

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY

R-1 ITEM NOMENCLATURE

1319: *Research, Development, Test & Evaluation, Navy*
 BA 4: *Advanced Component Development & Prototypes (ACD&P)*

PE 0603561N: *(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT*

Project Unit 3197:

The Undersea Superiority Project supports offboard Anti-Submarine Warfare (ASW) technologies selected by the Chief of Naval Operations (CNO) ASW Cross Functional Team for technologies that hold the potential for deployment and/or use by submarine platforms. Efforts associated with these technologies include design, development, integration and testing of future Undersea Superiority systems.

Project Unit 3220:

The objective of the Sea Based Strategic Deterrent (SBSD) Advanced Submarine System Development project is to design and prepare for construction of the replacement of the OHIO Class SSBN.

B. Program Change Summary (\$ in Millions)

| | FY 2010 | FY 2011 | FY 2012 Base | FY 2012 OCO | FY 2012 Total |
|-------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget | 549.392 | 608.566 | 841.214 | - | 841.214 |
| Current President's Budget | 523.133 | 608.566 | 856.326 | - | 856.326 |
| Total Adjustments | -26.259 | - | 15.112 | - | 15.112 |
| • Congressional General Reductions | - | - | - | - | - |
| • Congressional Directed Reductions | - | - | - | - | - |
| • Congressional Rescissions | - | - | - | - | - |
| • Congressional Adds | - | - | - | - | - |
| • Congressional Directed Transfers | - | - | - | - | - |
| • Reprogrammings | -6.914 | - | - | - | - |
| • SBIR/STTR Transfer | -17.390 | - | - | - | - |
| • Program Adjustments | - | - | 26.730 | - | 26.730 |
| • Section 219 Reprogramming | -1.085 | - | - | - | - |
| • Rate/Misc Adjustments | - | - | - | - | - |
| • Congressional General Reductions | -0.070 | - | -11.618 | - | -11.618 |
| Adjustments | - | - | - | - | - |
| • Congressional Add Adjustments | -0.800 | - | - | - | - |

Congressional Add Details (\$ in Millions, and Includes General Reductions)

- Project: 9999: Congressional Adds**
- Congressional Add: *SSBN(X) Systems Development*
 - Congressional Add: *Underwater Explosion Modeling for Non-Pressure Hull Fairing*
 - Congressional Add: *High Torque, Low Speed, Direct Drive Electric Motor Technology*
 - Congressional Add: *Submarine Fatline Vector Sensor Towed Array*

| FY 2010 | FY 2011 |
|---------|---------|
| 1.992 | - |
| 1.992 | - |
| 1.593 | - |
| 1.593 | - |
| 7.170 | - |

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2A, RDTE&E Project Justification: PB 2012 Navy

DATE: February 2011

| APPROPRIATION/BUDGET ACTIVITY | | R-1 ITEM NOMENCLATURE | | PROJECT | | | | | | | | |
|---|--|--|---------|--|-------------|---------------|---------|---------|---------|---------|------------------|------------|
| 1319: Research, Development, Test & Evaluation, Navy BA 7: Operational Systems Development | | PE 0101221N: Strategic Sub & Wpns Sys Supt | | 0951: Joint Warhead Fuze Sustainment Program | | | | | | | | |
| COST (\$ in Millions) | | FY 2010 | FY 2011 | FY 2012 Base | FY 2012 OCO | FY 2012 Total | FY 2013 | FY 2014 | FY 2015 | FY 2016 | Cost To Complete | Total Cost |
| 0951: Joint Warhead Fuze Sustainment Program | | 13.970 | 33.100 | 42.171 | - | 42.171 | 61.643 | 95.633 | 106.627 | 104.633 | Continuing | Continuing |
| Quantity of RDTE&E Articles | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

A. Mission Description and Budget Item Justification

The Joint Warhead Fuze Sustainment Program is an effort to develop advanced components to improve the reliability, safety, and security of Arming, Fuzing and Firing (AF&F) systems for nuclear reentry systems. The current effort is focused on supporting the Alteration of the AF&F system for the MK5/W88 system which will be five years beyond its design life at the scheduled deployment of the AF&F Alteration. This effort also supports future utilization of the developed components by the US Air Force and United Kingdom.

A study on SSBN based Conventional Prompt Global Strike (CPGS) options will be completed to address safety, security, and surety issues, along with ambiguity issues as they relate to various sea-based designs. Begin trade analysis for cost performance and schedule for those designs; information that is required to better understand the capabilities that could be delivered from naval platforms.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

| Title: TRIDENT II | FY 2010 | FY 2011 | FY 2012 |
|---|-------------|-------------|-------------|
| <p>Description: Identify, prioritize, develop, proof, and demonstrate advanced technologies that will be leveraged and incorporated into future AF&Fs.</p> <p>FY 2010 Accomplishments: FY 2010 efforts included: (\$13.970) Joint Warhead Fuze Sustainment Program Supported USN, USAF, and UK engineer working group. Began component level testing of potential arming/fuzing devices and technologies. Developed approach to address radiation hardening issues in electronic AF&F components.</p> <p>FY 2011 Plans: FY 2011 efforts include: (\$23.100) Joint Warhead Fuze Sustainment Program Develop, proof, and demonstrate identified advanced technologies for future AF&Fs Support USN, USAF, and UK engineer working group. Perform component level testing of potential arming/fuzing devices and technologies.</p> | 13.970 0 | 33.100 0 | 42.171 0 |

