

# UNCLASSIFIED

CLASSIFICATION:

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|--|---------|---------|---------|---------|--|---------|-------------------------------|---------|
| EXHIBIT R-2, RDT&E Budget Item Justification   |         |         |         |         |  |         | DATE:<br><b>February 2007</b> |         |
| APPROPRIATION/BUDGET ACTIVITY<br><b>RESEARCH DEVELOPMENT TEST &amp; EVALUATION, NAVY/BA-4</b>  |         |         |         |         | R-1 ITEM NOMENCLATURE<br>0603563N/Ship Concept Advanced Design |         |                               |         |
| COST (\$ in Millions)  | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010  | FY 2011 | FY 2012                       | FY 2013 |
| Total PE Cost  | 20.844  | 21.689  | 30.858  | 31.134  | 31.131   | 30.988  | 31.524                        | 32.069  |
| 2196/Design Tools, Plans & Concepts  | 11.635  | 2.142   | 1.364   | 1.383   | 1.416  | 1.397   | 1.423                         | 1.446   |
| 3161/NAVSEA Tech Authority   | 0.000   | 9.535   | 29.494  | 29.751  | 29.715   | 29.591  | 30.101                        | 30.623  |
| 9999/Congressional Adds  | 9.209   | 10.012  | 0.000   | 0.000   | 0.000  | 0.000   | 0.000                         | 0.000   |
|  |         |         |         |         |  |         |                               |         |
|  |         |         |         |         |  |         |                               |         |
|  |         |         |         |         |  |         |                               |         |
| <p><b>A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:</b><br/>                     Explore alternative surface ship force structures, advanced surface ship &amp; unmanned surface vehicles concepts, and the potential technologies for these force structures and advanced concepts in support of pre-acquisition mission needs analysis, mission area analysis, SCN and R&amp;D planning. The objective is a more affordable, mission capable surface ship force including ships with reduced manning, increased producibility, reduced operating and support costs, and greater utilization of the latest technology. The program directly supports the Navy Shipbuilding Plan with state-of-the-art design tools and methods for surface ship force structure alternative studies, ship &amp; unmanned vehicle concept studies, and the actual conduct of surface ship force structure alternative studies and advanced design concept studies for the ships that may become part of the SCN plan.</p> <p>(U) Project 2196 - This project funds concept development engineering, mission effectiveness analysis, and other analyses for formulation of future surface ship force structure along with development of the tools to accomplish these efforts. Advanced ship concept studies, ship and ship systems technology assessments, and the development and upgrade of ship concept design and engineering tools, methods, and criteria are also funded in this project.</p> <p>(U) Project 3161 - This project funds a broad assortment of initiatives supporting NAVSEA Technical Authority through integrated efforts in Cross Platform Systems Development (CPSD), furthering Sea Enterprise through the development of support elements for Technical Warrant holders and meeting relevant needs of the warfare community. The areas of exploration for CPSD include surface ship concept advanced development, submarine concepts, next generation unmanned surface vehicle, high speed ships and craft, ship engineering and analysis technology center, tool integration and technical data exchange, embedded interoperability engineering, and mission capability system engineering. The research products developed by this project directly influence future acquisition programs by providing a range of technically acceptable alternatives and evaluation of emerging technologies.</p> <p>(U) Project 9999: See project description on the R2a.</p> |         |         |         |         |  |         |                               |         |

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| APPROPRIATION/BUDGET ACTIVITY<br><b>RESEARCH DEVELOPMENT TEST &amp; EVALUATION, NAVY/BA-4</b> | R-1 ITEM NOMENCLATURE<br>0603563N/Ship Concept Advanced Design |
|---|--|

**B. PROGRAM CHANGE SUMMARY:**

| Funding:                       | FY 2006 | FY 2007 | FY 2008 | FY 2009 |
|--------------------------------|---------|---------|---------|---------|
| FY 2007 President's Budget:    | 21.221  | 21.549  | 30.937  | 30.897  |
| FY 2008/09 President's Budget: | 20.844  | 21.689  | 30.858  | 31.134  |
| Total Adjustments              | -0.377  | 0.140   | -0.079  | 0.237   |

Summary of Adjustments

|                       |        |        |        |       |
|-----------------------|--------|--------|--------|-------|
| SBIR Reductions       | -0.235 | 0.000  | 0.000  | 0.000 |
| Congressional Actions | -0.089 | 0.000  | 0.000  | 0.000 |
| Program Adjustments   | -0.053 | -0.082 | -0.079 | 0.237 |
| Reduction to Growth   | 0.000  | -9.828 | 0.000  | 0.000 |
| Congressional Adds    | 0.000  | 10.050 | 0.000  | 0.000 |

|          |        |       |        |       |
|----------|--------|-------|--------|-------|
| Subtotal | -0.377 | 0.140 | -0.079 | 0.237 |
|----------|--------|-------|--------|-------|

Schedule: PB06 includes Technical Authority funds in Project 2196 for FY 2006, and establishes Project 3161/NAVSEA Technical Authority for FY 2007 and future with Technical Authority funds moved to that project.

Technical:

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| EXHIBIT R-2a, RDT&E Project Justification                  |         |  |         |         |   |         | DATE:<br><b>February 2007</b> |         |
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N /BA-4</b> |         | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design |         |         | PROJECT NUMBER AND NAME<br>2196/Design Tools, Plans, and Concepts |         |                               |         |
| COST (\$ in Millions)                                      | FY 2006 | FY 2007  | FY 2008 | FY 2009 | FY 2010   | FY 2011 | FY 2012                       | FY 2013 |
| Project Cost   | 11.635  | 2.142  | 1.364   | 1.383   | 1.416   | 1.397   | 1.423                         | 1.446   |
| RDT&E Articles Qty   |         |  |         |         |   |         |                               |         |

**A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:** This project develops and explores alternative surface ship force structures, advanced surface ship & unmanned surface vehicles concepts, and the potential technologies for these force structures, along with advanced concepts in support of pre-acquisition mission needs analysis, mission area analysis, and SCN and R&D planning. The objective is a more affordable, mission capable surface ship force including ships with reduced manning, increased producibility, reduced operating and support costs, and greater utilization of the latest technology. The program directly supports the Navy Shipbuilding Plan with state-of-the-art design tools and methods for surface ship force structure alternative studies, ship & unmanned vehicle concept studies, surface ship mission effectiveness studies, and advanced design concept studies for the ships that may become part of the SCN plan.

(U) This project provides the foundation for an affordable and mission capable surface ship force. It also supports the next step in the development of a transformed naval force by accomplishing the pre-milestone A (especially pre-concept decision) efforts for all potential surface ships and craft. These efforts are the required first step in the integration of total ship systems, including combat systems, weapons systems and hull, mechanical and electrical (HM&E) systems. Inadequate early planning and ship concept formulation can result in down-stream design, construction and operational problems. A more subtle and severely negative impact of neglecting this early effort is that the "best" concepts and technologies may never even be considered and our greatest potential ship design advances never realized. Designs and technologies must meet the threat. This project supports this requirement.

(U) This project funds concept development engineering, mission effectiveness analysis, and other analyses for formulation of future surface ship force structure along with development of the tools to accomplish these efforts. Advanced ship concept studies, ship and ship systems technology assessments, and the development and upgrade of ship concept design and engineering tools, methods, and criteria are also funded in this project.

(U) This project accomplishes the following: (1) Develops alternative surface ship force structure concepts including the ships and unmanned vehicles; (2) Evaluates the mission capability effectiveness and costs for these alternative surface fleet architectures; (3) Performs fleet warfighting / mission effectiveness assessment studies; (4) Identifies future surface ship requirements and characteristics necessary to meet future threats and support mission needs; (5) Investigates new affordable ship concepts and evaluates technologies necessary to support these concepts; (6) Provides design methods and automated design tools to develop and evaluate ship concepts; and (7) Supports development of Initial Capabilities Documents (ICD) and analogous early requirements documents for future ships. These efforts are done to support mission analysis, mission needs development and technology assessment in support of future fleet concepts and potential ship acquisition programs. These efforts are fundamental to the Navy's formulation of the future fleet.

(U) Efforts under Project 2196 transition directly to early stage ship design in PE 0603564N, Ship Preliminary Design and Feasibility Studies, and similar Program Executive Office (PEO) ship design programs. While these efforts support concept exploration and mission needs assessment for potential future ship acquisition programs, they are not direct efforts for specific, authorized shipbuilding programs. This project is the only R&D effort (Government or commercial) that supports and maintains this country's naval ship design and engineering capabilities in the area of very early stage (Concept Design) design tools, criteria, and methods.

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| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N /BA-4</b> | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design | PROJECT NUMBER AND NAME<br>2196/Design Tools, Plans, and Concepts |

**B. Accomplishments/Planned Program**

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.690 | 0.728 | 0.537 | 0.547 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Ship Concepts and Mission Need Analysis: Develop ship concepts and perform analysis for potential ships and Force Architecture 5-10 years out in SCN plan.  
 FY06: Force Formulation Processes; Up River, Inland Combatants; Focused Mission Combatant Study; Radar Signature Evaluation Methodology; Fuel Study-Phase 2; Low Risk Composites-Phase 2.  
 FY07: Directed Energy Weapon Impacts; Barely Manned Patrol Craft Study; Small Combatant Study-Phase 2; Force Architecture Studies to support NECC; ASW-LCS Studies; T3-LCS concept  
 FY08: LSD (X) concept studies; Directed Energy Impacts-Phase 2; Barely Manned Patrol Craft Design; Gap analysis for Expeditionary Strike Force; Competition for New Risk Area Projects  
 FY09: Concept designs for NECC/ESF Gap Analysis; Competition for New Risk Area Projects

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.210 | 0.436 | 0.250 | 0.245 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Total Ship Technology Assessment: Analyze the benefits and impacts of new ship and hull, mechanical & electrical (HM&E) concepts, technologies and warfare systems.  
 FY06: Technology Knowledge Mgmt System (TKMS) Implementation; TKMS S/W procurement/integration; TKMS Pilot Task (PEO LMW and PEO Ships Focused); DARPA Alignment Pathway  
 FY07: Advanced Model TKMS for operational use (PEO LMW and PEO Ships focus); TKMS Capability Extensions based on Operational Feedback and emergent Customer Requirements  
 FY08: Support LSD Replacement AOA effort with technology identification using TKMS; Competition for New Risk Area Projects  
 FY09: Support LSD Replacement Design Team with tech. assessment, selection, and monitoring using TKMS; Analyze TKMS needs of TAO Replacement; Competition for New Risk Area Projects

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.631 | 0.692 | 0.402 | 0.416 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Ship Concept Design and Engineering Tools, Methods, and Criteria: Improve capability for rapid and accurate ship performance/cost/risk assessments and tradeoff studies.  
 FY06: NEMO program-automated Arrangements, -Multi Hull Optimization; Advanced Surface Ship Evaluation Tool (ASSET) Expanded Flexibility; COGENT UTE/TIES Integration; STEP AP233 for Sys. Engineering  
 FY07: ASSET Expanded Capability; COGENT UTE/TIES (II); LEAPS Composites Analysis; LEAPS Apps for Small Craft; Competition for New Risk Area Projects  
 FY08: ASSET Expanded Capability; LEAPS Composites Analysis (II); LEAPS Distribution System Modeling; LEAPS Apps for Small Craft (II); Competition for New Risk Area Projects  
 FY09: ASSET Expanded Capability; LEAPS Distribution System Modeling (II); LEAPS Apps for Small Craft (III); Competition for New Risk Area Projects

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**B. Accomplishments/Planned Program (Cont.)**

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.246 | 0.286 | 0.175 | 0.175 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

((U) Mission Systems Interface Development and Demonstration: Requirements development to counter asymmetric, peer and littoral enemies with tailored, modularized mission systems.  
 FY06: Special Operations mission package defn; Vertical Take Off and Landing Airborne Early Warning System (VTOL AEW) concept quick-look; Over The Horizon (OTH) communications relay;  
 FY07: VTOL AEW requirements analysis and JCTD planning; OTH prototype test and evaluation; Modularized weapon system interface definition and documentation  
 FY08: OTH - Unmanned Vehicle test and evaluation; Small combatant / craft stabilized weapon system concept development and ship impact analysis  
 FY09: Expeditionary Strike Force modular mission package definition; small combatant in-theater rearming concept development

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.464 | 0.000 | 0.000 | 0.000 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

((U) Ship Concept Advanced Development: Directly supports the Navy's ability to understand risk and ROM cost of surface warfare assets; Pre-Milestone A ship and craft design and analysis. (CPSD 1)  
 FY06: Fuel Economy Impact Study, Deployable/Recoverable OTH Comm Relays, Plug-n-fight Architecture model, Surface Force Mission Effectiveness (moves to project 3161 in FY07)

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.490 | 0.000 | 0.000 | 0.000 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

((U) Ship Design and Certification Tools: Evaluation tools to certify the safety and mission capability of ships and submarines. Integrated strategy for NAVSEA suite used to support of ship certs. (CPSD 2)  
 FY06: NEMO-LEAPS Integrator phase 3; LEAPS Common ship Engineering Algorithm Development; issue new relaease of LEAPS (moves to project 3161 in FY07)

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|--|--|---|

**B. Accomplishments/Planned Program (Cont.)**

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.311 | 0.000 | 0.000 | 0.000 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Engineering and Technical Data Exchange: Develop and implement a framework of standardized interfaces for ship development and engineering systems. (CPSD 3)  
FY06: LEAPS Common Translator; LEAPS Modeling and Simulation Translator; issue new release of LEAPS (moves to project 3161 in FY07)

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.283 | 0.000 | 0.000 | 0.000 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Next Generation USV: Development and demonstration of Unmanned Surface Vehicle (USVs) with focus on autonomous behavior, modularity, new ship classes for pre AoA studies. (CPSD 4)  
FY06: Automated Launch and Retrieval System Concept Report; Autonomous Path Selection and Collision Avoidance System Design (moves to project 3161 in FY07)