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY
 1319: Research, Development, Test & Evaluation, Navy
 BA 7: Operational Systems Development

R-1 ITEM NOMENCLATURE
 PE 0101221N: Strategic Sub & Wpns Sys Supt

PROJECT
 0951: Joint Warhead Fuze Sustainment Program

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

| | FY 2010 | FY 2011 | FY 2012 |
|---|---------|---------|---------|
| Begin development of advanced AF&F safety and surety architecture solution. Document enveloping requirements to support Navy, Air Force, and UK applications. (\$10.0M) Global Strike Conduct a study that addresses safety and surety issues, along with ambiguity issues as they relate to various sea-based designs. Begin trade analysis for cost performance & schedule for those designs; information that is required to better understand the capabilities that could be delivered from naval platforms. FY 2012 Plans: FY2012 efforts include: (\$42.171) Joint Warhead Fuze Sustainment Program Continue development, proofing, demonstration, and technology maturation of identified advanced technologies for future AF&Fs Support USN, USAF, and UK engineer working group. Conduct AF&F sub-assembly design demonstrations Continue development of advanced safety and surety architecture solutions. Complete Conceptual Design Review. Commence detailed design. | 13.970 | 33.100 | 42.171 |
| Accomplishments/Planned Programs Subtotals | 13.970 | 33.100 | 42.171 |

C. Other Program Funding Summary (\$ in Millions)

N/A

D. Acquisition Strategy

Contracts will continue to be awarded to those sources who were engaged in the Mk4LE Reentry Body development program and are currently engaged in the production and/or operational support of the deployed Mk4LE Reentry Body on the basis of Other Than Full and Open Competition pursuant to the authority of 10 U.S.C. 2304 (c) (1) and (3) implemented by FAR 6.302-1, 3, 4

E. Performance Metrics

Not applicable

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY
 1319: Research, Development, Test & Evaluation, Navy
 BA 7: Operational Systems Development

R-1 ITEM NOMENCLATURE
 PE 0101221N: Strategic Sub & Wpns Sys Supt

PROJECT
 0951: Joint Warhead Fuze Sustainment
 Program

Product Development (\$ in Millions)

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Total Prior Years Cost | FY 2011 | | FY 2012 Base | | FY 2012 OCO | | FY 2012 Total | Cost To Complete | Total Cost | Target Value of Contract |
|-------------------------------------|------------------------|--------------------------------|------------------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| | | | | Cost | Award Date | Cost | Award Date | Cost | Award Date | | | | |
| Joint Warhead Fuze Sustainment DOE | MIPR | DOE:NM | 13.170 | 20.600 | Oct 2010 | 39.284 | Oct 2011 | - | - | 39.284 | Continuing | Continuing | Continuing |
| Joint Warhead Fuze Sustainment ITT | SS/CPFF | ITT:VA | 0.300 | 1.500 | Oct 2010 | 1.887 | Oct 2011 | - | - | 1.887 | Continuing | Continuing | Continuing |
| Joint Warhead Fuze Sustainment LMMS | SS/CPFF | LMMS:CA | 0.500 | 1.000 | Oct 2010 | 1.000 | Oct 2011 | - | - | 1.000 | Continuing | Continuing | Continuing |
| Global Strike Study | MIPR | DOE:NM | - | 3.000 | Oct 2010 | - | Oct 2011 | - | - | - | 0.000 | 0.000 | 6.000 |
| Global Strike Study | SS/CPFF | LMMS:CA | - | 7.000 | Oct 2010 | - | Oct 2011 | - | - | - | 0.000 | 7.000 | 14.000 |
| Subtotal | | | 13.970 | 33.100 | | 42.171 | | - | - | 42.171 | | | |

| Total Prior Years Cost | FY 2011 | | FY 2012 Base | | FY 2012 OCO | | FY 2012 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| | Cost | Award Date | Cost | Award Date | Cost | Award Date | | | | |
| 13.970 | 33.100 | | 42.171 | | - | - | 42.171 | | | |
| Project Cost Totals | | | | | | | | | | |

Remarks

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY
 1319: Research, Development, Test & Evaluation, Navy
 BA 7: Operational Systems Development

R-1 ITEM NOMENCLATURE
 PE 0101221N: Strategic Sub & Wpns Sys Supt

PROJECT
 0951: Joint Warhead Fuze Sustainment Program

Schedule Details

| | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Proj 0951 | | | | |
| Contract Go-ahead and Milestones | 2 | 2010 | 2 | 2010 |
| Define Technical Requirements | 2 | 2010 | 3 | 2011 |
| Technology Development Strategies | 2 | 2010 | 3 | 2011 |
| Capabilities Assessment | 4 | 2010 | 3 | 2011 |
| Technology Maturation | 2 | 2010 | 4 | 2013 |
| Design Demonstration | 1 | 2012 | 4 | 2014 |
| Assembly Level Testing | 3 | 2012 | 4 | 2016 |
| Performance Assessment of Tested Designs | 1 | 2013 | 4 | 2016 |
| Development Tests | 3 | 2014 | 4 | 2016 |
| Production Engineering | 1 | 2013 | 4 | 2016 |
| General JCIDS Support | 2 | 2010 | 4 | 2016 |
| General Acquisition Planning Support | 2 | 2010 | 4 | 2016 |
| Global Strike Payload Ambiguity Studies | 1 | 2011 | 4 | 2011 |
| Global Strike Surety Studies | 1 | 2011 | 4 | 2011 |

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY
 1319: Research, Development, Test & Evaluation, Navy
 BA 5: Development & Demonstration (SDD)

R-1 ITEM NOMENCLATURE
 PE 0604503N: SSN-688 & Trident
 Modernization

PROJECT
 0742: Sub Integrated Ant System

| COST (\$ in Millions) | FY 2010 | FY 2011 | FY 2012 | FY 2012 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 | Cost To | Total Cost |
|---------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------------|------------|
| | | | Base | OCO | Total | | | | | Complete | |
| 0742: Sub Integrated Ant System | 36.814 | 29.341 | 22.763 | - | 22.763 | 15.379 | 13.403 | 10.690 | 36.387 | Continuing | Continuing |
| Quantity of RDT&E Articles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

A. Mission Description and Budget Item Justification

The Submarine Integrated Antenna System project (0742) provides for the development and testing of submarine antennas designed to meet emerging submarine requirements of: (a) Improved frequency coverage and data rate capabilities of submarine antennas and their interface to the External Communications System, (b) Improved submarine antenna performance and data rate while the submarine is operating at speed and depth, (c) Antenna compatibility with new waveforms and transceiver equipment, (d) Improved stealth capability of existing and future antennas and (e) Improved antenna design to reduce Total Ownership Cost. This project funds research and development for submarine antennas including (1) Pre-Planned Product Improvement (P3I) efforts to existing antennas including Outboard Electronics (OE)-538/BRC Multi-Function Antenna, (2) OE-562 Submarine, High Data Rate (SubHDR) system development of Underwater Explosion (UNDEX) modification kits, (3) Development of new systems including Advanced High Data Rate (AdvHDR), and (4) Commence support of Submarine Communications Buoy (SCB) Project Arrangement with United Kingdom (UK). The efforts listed above will provide Ship Submersible Nuclear (SSN), Ship Submersible Ballistic Nuclear (SSBN) and Ship Submersible Guided Nuclear (SSGN) platforms with improved communications capabilities to support future Joint, Allied, and Naval operations.

JUSTIFICATION FOR BUDGET ACTIVITY:

This project is funded under **ENGINEERING AND MANUFACTURING DEVELOPMENT** because it encompasses engineering and manufacturing development of new end-items prior to production approval decision.

Notes/Comments:

- FY12 OE-538: Complete the manufacturing of the Engineering Development Model. Perform a Development Test (DT) and Operational Assessment (OA).
- FY12 Submarine High Data Rate (SubHDR): Complete UNDEX development. Complete research and analysis on performance reliability components. Commence development of components identified by research and analysis.
- FY12 Advanced High Data Rate (AdvHDR): Continue risk mitigation demonstrations and technology maturation efforts towards technology readiness assessments in preparation of Milestone B.
- FY12 Submarine Communications Buoy (SCB): Commence support of Submarine Communications Buoy (SCB) project arrangement with UK. Commence performance requirements, Analysis of Alternatives for SCB.
- FY12 Communications at Speed and Depth (CSD): Increment 1 program close out.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

| Title: Antenna Transition Engineering | FY 2010 | FY 2011 | FY 2012 |
|---------------------------------------|-----------|------------|------------|
| | Articles: | 3,729 0 | 4,557 0 |

FY 2010 Accomplishments:

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY

1319: Research, Development, Test & Evaluation, Navy
 BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE

PE 0603561N: (U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT

PROJECT

2033: Adv Submarine Systems Development

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

by comparing to physical scale model and available full-scale data. Initiated Electromagnetic Silencing Project Agreement (PA) with the United Kingdom (UK) to develop technologies for OHIO Replacement and Successor programs.

FY 2011 Plans:

Conduct LSV operations and maintain LSV and ISMS test ranges. Support OHIO Class SSBN replacement and future VA Class design development. Support VA Class Cost Reduction Sail Trials. Continue conducting full-scale baseline signature measurement trials. Complete qualification testing associated with a new material for use in future conformal arrays. Continue Electromagnetic Silencing PA with the UK to develop technologies for OHIO Replacement and UK Successor programs. Conduct joint scale model stress magnetization and electric signature measurements with the UK to support future platform designs. Execute 1/4-scale LSV test to measure flow noise resulting from surface roughness to validate numerical prediction capabilities.

FY 2012 Plans:

Conduct LSV maintenance, support, and operations and maintain LSV and ISMS test ranges. Support OHIO Class SSBN replacement design development and support VA Class Cost Reduction Sail Trials. Continue Electromagnetic Silencing PA with the UK to develop technologies for OHIO Replacement and Successor programs. Develop and validate performance of control algorithms for both magnetic and electric signatures.

Title: Total Ownership Cost/Affordability/Subtotal Cost

Description: Demonstrate technologies with potential to reduce total ownership costs of submarine systems by lowering construction costs, improving commonality of interfaces, extending the life of parts, and lowering life cycle maintenance requirements.