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.425 | 0.000 | 0.000 | 0.000 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) High Speed Ships and Craft: Investigate concepts for future high speed ships and craft that promise improved mission effectiveness in mobility, survivability, and warfare mission areas. (CPSD 5)  
FY06: High Speed Propulsion Plant Architecture; Ship Synthesis Modeling (moves to project 3161 in FY07)

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**B. Accomplishments/Planned Program (Cont.)**

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.707 | 0.000 | 0.000 | 0.000 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Alternative Power Systems: Investigate concepts for ships and craft with alternative power/propulsion systems evaluating effectiveness in mobility, survivability, and warfare mission areas. (CPSD 6)  
 FY06: Propulsion Plant Architecture Study; Energy Requirements Study; Cost/Risk Comparison of Propulsion Systems (moves to project 3161 in FY07)

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.278 | 0.000 | 0.000 | 0.000 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Ship Engineering & Analysis Technology Center (formerly Hydrodynamic/Hydroacoustic Technology Center (H/HTC)): Provides Government activities, shipbuilders, academia and contractors the following (FY06-FY09): high performance computing systems; commercial and research software libraries; classified and unclassified connectivity; high end data visualization; and collaboration tools/Centralized data repository. Provide the framework of continued world class computing upon which specific task funding will build. (moves to project 3161 in FY07) (CPSD 7)

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.990 | 0.000 | 0.000 | 0.000 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Future Submarine Design: Develop ship concept studies and evaluate technologies to define the Next Generation Submarine, common SSN-SSBN Hull and Payload Modularity. (CPSD 8)  
 FY06: SUBCODE Concept Design Tool development; Next Generation Submarine Concepts; Next Generation Submarine Technologies Study; Submarine Concept Design Processes and Standards (moves to project 3161 in FY07)

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| <b>APPROPRIATION/BUDGET ACTIVITY</b><br>RDT&E, N /BA-4  | <b>PROGRAM ELEMENT NUMBER AND NAME</b><br>0603563N/Ship Concept Advanced Design | <b>PROJECT NUMBER AND NAME</b><br>2196/Design Tools, Plans, and Concepts |                               |       |
| <b>B. Accomplishments/Planned Program (Cont.)</b>   |   |  |                               |       |
|   | FY 06   | FY 07  | FY 08                         | FY 09 |
| Accomplishments/Effort/Subtotal Cost  | 4.088   | 0.000  | 0.000                         | 0.000 |
| RDT&E Articles Quantity   | N/A   | N/A  | N/A                           | N/A   |
| (U) Embedded Interoperability Engineering: Executes a dedicated process for evaluating the interoperability performance of warfare systems early in the acquisition cycle, prior to certification. (CPSD 9)<br>FY06: CVN 65, 75 interoperability assess/test; BFIMS One List database creation; Distributed Eng Plant support: AEGIS B/L 7.1.1.1, B/L 6.1.7, CVN 68, LHA 4 APIT, DEP sup. (moves to project 3161 in FY07) |   |  |                               |       |
|   | FY 06   | FY 07  | FY 08                         | FY 09 |
| Mission Capability Systems Engineering  | 1.822   | 0.000  | 0.000                         | 0.000 |
| Accomplishments/Effort/Subtotal Cost  | 1.822   | 0.000  | 0.000                         | 0.000 |
| RDT&E Articles Quantity   | N/A   | N/A  | N/A                           | N/A   |
| (U) Mission Capability Systems Engineering: Develop force level systems engineering criteria and guidance at the systems of systems (SoS) and Family of Systems (FoS) level. (CPSD 10)<br>FY06: Define Warfare Systems Engineering Process; Review Mission Capability Based Requirements in Several Systems; Review certain architectures for interoperability (moves to project 3161 in FY07)                            |   |  |                               |       |

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**C. OTHER PROGRAM FUNDING SUMMARY:**

| <u>Line Item No. &amp; Name</u>                                     | <u>FY 2006</u> | <u>FY 2007</u> | <u>FY 2008</u> | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011</u> | <u>FY 2012</u> | <u>FY 2013</u> | <u>To Complete</u> | <u>Total Cost</u> |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|-------------------|
| (U) Related RDT&E   |                |                |                |                |                |                |                |                |                    |                   |
| (U) PE 0603512N (Carrier Systems Development)                       | 165            | 156.248        | 84.806         | 72.683         | 61.070         | 44.864         | 44.477         | 46.373         |                    |                   |
| (U) PE 0603513N (Shipboard Systems Component Development)           | 44.476         | 49.993         | 9.450          | 9.561          | 9.606          | 9.622          | 9.791          | 9.967          |                    |                   |
| (U) PE 0603564N (Ship Preliminary Design and Feasibility Studies)   | 26.291         | 25.766         | 18.736         | 10.642         | 25.794         | 12.696         | 3.639          | 0.638          |                    |                   |
| (U) PE 0604300N (SC21 Total Ship Systems Engineering)               | 1,100.804      | 820.065        | 621.544        | 658.223        | 880.899        | 1,004.274      | 839.915        | 702.464        |                    |                   |
| (U) PE 0604567N (Ship Contract Design/Live Fire T&E)                | 56.415         | 51.729         | 62.404         | 73.698         | 69.270         | 101.536        | 91.287         | 90.106         |                    |                   |
| (U) PE 0603582N (Combat System Integ/Strike Force Interoperability) | 74.626         | 64.088         | 53.427         | 53.435         | 39.139         | 38.621         | 38.12          | 37.621         |                    |                   |

**D. ACQUISITION STRATEGY:**

This is a non acquisition program that develops, evaluates, and validates early stages of total ship concepts and technologies in support of SCN planning and potential future ship acquisition programs. This program also supports development, demonstration, evaluation, and validation of engineering tools, methods, and criteria for those concept designs and assessments.

**E. MAJOR PERFORMERS:**

Field Activities & Locations - Work Performed:

NSWC Carderock, Bethesda, MD - Future ship open architectures, advanced ship concepts, ship & ship system technology assessments, design & engineering tool upgrades

NSWC Dahlgren, Dahlgren, VA - Future force architectures, mission effectiveness analyses, analytical tool development

SPAWAR, San Diego, CA - C4ISR systems concept development & integration

Contractors & Locations - Work Performed

TBD - Systems engineering analyses, trade studies, ship concept design, cost impact analysis