Articles:

| FY 2010 | FY 2011 | FY 2012 |
|-------------|------------|------------|
| 13,115 0 | 3,118 0 | 2,584 0 |

FY 2010 Accomplishments:

Developed TEMPAL T Technical Data Package (TDP) for an at-sea demonstration of a ball valve rotary Electric Actuation System (EAS) and Universal Modular Mast (UMM) linear EAS. Completed Concept Design Report for the elimination of the External Hydraulic System on VA Class Submarines. Built and lab tested advanced CO2 scrubber sorbent test cubes and installed OPALTs on an SSN (USS Scranton) and SSBN (USS Nevada) for at-sea testing. Transition agreement signed with VA Class Program (PMS-450) for incorporation of system as a Reduced Total Ownership Cost (RTOC) initiative on VA Class design of a full capacity Technical Readiness Level (TRL)-6 CO2 lab unit to assess the technology of solid sorbent material. Completed full-scale trials on SSN-688 and SSN-688I platforms to obtain data to support final recommendations relating to the maintenance associated with Main Ballast Tank (MBT) treatments with final recommendations to allow only partial replacement of some treatments during availabilities underway.

FY 2011 Plans:

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy

DATE: February 2011

| APPROPRIATION/BUDGET ACTIVITY | R-1 ITEM NOMENCLATURE | PROJECT | | | |
|--|---|---|----------------|----------------|----------------|
| 1319: Research, Development, Test & Evaluation, Navy BA 4: Advanced Component Development & Prototypes (ACD&P) | PE 0603561N: (U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT | 2033: Adv Submarine Systems Development | | | |
| B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each) | | | FY 2010 | FY 2011 | FY 2012 |
| <p>Finalize updates to maintenance documentation for MBT damping configurations. Perform Navy land-based test and evaluation of the UMM linear EAS. Install UMM linear EAS and ball valve rotary EAS TEMPALTs on USS Missouri to demonstrate electrically-actuated systems at-sea. Continue at-sea evaluation of advanced carbon dioxide (CO2) test cubes. Develop the system procurement specification, and design and build a full capacity CO2 scrubber prototype TRL-6 for further technical evaluation of solid sorbent technology. Continue assessment of total ownership cost reduction opportunities for in-service submarines to reduce current and future submarine maintenance cost.</p> <p>FY 2012 Plans: Design and build a full-capacity advanced CO2 scrubber TRL-9 prototype and perform vendor test and evaluation. The TRL-9 prototype is the VA Class Block IV qualified version. Monitor and record data on ball valve rotary EAS and UMM linear EAS TEMPALTs during at-sea demonstrations.</p> <p>Title: Advanced Propulsion/Ship Concept Developments/Subtotal Cost</p> | | | 17,542,000 | 7,079,000 | 4,534,000 |
| <p>Description: Overcome technological barriers that have significant impact on submarine HM&E systems so as to enable design options for a submarine with VIRGINIA Class capability in two technical areas: Shaftless Propulsion and Radical Ship HM&E Infrastructure Reduction. Develop submarine alternative propulsion and stern configurations with potential to significantly reduce submarine acquisition costs. Demonstrate critical performance parameters through appropriate scale demonstrators in realistic environmental conditions. Evaluate integration of technologies and approaches for cost reduction in future submarines. Develop understanding of ship concept studies and submarine cost drivers and model analysis. Develop and demonstrate technologies for future submarines in areas of hull and platform technologies, propulsors, ship control, electric actuation, sensors, and self defense. This work will apply to future submarine designs including the long-lead concept work on the OHIO Replacement Program. Evaluate current platforms via full scale signature measurement trials to guide future R&D investments.</p> <p>FY 2010 Accomplishments: Continued partnership with DARPA on Tango Bravo (TB) projects. Continued demonstration and performance testing of TB Shaftless Propulsion prototype and direct drive motor for X-Planes control surface electric actuation. For TB, performed motor structural acoustic design and testing. For the Bow Plane effort, completed specifications, arrangement drawings, safety assessment reports, fabricated the design, performed test and evaluation, and completed OPALT TDP for bow plane control surface electric actuator demonstration on a VA Class submarine. Initiated preliminary multi-material characterization/construction and demonstration of multi-material beams, and propulsor design tool for Hybrid Multi-Material Rotor (HMMR).</p> <p>FY 2011 Plans:</p> | | | | | |

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-2A, RD&E Project Justification: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY

1319: *Research, Development, Test & Evaluation, Navy*
 BA 4: *Advanced Component Development & Prototypes (ACD&P)*

R-1 ITEM NOMENCLATURE
 PE 0603561N: (U)ADVANCED SUBMARINE
 SYSTEM DEVELOPMENT

PROJECT
 2033: *Adv Submarine Systems Development*

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

Continued partnership with DARPA on TB Shaftless Propulsion projects. Continue demonstration and performance testing of TB Shaftless Propulsion prototype. Complete fabrication of Retractable Bow Planes (RBP) OPALT to demonstrate bow plane control surface Electric Actuation System (EAS) on a VA Class submarine. Execute full scale electromagnetic signature trials on in-service submarines to guide R&D investments. Continue preliminary multi-material characterization/construction and demonstration of multi-material beams, and propulsor design tool for HMMR.

FY 2012 Plans:

Install OPALT to demonstrate bow plane control surface EAS on a VA Class Submarine. Continue demonstration and performance testing of TB Shaftless Propulsion prototype and perform motor structural acoustic analysis. Continue partnership with DARPA on HMMR program to include delivery of coupled design software tool sets and multi-material characterization.

C. Other Program Funding Summary (\$ in Millions)

N/A

Accomplishments/Planned Programs Subtotals

| | FY 2010 | FY 2011 | FY 2012 |
|--|---------|---------|---------|
| | 72.544 | 42.515 | 33.889 |

D. Acquisition Strategy

F2033: Sole source Concept Formulation (CONFORM) contracts with the only two submarine design/construction shipyards, General Dynamics Electric Boat (GDEB) and Northrop Grumman Shipbuilding Newport News (NGNN). Engagement with industry to build vendor base and support development of R&D products for enhanced submarine capability via competitively awarded Small Business Innovation Research (SBIR) contracts to support Hull Mechanical & Electrical systems.

E. Performance Metrics

- To enable transition of a minimum of three technology challenge solutions supporting emergent war fighter needs.
- Sustain critical one of a kind national R&D hydroacoustic infrastructure enabling the design and assessment of VIRGINIA Class cost reduction and the OHIO Replacement designs for affordability.
- Refine the design of the Advanced Carbon Dioxide Removal System (ACRU) CO2 Scrubber System based on at-sea testing of new solid sorbent materials and the removal of liquid amine system from future submarines.
- Install and perform three at-sea demonstrations for electric actuation of critical ship control and ship system operational components in support of the OHIO Replacement and follow-on VIRGINIA Class Block Upgrades.
- Assess as-built VIRGINIA and OHIO Class SSB/SSGN submarine for design drivers/design tools and model validation to define R&D needs for OHIO Class Replacement component development and technical design maturity.

UNCLASSIFIED

Exhibit R-3, RD&E Project Cost Analysis: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY

1319: Research, Development, Test & Evaluation, Navy
BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE
PE 0603561N: (U)ADVANCED SUBMARINE
SYSTEM DEVELOPMENT

PROJECT
2033: Adv Submarine Systems Development

Product Development (\$ in Millions)

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Total Prior Years Cost | FY 2011 | | FY 2012 Base | | FY 2012 OCO | | FY 2012 Total | | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------|------------------------|--------------------------------|------------------------|---------|------------|--------------|------------|-------------|------------|---------------|------------|------------------|------------|--------------------------|
| | | | | Cost | Award Date | Cost | Award Date | Cost | Award Date | Cost | Award Date | | | |
| Product Development | MIPR | DARPA:Arlington, VA | - | 1.084 | Apr 2011 | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Product Development | SS/CPFF | NGSB:Newport News, VA | 3.082 | 0.250 | Apr 2011 | 0.394 | Dec 2011 | - | - | 0.394 | - | Continuing | Continuing | Continuing |
| Product Development | WR | NSWC:Dahlgren, VA | 5.241 | - | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Product Development | SS/CPFF | Kollmorgen:N. Hampton, MA | 1.100 | - | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Product Development | SS/CPFF | Oceanering:Chesapeake, VA | 1.900 | - | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Product Development | SS/CPFF | Boeing:St. Louis, MO | 0.925 | - | - | - | - | - | - | - | - | 0.000 | 1.900 | 1.900 |
| Product Development | SS/CPFF | EB:Groton, CT | 29.472 | 6.809 | Jun 2011 | 3.429 | Mar 2012 | - | - | 3.429 | - | 0.000 | 0.925 | 0.925 |
| Product Development | SS/CPFF | Raytheon:Portsmouth, RI | 16.034 | - | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Product Development | WR | NSWC:Carderock, MD | 60.613 | 8.570 | Jun 2011 | 5.007 | Mar 2012 | - | - | 5.007 | - | Continuing | Continuing | Continuing |
| Product Development | SS/CPFF | ARL/PSU:State College, PA | 4.387 | 0.400 | Mar 2011 | 0.700 | Jan 2012 | - | - | 0.700 | - | Continuing | Continuing | Continuing |
| Product Development | SS/CPFF | UT/ARL:Austin, TX | 6.050 | - | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Product Development | SS/CPFF | JHU/APL:laurel, MD | 15.594 | 0.200 | May 2011 | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Product Development | Various | Various:Various | 29.489 | 2.435 | Jun 2011 | 1.168 | Mar 2012 | - | - | 1.168 | - | Continuing | Continuing | Continuing |
| Product Development | WR | NUWC:Newport, RI | 46.034 | 6.755 | Jun 2011 | 5.671 | Mar 2012 | - | - | 5.671 | - | Continuing | Continuing | Continuing |
| Product Development | WR | ONR:Arlington, VA | 8.066 | - | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Product Development | SS/CPFF | Lockheed Martin:Bethesda, MD | 8.934 | - | - | - | - | - | - | - | - | 0.000 | 8.934 | 8.934 |
| Product Development | WR | SPAWAR:San Diego, CA | 5.850 | - | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Subtotal | | | 242.771 | 26.503 | | 16.369 | | - | | 16.369 | | Continuing | Continuing | Continuing |