TBD - Software, tools development

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| Exhibit R-3 Cost Analysis (page 1) |                        |   |                                       |            |                  |            |                  | DATE: <b>February 2007</b>             |                  |            |                  |                  |            |                          |
|------------------------------------|------------------------|---|---------------------------------------|------------|------------------|------------|------------------|--|------------------|------------|------------------|------------------|------------|--------------------------|
| APPROPRIATION/BUDGET ACTIVITY      |                        |   | PROGRAM ELEMENT                       |            |                  |            |                  | PROJECT NUMBER AND NAME                |                  |            |                  |                  |            |                          |
| <b>RD&amp;E, N/BA-4</b>            |                        |   | 0603563N/Ship Concept Advanced Design |            |                  |            |                  | 2196/Design Tools, Plans, and Concepts |                  |            |                  |                  |            |                          |
| Cost Categories                    | Contract Method & Type | Performing Activity & Location              | Total PY s Cost                       | FY 06 Cost | FY 06 Award Date | FY 07 Cost | FY 07 Award Date | FY 08 Cost                             | FY 08 Award Date | FY 09 Cost | FY 09 Award Date | Cost to Complete | Total Cost | Target Value of Contract |
| Primary Hardware Development       |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Systems Engineering                | various                | Other Various Contractors                   | 58.612                                | 2.560      | various          | 0.334      | various          | 0.271                                  | various          | 0.271      | various          | Continuing       | Continuing |                          |
| Engineering Development            | WX & RX                | NAVSEA, Dahlgren Div,<br>Dahlgren, VA       | 3.806                                 | 2.906      | various          | 0.835      | various          | 0.275                                  | various          | 0.275      | various          | Continuing       | Continuing |                          |
|                                    | WX&RX                  | NSWC PHD                                    |                                       | 1.788      | various          |            |                  |  |                  |            |                  |                  |            |                          |
| Demonstration & Evaluation         | WX & RX                | NAVSEA, Carderock Div,<br>West Bethesda, MD | 35.009                                | 4.201      | various          | 0.853      | various          | 0.748                                  | various          | 0.767      | various          | Continuing       | Continuing |                          |
|                                    | WX & RX                | SPAWAR                                      |                                       | 0.150      | various          | 0.100      | various          | 0.050                                  | various          | 0.050      | various          | Continuing       | Continuing |                          |
| Licenses                           |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Tooling                            | WX\RXPD                | SPAWAR                                      | 10.391                                |            |                  |            |                  |  |                  |            |                  | 0.000            | 10.391     |                          |
| GFE                                |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Award Fees                         |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Subtotal Product Development       |                        |   | 107.818                               | 11.605     |                  | 2.122      |                  | 1.344                                  |                  | 1.363      |                  | 0.000            | 124.252    |                          |
| Remarks:                           |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  |            |                          |
| Development Support                |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Software Development               |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Training Development               |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Integrated Logistics Support       |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Configuration Management           |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Technical Data                     |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| GFE                                |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Award Fees                         |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  | 0.000      |                          |
| Subtotal Support                   |                        |   | 0.000                                 | 0.000      |                  | 0.000      |                  | 0.000                                  |                  | 0.000      |                  | 0.000            | 0.000      |                          |
| Remarks:                           |                        |   |                                       |            |                  |            |                  |  |                  |            |                  |                  |            |                          |

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| Exhibit R-3 Cost Analysis (page 2)                        |                        |                                |                 |  |                  |            |                  | DATE: <b>February 2007</b>  |                  |            |                  |                  |            |                          |
|---|------------------------|--------------------------------|-----------------|--|------------------|------------|------------------|---|------------------|------------|------------------|------------------|------------|--------------------------|
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N/BA-4</b> |                        |                                |                 | PROGRAM ELEMENT<br>0603563N/Ship Concept Advanced Design |                  |            |                  | PROJECT NUMBER AND NAME<br>2196/Design Tools, Plans, and Concepts |                  |            |                  |                  |            |                          |
| Cost Categories   | Contract Method & Type | Performing Activity & Location | Total PY s Cost | FY 06 Cost   | FY 06 Award Date | FY 07 Cost | FY 07 Award Date | FY 08 Cost  | FY 08 Award Date | FY 09 Cost | FY 09 Award Date | Cost to Complete | Total Cost | Target Value of Contract |
| Developmental Test & Evaluation                           |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Operational Test & Evaluation                             |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Live Fire Test & Evaluation                               |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Test Assets   |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Tooling   |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| GFE   |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Award Fees  |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Subtotal T&E  |                        |                                | 0.000           | 0.000  |                  | 0.000      |                  | 0.000   |                  | 0.000      |                  | 0.000            | 0.000      |                          |
| Remarks:  |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  |            |                          |
| Contractor Engineering Support                            |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Government Engineering Support                            |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Program Management Support                                |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Travel  |                        |                                | 0.030           | 0.030  |                  | 0.020      |                  | 0.020   |                  | 0.020      |                  | Continuing       | Continuing |                          |
| Labor (Research Personnel)                                |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| SBIR Assessment   |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  | 0.000      |                          |
| Subtotal Management                                       |                        |                                | 0.030           | 0.030  |                  | 0.020      |                  | 0.020   |                  | 0.020      |                  | 0.000            | 0.090      |                          |
| Remarks:  |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  |            |                          |
| Total Cost  |                        |                                | 107.848         | 11.635   |                  | 2.142      |                  | 1.364   |                  | 1.383      |                  | 0.000            | 124.372    |                          |
| Remarks:  |                        |                                |                 |  |                  |            |                  |   |                  |            |                  |                  |            |                          |

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| EXHIBIT R4, Schedule Profile                                     |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   | DATE: <b>February 2007</b> |      |   |   |   |      |   |   |   |      |   |   |   |
|--|------|---|---|---|---------------------------------------|---|---|---|------|---|---|---|------|---|--|---|------|---|---|----------------------------|------|---|---|---|------|---|---|---|------|---|---|---|
| APPROPRIATION/BUDGET ACTIVITY                                    |      |   |   |   | PROGRAM ELEMENT NUMBER AND NAME       |   |   |   |      |   |   |   |      |   | PROJECT NUMBER AND NAME                |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| <b>RDT&amp;E, N /BA-4</b>  |      |   |   |   | 0603563N/Ship Concept Advanced Design |   |   |   |      |   |   |   |      |   | 2196/Design Tools, Plans, and Concepts |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| Fiscal Year  | 2006 |   |   |   | 2007                                  |   |   |   | 2008 |   |   |   | 2009 |   |  |   | 2010 |   |   |                            | 2011 |   |   |   | 2012 |   |   |   | 2013 |   |   |   |
|  | 1    | 2 | 3 | 4 | 1                                     | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3                                      | 4 | 1    | 2 | 3 | 4                          | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 |
| <b>Engineering Milestones</b>                                    |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| Pre-MS A Ship Concept Studies                                    |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| Capability to Assess Alt & Adv Hull Forms                        |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| Force Architecture Including Futures & Force Structure Alt       |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| Initial Open Systems Architecture & other Technology Assessments |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| Assessment of Technology Benefits                                |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| Technology Management & Cost Assessment Methods                  |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
| CPSD projects<br>10 projects that move to 3161 in FY07           |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
|  |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |
|  |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |  |   |      |   |   |                            |      |   |   |   |      |   |   |   |      |   |   |   |



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| EXHIBIT R-2a, RDT&E Project Justification   |  |              |               |               |  |               | DATE:<br><b>February 2007</b> |               |
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N /BA-4</b>  | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design |              |               |               | PROJECT NUMBER AND NAME<br>3161/NAVSEA Technical Authority |               |                               |               |
| COST (\$ in Millions)   | FY 2006  | FY 2007      | FY 2008       | FY 2009       | FY 2010  | FY 2011       | FY 2012                       | FY 2013       |
| Project Cost  | <b>0.000</b>   | <b>9.535</b> | <b>29.494</b> | <b>29.751</b> | <b>29.715</b>  | <b>29.591</b> | <b>30.101</b>                 | <b>30.623</b> |
| RDT&E Articles Qty  |  |              |               |               |  |               |                               |               |
| <p><b>A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:</b> A. (U) Mission Description and Budget Item Justification: This project has been established to support NAVSEA Technical Authority through coordinated, collaborative, cross-platform systems development resulting in advanced capabilities across NAVSEA business lines through reuse, adaptation and extension of processes, procedures, and tools necessary to develop and explore alternative surface ship and submarine force structures; advanced submarine concepts, surface ship &amp; unmanned surface vehicle concepts; interoperability; and development of systems level engineering criteria to support these force structures and advanced concepts as part of pre-acquisition mission needs analysis, mission area analysis, SCN, and R&amp;D planning. The objective is the coordination of ongoing early-stage concept design and development efforts for cross-platform applicability to result in a more affordable, mission-capable, and interoperable surface ship and submarine forces including ships and submarines with reduced manning, increased producibility, reduced operating and support costs, and greater utilization of the latest technology.</p> <p>(U) Efforts under Project 3161 enhance ongoing efforts within Project 2196 and transition directly to early-stage ship design for Ship and Submarine Preliminary Design and Feasibility Studies and other Program Executive Office (PEO) ship and submarine design programs. While these efforts support concept exploration and mission needs assessment for potential future ship and submarine acquisition programs, they are not direct efforts for specific, authorized shipbuilding programs. This project is the only R&amp;D effort (Government or commercial) that provides a coordinated, collaborative approach to the development of cross-platform naval ship, submarine, and weapon system design and engineering capabilities in the areas of design tools, criteria, and methods. This project also provides innovative solutions for current Fleet issues involving Technical Authority, such as current interoperability issues with new systems or platforms.</p> |  |              |               |               |  |               |                               |               |

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**Exhibit R-2a, RDTEN Project Justification**  
(Exhibit R-2a)

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| EXHIBIT R-2a, RDT&E Project Justification | DATE:<br><b>February 2007</b> |
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| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N /BA-4</b> | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design | PROJECT NUMBER AND NAME<br>3161/NAVSEA Technical Authority |
|--|--|--|

**B. Accomplishments/Planned Program**

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.000 | 0.584 | 2.022 | 2.019 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Ship Concept Advanced Development: Directly supports the Navy's ability to understand risk and ROM cost of surface warfare assets; Pre-Milestone A ship and craft design and analysis. (CPSD 1)  
 FY06: Fuel Economy Impact Study, Deployable/Recoverable OTH Comm Relays, Plug-n-fight Architecture model, Surface Force Mission Effectiveness (project 2196 in FY06)  
 FY07: Deployable/Recoverable OTH Comm Relays Prototype Development/Transition; High Speed Open Ocean Combatant Structural Design Criteria; Competition for New Risk Area Projects  
 FY08: Friction Stir Welding of Al for Naval Applications; Future Expeditionary Warfare Concept Study; UCAV Ship Support Study; High Speed Open Ocean Phase 2; Competition for New Risk Area

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.000 | 1.547 | 2.754 | 2.859 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Ship Design and Certification Tools and Technical Data Exchange: Evaluation tools to certify the safety and mission capability of ships and submarines. Integrated strategy for NAVSEA suite used to support of ship certs. (CPSD 2)  
 FY06: NEMO-LEAPS Integrator phase 3; LEAPS Common ship Engineering Algorithm Development; issue new release of LEAPS (project 2196 in FY06). LEAPS Common Translator; LEAPS Modeling and Simulation Translator; issue new release of LEAPS (project 2196 in FY06)  
 FY07: NEMO-LEAPS Integrator phase 4; Fleet Incident Situational Response program; LEAPS Modeling and Simulation Translator phase 2.  
 FY08: Extend tools and ship model integration supporting Fleet Incident Situational Response program. Extend and integrate modeling & simulation tools supporting LFT&E. Competition for New Risk Area Projects.  
 FY09: Extend and integrate analytical tools supporting high performance naval ship technologies. Demo tech data exchange between LFT&E M&S environment and shipbuilder CAD environments; Extend M&S integrated environmental to additional engineering disciplines. Competition for New Risk Area Projects.

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.000 | 1.754 | 2.654 | 2.649 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Advanced Ship Systems Development: Develop and validate advanced tools and processes to reduce technical risk to naval platform acquisition programs in support of naval Technical Authority (CPSD 3).  
 FY07: Conduct Future Fleet Engineering Systems and Service Life Studies; Initiate development of Full Ship Finite Element Modeling Baseline for Future Ships; Initiate development of Acoustic Spectrum Management Tools for Surface Ships.  
 FY08: Continue development and validation of Full Ship Finite Element Modeling Baseline; Expand development of Acoustic Spectrum Management Tools for Surface Ships capabilities and resolution; Initiate platform ballasting and deballasting design tool studies. Initiate Open Systems Architecture Baseline Combat System Studies for transition into new acquisition platforms and in-service ship upgrades.  
 FY09: Validate Future Fleet Engineering Systems and Service Life Studies; Continue development and validation of Full Ship Finite Element Modeling Baseline and expand resolution for damage control assessment; Continue platform ballasting and deballasting design tool studies; Validate ship system commercial design tools for advanced material handling and machining.

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| EXHIBIT R-2a, RDT&E Project Justification                  |  | DATE:<br><b>February 2007</b>                              |
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N /BA-4</b> | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design | PROJECT NUMBER AND NAME<br>3161/NAVSEA Technical Authority |

**B. Accomplishments/Planned Program**

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.000 | 0.757 | 1.767 | 1.764 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Next Generation USV: Development and demonstration of Unmanned Surface Vehicle (USVs) with focus on autonomous behavior, modularity, new ship classes for pre AoA studies. (CPSD 4)  
 FY06: Automated Launch and Retrieval System Concept Report; Autonomous Path Selection and Collision Avoidance System Design (project 2196 in FY06)  
 FY07: Automated Launch and Retrieval System Prototype; Autonomous Path Selection and Collision Avoidance Prototype; Rapidly Deployable MUTE USV Design; Payload Pwr Support Concept Design  
 FY08: Rapidly Deployable MUTE USV Prototype; Payload Power Support Prototype; Long Range Endurance design; Autonomous Health Monitoring and Recovery design; Competition for New

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.000 | 1.022 | 3.615 | 3.609 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) High Speed Ships and Craft: Investigate concepts for future high speed ships and craft that promise improved mission effectiveness in mobility, survivability, and warfare mission areas. (CPSD 5)  
 FY06: High Speed Propulsion Plant Architecture; Ship Synthesis Modeling (project 2196 in FY06)  
 FY07: High Speed Propulsion Plant Architecture-phase 2; Ship Synthesis Modeling-phase 2; Propulsion Systems Engineering; Competition for New Risk Area Projects  
 FY08: High Speed Advanced Actuators design and prototype construction; Plant architecture systems engineering process integration into NVR; Competition for New Risk Area Projects  
 FY09: Drag Reduction Transition to fleet demonstrator; AWJ-21 design tool validation and NVR integration; Competition for New Risk Area Projects