Remarks
Various/VAR is used to group multiple activities with small funding levels. Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY
 1319: Research, Development, Test & Evaluation, Navy
 BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE
 PE 0603561N: (U)ADVANCED SUBMARINE
 SYSTEM DEVELOPMENT

PROJECT
 2033: Adv Submarine Systems Development

Support (\$ in Millions)

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Total Prior Years Cost | FY 2011 | | FY 2012 Base | | FY 2012 OCO | | FY 2012 Total | Cost To Complete | Total Cost | Target Value of Contract |
|--------------------------------|------------------------|--------------------------------|------------------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| | | | | Cost | Award Date | Cost | Award Date | Cost | Award Date | | | | |
| Contractor Engineering Support | SS/CPFF | Various:Various | 7.512 | 0.885 | Jun 2011 | 0.885 | Dec 2011 | - | - | 0.885 | Continuing | Continuing | Continuing |
| Government Engineering Support | WR | Various:Various | 4.018 | 0.335 | Jun 2011 | 0.780 | Dec 2011 | - | - | 0.780 | Continuing | Continuing | Continuing |
| Travel | WR | NAVSEA HQ:Not Specified | 0.409 | 0.100 | Jun 2011 | 0.100 | Nov 2011 | - | - | 0.100 | Continuing | Continuing | Continuing |
| Acquisition Workforce | Various | Not Specified:Not Specified | 0.293 | - | - | - | - | - | - | - | 0.000 | 0.293 | 0.293 |
| Subtotal | | | 12.232 | 1.320 | | 1.765 | | - | | 1.765 | | | |

Remarks
 Various/VAR is used to group multiple activities with small funding levels.
 Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

Test and Evaluation (\$ in Millions)

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Total Prior Years Cost | FY 2011 | | FY 2012 Base | | FY 2012 OCO | | FY 2012 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|------------------------|---------|------------|--------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| | | | | Cost | Award Date | Cost | Award Date | Cost | Award Date | | | | |
| Developmental Test & Evaluation | SS/CPFF | EB:Groton, CT | 4.627 | 0.219 | Jun 2011 | 3.141 | Mar 2012 | - | - | 3.141 | Continuing | Continuing | Continuing |
| Developmental Test & Evaluation | SS/CPFF | Raytheon:Portsmouth, VA | 9.104 | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Developmental Test & Evaluation | WR | NAVAIR:Patuxent, MD | 2.593 | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |
| Developmental Test & Evaluation | Various | Various:Various | 5.236 | 1.136 | Jun 2011 | - | - | - | - | - | Continuing | Continuing | Continuing |
| Developmental Test & Evaluation | WR | NUWC:Newport, RI | 2.372 | 7.749 | Jun 2011 | 6.523 | Mar 2012 | - | - | 6.523 | Continuing | Continuing | Continuing |
| Developmental Test & Evaluation | WR | NSWC:Carderock, MD | 7.667 | 5.588 | Jun 2011 | 6.091 | Mar 2012 | - | - | 6.091 | Continuing | Continuing | Continuing |
| Developmental Test & Evaluation | SS/CPFF | NGSB:Newport News, VA | 0.783 | - | - | - | - | - | - | - | Continuing | Continuing | Continuing |

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY
 1319: Research, Development, Test & Evaluation, Navy
 BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE
 PE 0603561N: (U)ADVANCED SUBMARINE
 SYSTEM DEVELOPMENT

PROJECT
 2033: Adv Submarine Systems Development

Test and Evaluation (\$ in Millions)

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Total Prior Years Cost | FY 2011 | | FY 2012 Base | | FY 2012 OCO | | FY 2012 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---------------------------------|------------------------|--------------------------------|------------------------|---------------|------------|---------------|------------|-------------|------------|---------------|------------------|------------|--------------------------|
| | | | | Cost | Award Date | Cost | Award Date | Cost | Award Date | | | | |
| Developmental Test & Evaluation | SS/CPFF | JHU/ARL:Laurel, MD | 0.305 | - | | - | | - | | - | Continuing | Continuing | Continuing |
| Developmental Test & Evaluation | SS/CPFF | ARL/PSU:State College, PA | 0.720 | - | | - | | - | | - | Continuing | Continuing | Continuing |
| Developmental Test & Evaluation | WR | NSWC:Dahlgren, VA | 1.320 | - | | - | | - | | - | Continuing | Continuing | Continuing |
| Subtotal | | | 34.727 | 14.692 | | 15.755 | | - | | 15.755 | | | |

Remarks

Various/VAR is used to group multiple activities with small funding levels. Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

| Total Prior Years Cost | FY 2011 | | FY 2012 Base | | FY 2012 OCO | | FY 2012 Total | Cost To Complete | Total Cost | Target Value of Contract |
|----------------------------|----------------|------------|---------------|------------|---------------|------------|---------------|------------------|---------------|--------------------------|
| | Cost | Award Date | Cost | Award Date | Cost | Award Date | | | | |
| Project Cost Totals | 289.730 | | 42.515 | | 33.889 | | - | | 33.889 | |

Remarks

| | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|
| Remarks | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|