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.000 | 0.715 | 2.410 | 2.405 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Alternative Power Systems: Investigate concepts for ships and craft with alternative power/propulsion systems evaluating effectiveness in mobility, survivability, and warfare mission areas. (CPSD 6)  
 FY06: Propulsion Plant Architecture Study; Energy Requirements Study; Cost/Risk Comparison of Propulsion Systems (project 2196 in FY06)  
 FY07: Propulsion Plant Architecture Study-phase 2; Nuclear Frigate Preliminary Design; Fuel Cell Concept SYSENG and validation with LDTs Data; Competition for New Risk Area Projects  
 FY08: Fuel Cell At Sea Demonstration design; Rim Driven Ducted Propulsor design; Competition for New Risk Area Projects  
 FY09: Fuel Cell At Sea Demonstration prototype construction; Rim Driven Ducted Propulsor prototype construction; Competition for New Risk Area Projects

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| EXHIBIT R-2a, RDT&E Project Justification                  |  | DATE:<br><b>February 2007</b>                              |
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N /BA-4</b> | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design | PROJECT NUMBER AND NAME<br>3161/NAVSEA Technical Authority |

**B. Accomplishments/Planned Program**

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.000 | 0.000 | 1.199 | 1.197 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Ship Engineering & Analysis Technology Center (formerly Hydrodynamic/Hydroacoustic Technology Center (H/HTC)): Provides Government activities, shipbuilders, academia and contractors the following (FY06-FY09): high performance computing systems; commercial and research software libraries; classified and unclassified connectivity; high end data visualization; and collaboration tools/Centralized data repository. Provide the framework of continued world class computing upon which specific task funding will build. (project 2196 in FY06) (CPSD 7)

|                                      | FY 06 | FY 07 | FY 08 | FY 09 |
|--------------------------------------|-------|-------|-------|-------|
| Accomplishments/Effort/Subtotal Cost | 0.000 | 0.715 | 4.825 | 4.817 |
| RDT&E Articles Quantity              | N/A   | N/A   | N/A   | N/A   |

(U) Future Submarine Design: Develop ship concept studies and evaluate technologies to define the Next Generation Submarine, common SSN-SSBN Hull and Payload Modularity. (CPSD 8)  
 FY06: SUBCODE Concept Design Tool Dev.; Next Generation Sub Concepts; Next Generation Submarine Technologies Study; Submarine Concept Design Processes and Standards (project 2196 in FY06)  
 FY07: Navy After Next Tech Validations; SUBCODE Concept Design Tool Dev - phase 2; Technical Warrant Holder Concept Validation Support; Submarine Design Processes and Standards Development  
 FY08: Navy After Next Tech Validations; Technical Warrant Holder Concept Validation Support; SUBCODE Concept Design Tool Dev - phase 3; Submarine Design Processes and Standards Development  
 FY09: Navy After Next Tech Validations; Technical Warrant Holder Concept Validation Support; SUBCODE Concept Design Tool Dev - phase 4; Submarine Design Processes and Standards Development

|                                       | FY 06 | FY 07 | FY 08 | FY 09 |
|---------------------------------------|-------|-------|-------|-------|
| Embedded Interoperability Engineering |       |       |       |       |
| Accomplishments/Effort/Subtotal Cost  | 0.000 | 1.258 | 4.124 | 4.316 |
| RDT&E Articles Quantity               | N/A   | N/A   | N/A   | N/A   |

(U) Embedded Interoperability Engineering: Establishes and executes a dedicated process for evaluating the interoperability performance of warfare systems early in the acquisition cycle, prior to certification. Ensures fewer mission critical system failures that would degrade the warfighting capability that is ultimately fielded. Focus on emerging Open Architecture warfare systems. (CPSD 9)  
 FY06: CVN 69, 74 interoperability test/assessment; BFIMS One List database creation; Distributed Eng Plant support: AEGIS B/L 7.1.1.1, B/L 6.1.7, CVN 68, LHA 4 APIT report (project 2196 in FY06).  
 FY07: Develop tactics, techniques and procedures (TTP) for CVN 69, 74 based on FY06 work; Interoperability test and assessment for LCS-1, CVN 68, LHD 7 and Aegis Baseline 7. Develop BFIMS.  
 FY08: Develop TTP for LCS-1, CVN 68, LHD 7 and Aegis B/L 7 based on FY07 work; Interoperability test and assessment for LCS-2, CVN 77, DDG Modernization and DDG 1000.  
 FY09: Develop TTP for LCS-2, CVN 77 and DDG Modernization based on FY08 work; Interoperability test and assessment for CG Modernization, DDG 1000 and CVN 21 (CVN 78).

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**Exhibit R-2a, RDTEN Project Justification**  
(Exhibit R-2a)

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| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N /BA-4</b>  | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design | PROJECT NUMBER AND NAME<br>3161/NAVSEA Technical Authority |                               |       |
| <b>B. Accomplishments/Planned Program</b>   |  |  |                               |       |
| Mission Capability Systems Engineering  | FY 06  | FY 07  | FY 08                         | FY 09 |
| Accomplishments/Effort/Subtotal Cost  | 0.000  | 1.183  | 4.124                         | 4.116 |
| RDT&E Articles Quantity   | N/A  | N/A  | N/A                           | N/A   |
| <div style="border: 1px solid black; padding: 10px;"> <p>(U) Mission Capability Systems Engineering: Develop force level systems engineering criteria and guidance at the systems of systems (SoS) and Family of Systems (FoS) level. (CPSD 10)<br/> FY06: Define Warfare Systems Engineering Process; Review Mission Capability Based Requirements in Several Systems; Review certain architectures for interoperability (project 2196 in FY06)<br/> FY07: Continue to refine the Warfare Systems Engineering Process; update concepts to Mission Capability Based Requirements; review Warfare System Integrated Architectures for interoperability; evaluate the development of Warfare Systems Integrated Architectures and ensure alignment to FORCEnet Architecture; evaluate systems engineering principles to Sea Trial Experiments aligned with mission capability gaps. Develop transition documentation for experiments achieving positive military utility assessments; analyze and develop ground level Key Performance Parameters for use across all AT/FP programs.</p> <p>FY08: Continue to develop Integrated Architectural views for Warfare Systems, ensuring alignment to FORCEnet Architecture; manage the NAVSEA Sea Trial effort, identifying, defining and evaluating Sea Trial initiatives addressing documented capability gaps, providing technical reviews in the evaluation of initiatives as requested by the Fleet Collaborative Teams (FCT); continue to analyze and develop experiments for achieving positive military utility assessments; continue to analyze and develop ground level Key Performance Parameters for use across all AT/FP programs.</p> <p>FY09: Continue to manage the NAVSEA Sea Trial effort, identifying, defining and evaluating Sea Trial initiatives addressing documented capability gaps, and providing technical support in the evaluation of initiatives as requested by the FCTs; develop transition documentation for experiments achieving positive military utility assessments; transition Key Performance Parameters for use across all AT/FP programs in new construction programs.</p> </div> |  |  |                               |       |