UNCLASSIFIED

Exhibit R-4, RD&E Schedule Profile: PB 2012 Navy

APPROPRIATION/BUDGET ACTIVITY

1319: Research, Development, Test & Evaluation, Navy
 BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE

PE 0603561N: (U)ADVANCED SUBMARINE
 SYSTEM DEVELOPMENT

DATE: February 2011

PROJECT

2033: Adv Submarine Systems Development

| FISCAL YEARS | FY 2010 | | FY 2011 | | FY 2012 | | FY 2013 | | FY 2014 | | FY 2015 | | FY 2016 | |
|--|---------|--|---------|------------------------|---------|-----|---------|-----|---------|-----|---------|-----|---------|-----|
| | Start | End | Start | End | Start | End | Start | End | Start | End | Start | End | Start | End |
| PROJECT Small Missiles Encapsulation Demonstration | | Full-scale test | | | | | | | | | | | | |
| | | Prototype Launch Design CDR and fly-out test | | Final Report | | | | | | | | | | |
| Innovation Technology Transition | | | | | | | | | | | | | | |
| | | | | Development transition | | | | | | | | | | |
| Infrared Warfare Technology Development | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Towed Array Handler and In-Service Reliability | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| AUV PROGRAM SHOWSHIP (U)ACD&P PROJECT Tango Bravo Shipless Propulsion | | | | Prototype Demo | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Electric Control Surface Validation Demonstration (Buw Plane OPALT) | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| ONR FHC Advanced Material Propeller (ANMP) | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| HYDRA MULTI MATERIAL ROTOR (HMIMR) Dev. | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

UNCLASSIFIED

Exhibit R-4, RDT&E Schedule Profile: PB 2012 Navy

APPROPRIATION/BUDGET ACTIVITY

1319: Research, Development, Test & Evaluation, Navy

BA 4: Advanced Component Development & Prototypes (ACD&P)

PROJECT

2033: Adv Submarine Systems Development

R-1 ITEM NOMENCLATURE

PE 0603561N: (U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT

DATE: February 2011

| STEALTH III PROJECT | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 |
|--|--|---------|---------|---------|---------|---------|---------|
| Completed Wake Signature Model Validation | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| CAVES Outer Layer Material Qualification | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| Functional Acoustic Signature Assessment | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| Strong Mission | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| Large Aperture Bow Array (LAWA) Testing | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| Mini-Propulsion System System (Laser/Active Range) Qualification (Active Range) (LAWA) | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| ISIRI model and output | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| ISIRI VA testing (Peak to Peak Horizontal and LRM) Activities | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| LOVA | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| LOVA & ISIRI Level 1 efforts | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| Roll Treatment | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| Roll Treatment in | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| End-on-Sea Trial (VLA and Sonar) | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| Electromagnetic Signature Profile Assessment will be | [Timeline bar from FY 2010 to FY 2011] | | | | | | |
| Full-Scale Passive Acoustic Trial | [Timeline bar from FY 2010 to FY 2011] | | | | | | |