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| EXHIBIT R-2a, RDT&E Project Justification                  |  | DATE: <b>February 2007</b>                                 |
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N /BA-4</b> | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design | PROJECT NUMBER AND NAME<br>3161/NAVSEA Technical Authority |

**C. OTHER PROGRAM FUNDING SUMMARY:**

| <u>Line Item No. &amp; Name</u>  | <u>FY 2006</u> | <u>FY 2007</u> | <u>FY 2008</u> | <u>FY 2009</u> | <u>FY 2010</u> | <u>FY 2011</u> | <u>FY 2012</u> | <u>FY 2013</u> | <u>To Complete</u> | <u>Total Cost</u> |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|-------------------|
| (U) Related RDT&E  |                |                |                |                |                |                |                |                |                    |                   |
| (U) PE 0603512N (Carrier Systems Development)                          | 110,805        | 153,894        | 88,064         | 71,937         | 60,369         | 44,339         | 44,097         | 46,127         |                    |                   |
| (U) PE 0603513N (Shipboard Systems Component Development)              | 44,518         | 14,135         | 9,424          | 9,456          | 9,493          | 9,517          | 9,719          | 9,926          |                    |                   |
| (U) PE 0603564N (Ship Preliminary Design and Feasibility Studies)      | 26,291         | 21,314         | 18,627         | 10,560         | 25,588         | 12,609         | 3,622          | 0,636          |                    |                   |
| (U) PE 0604300N (SC21 Total Ship Systems Engineering)                  | 1,100,804      | 817,528        | 617,923        | 652,858        | 873,516        | 997,010        | 835,763        | 700,520        |                    |                   |
| (U) PE 0604567N (Ship Contract Design/Live Fire T&E)                   | 56,415         | 72,055         | 62,114         | 73,073         | 68,650         | 100,768        | 90,811         | 89,846         |                    |                   |
| (U) PE 0603582N (Combat System Integration/Strike Force Interoperabili | 74,626         | 62,095         | 53,311         | 52,867         | 38,639         | 38,164         | 37,806         | 37,445         |                    |                   |

**D. ACQUISITION STRATEGY:**

This is a non acquisition program that develops, evaluates, and validates early stages of total ship concepts and technologies in support of SCN planning and potential future ship and submarine acquisition programs. This program also supports development, demonstration, evaluation, and validation of engineering tools, methods, and criteria for those concept designs and assessments. This program supports the NAVSEA Technical Warrant Holders by providing validated engineering tools, methods, and criteria for ship, submarine and weapon system concept designs and assessments while fostering collaboration and coordination of efforts resulting in more effective use of funding.

**E. MAJOR PERFORMERS:**

Field Activities & Locations - Work Performed:

- NSWC Carderock, Bethesda, MD - Future ship open architectures, advanced ship concepts, ship & ship system technology assessments, design & engineering tool upgrades
- NSWC Dahlgren, Dahlgren, VA - Future force architectures, mission effectiveness analyses, analytical tool development
- SPAWAR, San Diego, CA - C4ISR systems concept development & integration

Contractors & Locations - Work Performed

- TBD - Systems engineering analyses, trade studies, ship concept design, cost impact analysis
- TBD - Software, tools development

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| Exhibit R-3 Cost Analysis (page 1) |                        |                                |                                       |            |                  |            |                                 |            |                  | DATE: February 2007 |                  |                  |            |                          |
|------------------------------------|------------------------|--------------------------------|---------------------------------------|------------|------------------|------------|---------------------------------|------------|------------------|---------------------|------------------|------------------|------------|--------------------------|
| APPROPRIATION/BUDGET ACTIVITY      |                        |                                | PROGRAM ELEMENT                       |            |                  |            | PROJECT NUMBER AND NAME         |            |                  |                     |                  |                  |            |                          |
| RDT&E, N/BA-4                      |                        |                                | 0603563N/Ship Concept Advanced Design |            |                  |            | 3161/NAVSEA Technical Authority |            |                  |                     |                  |                  |            |                          |
| Cost Categories                    | Contract Method & Type | Performing Activity & Location | Total PY s Cost                       | FY 06 Cost | FY 06 Award Date | FY 07 Cost | FY 07 Award Date                | FY 08 Cost | FY 08 Award Date | FY 09 Cost          | FY 09 Award Date | Cost to Complete | Total Cost | Target Value of Contract |
| Primary Hardware Development       |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Systems Engineering                | various                | Various Contractors            |                                       |            |                  | 2.700      | various                         | 6.150      | various          | 6.150               | various          | Continuing       | Continuing |                          |
|                                    | WX&RX                  | NSWC, NUWC, CDSA               |                                       |            |                  | 2.335      | various                         | 10.750     | various          | 10.710              | various          | Continuing       | Continuing |                          |
| Engineering Development            | WX&RX                  | NSWC, NUWC                     |                                       |            |                  | 1.500      | various                         | 6.750      | various          | 6.750               | various          | Continuing       | Continuing |                          |
|                                    |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  |            |                          |
| Demonstration & Evaluation         | WX&RX                  | NSWC                           |                                       |            |                  | 1.400      | various                         | 3.494      | various          | 3.791               | various          | Continuing       | Continuing |                          |
|                                    | WX&RX                  | SPAWAR                         |                                       |            |                  | 1.500      | various                         | 2.250      | various          | 2.250               | various          |                  |            |                          |
|                                    |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  |            |                          |
| Licenses                           |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Tooling                            |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  | 0.000            | 0.000      |                          |
| GFE                                |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Award Fees                         |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Subtotal Product Development       |                        |                                | 0.000                                 | 0.000      |                  | 9.435      |                                 | 29.394     |                  | 29.651              |                  | 0.000            | 68.480     |                          |
| Remarks:                           |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  |            |                          |
| Development Support                |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Software Development               |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Training Development               |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Integrated Logistics Support       |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Configuration Management           |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Technical Data                     |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| GFE                                |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Award Fees                         |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  | 0.000      |                          |
| Subtotal Support                   |                        |                                | 0.000                                 | 0.000      |                  | 0.000      |                                 | 0.000      |                  | 0.000               |                  | 0.000            | 0.000      |                          |
| Remarks:                           |                        |                                |                                       |            |                  |            |                                 |            |                  |                     |                  |                  |            |                          |

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| Exhibit R-3 Cost Analysis (page 2)                        |                        |                                |  |            |                  |            |  | DATE: <b>February 2007</b> |                  |            |                  |                  |            |                          |
|---|------------------------|--------------------------------|--|------------|------------------|------------|--|----------------------------|------------------|------------|------------------|------------------|------------|--------------------------|
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N/BA-4</b> |                        |                                | PROGRAM ELEMENT<br>0603563N/Ship Concept Advanced Design |            |                  |            | PROJECT NUMBER AND NAME<br>3161/NAVSEA Technical Authority |                            |                  |            |                  |                  |            |                          |
| Cost Categories   | Contract Method & Type | Performing Activity & Location | Total PY s Cost  | FY 06 Cost | FY 06 Award Date | FY 07 Cost | FY 07 Award Date   | FY 08 Cost                 | FY 08 Award Date | FY 09 Cost | FY 09 Award Date | Cost to Complete | Total Cost | Target Value of Contract |
| Developmental Test & Evaluation                           |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Operational Test & Evaluation                             |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Live Fire Test & Evaluation                               |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Test Assets   |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Tooling   |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| GFE   |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Award Fees  |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Subtotal T&E  |                        |                                | 0.000  | 0.000      |                  | 0.000      |  | 0.000                      |                  | 0.000      |                  | 0.000            | 0.000      |                          |
| Remarks:  |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  |            |                          |
| Contractor Engineering Support                            |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Government Engineering Support                            |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Program Management Support                                |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Travel  |                        |                                |  |            |                  | 0.100      |  | 0.100                      |                  | 0.100      |                  | Continuing       | Continuing |                          |
| Labor (Research Personnel)                                |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| SBIR Assessment   |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  | 0.000      |                          |
| Subtotal Management                                       |                        |                                | 0.000  | 0.000      |                  | 0.100      |  | 0.100                      |                  | 0.100      |                  | 0.000            | 0.300      |                          |
| Remarks:  |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  |            |                          |
| Total Cost  |                        |                                | 0.000  | 0.000      |                  | 9.535      |  | 29.494                     |                  | 29.751     |                  | 0.000            | 68.780     |                          |
| Remarks:  |                        |                                |  |            |                  |            |  |                            |                  |            |                  |                  |            |                          |

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| EXHIBIT R4, Schedule Profile                                    |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   | DATE: <b>February 2007</b> |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
|---|------|---|---|---|---------------------------------------|---|---|---|------|---|---|---|------|---|---------------------------------|---|----------------------------|---|---|---|------|---|---|---|------|---|---|---|------|---|---|---|--|--|--|--|
| APPROPRIATION/BUDGET ACTIVITY                                   |      |   |   |   | PROGRAM ELEMENT NUMBER AND NAME       |   |   |   |      |   |   |   |      |   | PROJECT NUMBER AND NAME         |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| <b>RDT&amp;E, N /BA-4</b>                                       |      |   |   |   | 0603563N/Ship Concept Advanced Design |   |   |   |      |   |   |   |      |   | 3161/NAVSEA Technical Authority |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Fiscal Year   | 2006 |   |   |   | 2007                                  |   |   |   | 2008 |   |   |   | 2009 |   |                                 |   | 2010                       |   |   |   | 2011 |   |   |   | 2012 |   |   |   | 2013 |   |   |   |  |  |  |  |
|   | 1    | 2 | 3 | 4 | 1                                     | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3                               | 4 | 1                          | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 | 1    | 2 | 3 | 4 |  |  |  |  |
| <b>Engineering Milestones</b>                                   |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Ship Concepts Advanced Development                              |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Ship Design and Certification Tools and Technical Data Exchange |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Advanced Ship Systems Development                               |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Next Generation USV   |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| High Speed Ships and Craft                                      |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Alternative Power Systems                                       |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Ship Engineering & Analysis Technology Center                   |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Future Submarine Design   |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Embedded Interoperability Engineering                           |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |
| Mission Capability Systems Engineering                          |      |   |   |   |                                       |   |   |   |      |   |   |   |      |   |                                 |   |                            |   |   |   |      |   |   |   |      |   |   |   |      |   |   |   |  |  |  |  |

R-1 Line Item No. 45  
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| EXHIBIT R-2a, RDT&E Project Justification | DATE: <b>February 2007</b> |
|---|----------------------------|

|   |  |   |
|---|--|---|
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N / BA-4</b> | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design | PROJECT NUMBER AND NAME<br>Project Unit (PU) No. and Name: Congressional Plus-Ups : VARIOUS |
|---|--|---|

**CONGRESSIONAL PLUS-UPS:**

|  | FY 06 | FY 07 |  |  |
|--|-------|-------|--|--|
| 9816N/9816C                            |       |       |  |  |
| Autonomous Maritime Navigation Program | 6.589 | 5.579 |  |  |

(U) AMN involves development of sensor fusion processing; development of automated data interpretation processing; development of intelligent autonomy and control , integration of these components into a fully autonomous dynamic navigation planning and operations capability, and integration into Navy test craft for system maturing and testing. System by design will be portable to other military platforms, both unmanned and manned, to enable very high levels of autonomous operations to reduce manpower requirements and improve both war fighter safety and conditions.

|                                    | FY 06 |  |  |  |
|------------------------------------|-------|--|--|--|
| 9817N                              |       |  |  |  |
| Security Video Distribution System | 0.970 |  |  |  |

(U) The purpose of this project is to develop a Security Video Distribution System for shipboard force protection designed to provide a ship-wide ability to both view and control live and stored video using the shipboard wired and wireless network.

|                    | FY 06 |  |  |  |
|--------------------|-------|--|--|--|
| 9818N              |       |  |  |  |
| Video Analysis R&D | 1.650 |  |  |  |

(U) The purpose of this project is to develop, test and evaluate advanced video technologies such as infra-red and other imaging/processing techniques for accessing engineering and propulsion plant status onboard US Navy ships.

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| EXHIBIT R-2a, RDT&E Project Justification | DATE: <b>February 2007</b> |
|---|----------------------------|

|   |  |   |
|---|--|---|
| APPROPRIATION/BUDGET ACTIVITY<br><b>RDT&amp;E, N / BA-4</b> | PROGRAM ELEMENT NUMBER AND NAME<br>0603563N/Ship Concept Advanced Design | PROJECT NUMBER AND NAME<br>Project Unit (PU) No. and Name: Congressional Plus-Ups : VARIOUS |
|---|--|---|

**CONGRESSIONAL PLUS-UPS:**

|                             | FY 06 | FY 07 |  |  |
|-----------------------------|-------|-------|--|--|
| 9990N                       |       |       |  |  |
| Advanced Capabilities Group | 0.000 | 2.092 |  |  |

(U) To conduct a series of studies in FY2007 in topics ranging from capability based costing of ship platforms to early stage assessment of mission effectiveness and system performance.

|   | FY 06 | FY 07 |  |  |
|---|-------|-------|--|--|
| 9991N   |       |       |  |  |
| Machinery Analytics for Controls & Monitoring Sys | 0.000 | 1.345 |  |  |

(U) This add will integrate remote monitoring technologies with Navy shipboard CBM systems to significantly improve diagnostics, troubleshooting, remote monitoring and assessment for distance support and maintenance planning, informing shipboard operators at the first sign of pending problems and enabling them to take proactive corrective measures before a failure occurs.

|  | FY 06 | FY 07 |  |  |
|--|-------|-------|--|--|
| 9992N  |       |       |  |  |
| Scout Radar Stealth Upgrades for Special Warfare C | 0.000 | 0.996 |  |  |

(U) To further refine the initial process of converting a Low Probability of Intercept (LPI) Radar with a six foot scanner to a LPI Radar with a smaller scanner capable of being used on Combatant Craft (small boats).