Navy

UNCLASSIFIED

Page 23 of 47

R-1 Line Item #42

Volume 2 - 309

UNCLASSIFIED

Exhibit R-4, RD&E Schedule Profile: PB 2012 Navy

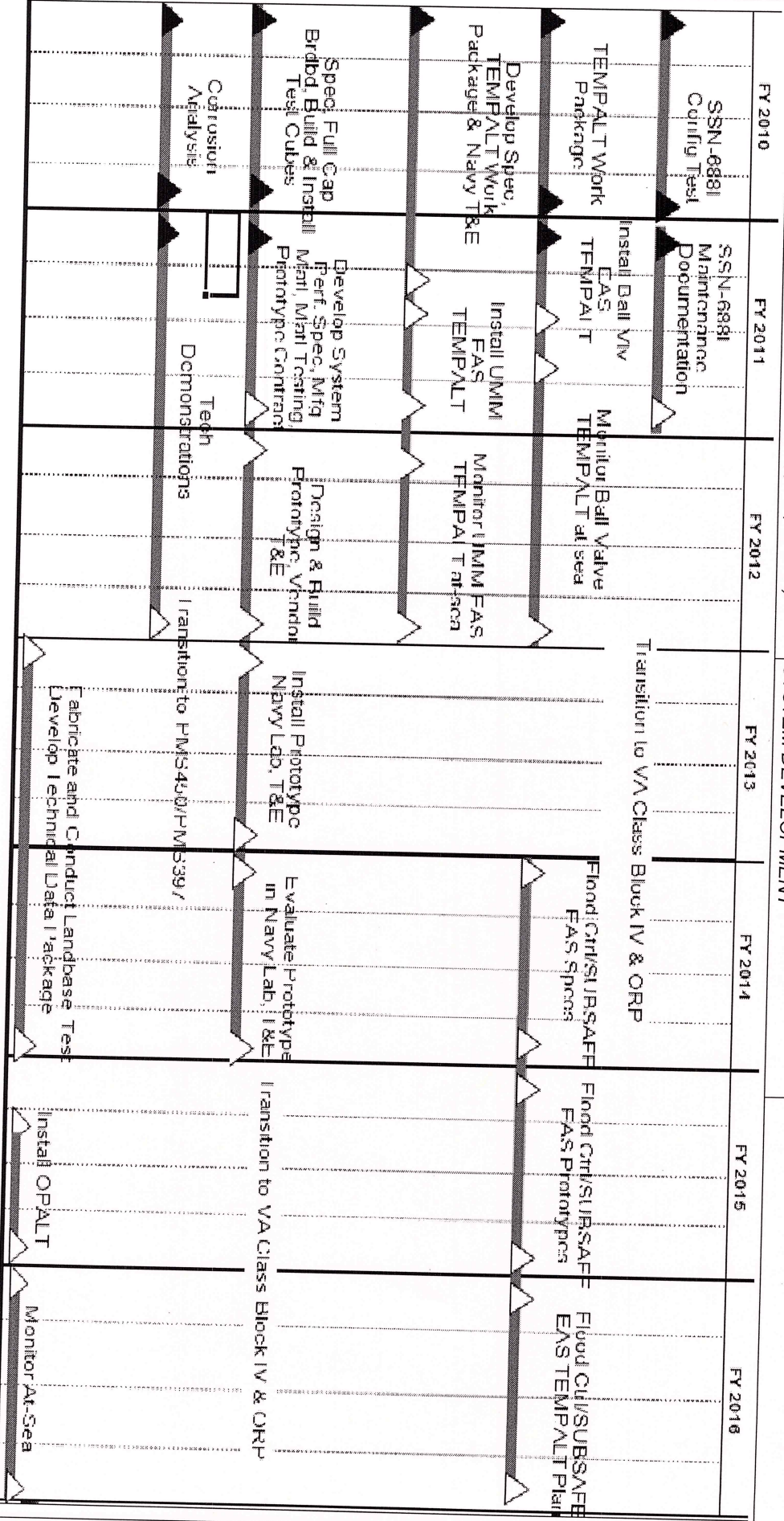
APPROPRIATION/BUDGET ACTIVITY

1319: Research, Development, Test & Evaluation, Navy
 BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE
 PE 0603561N: (U)ADVANCED SUBMARINE
 SYSTEM DEVELOPMENT

PROJECT
 2033: Adv Submarine Systems Development

DATE: February 2011



UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY
 1319: Research, Development, Test & Evaluation, Navy
 BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE
 PE 0603561N: (U)ADVANCED SUBMARINE
 SYSTEM DEVELOPMENT

PROJECT
 2033: Adv Submarine Systems Development

Schedule Details

| Proj 2033 | Events by Sub Project | Start | | End | |
|-----------|---|---------|------|---------|------|
| | | Quarter | Year | Quarter | Year |
| | P&S Small Missile Encapsulation Demonstration Full-Scale Testing | 2 | 2010 | 4 | 2010 |
| | P&S Water Piercing Missile Launch Demo Prototype Launcher Critical Design Review, Fly-out test and final report | 2 | 2010 | 4 | 2010 |
| | P&S Innovation Technology Transition SBIR/RAD projects | 1 | 2010 | 4 | 2016 |
| | P&S Irregular Warfare Technology Development/Test/Transition | 1 | 2010 | 4 | 2011 |
| | P&S Towed Array Handling System Concept Development | 1 | 2012 | 2 | 2013 |
| | P&S Towed Array Handling System Requirements Definition | 3 | 2013 | 2 | 2014 |
| | P&S Towed Array Handling System Modeling & Simulation | 3 | 2014 | 2 | 2015 |
| | P&S Towed Array Handling System ADM Development | 2 | 2015 | 4 | 2016 |
| | AP Tango Bravo Shaftless Propulsion Prototype Demo | 1 | 2010 | 4 | 2012 |
| | AP Electric Control Surface Actuation Demo (Bow Plane OPALT) Fabricate/Design/T&E/Dev TDP | 1 | 2010 | 4 | 2011 |
| | AP Electric Control Surface Actuation Demo (Bow Plane OPALT) Install OPALT | 1 | 2012 | 3 | 2012 |
| | AP Electric Control Surface Actuation Demo (Bow Plane OPALT) Monitor At-Sea | 1 | 2013 | 4 | 2016 |
| | AP Hybrid Multi-Material Rotor Development , Coupled Tool Architecture/Build Full Thickness Beams | 1 | 2010 | 2 | 2011 |
| | AP Hybrid Multi-Material Rotor Development , Mat'l Characteristics/ Coupled Design Tools | 3 | 2011 | 4 | 2012 |
| | AP ONR FNC AMP Advanced Material Propeller Development | 1 | 2014 | 4 | 2016 |
| | STEALTH Coupled Wake Signature Model Validation | 1 | 2010 | 4 | 2011 |
| | STEALTH CAVES Outer-Layer Material Qualification | 1 | 2010 | 4 | 2013 |
| | STEALTH Conformal Array Signature Assessment | 1 | 2010 | 4 | 2010 |

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-4A, RDTE&E Schedule Details: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY

1319: Research, Development, Test & Evaluation, Navy

BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE

PE 0603561N: (U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT

PROJECT

2033: Adv Submarine Systems Development

| Events by Sub Project | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| STEALTH Stone Mason | 1 | 2010 | 4 | 2012 |
| STEALTH ISMS Large Aperture Bow Array Target Strength and Structural Testing | 1 | 2010 | 4 | 2012 |
| STEALTH LSV/ISMS Next Gen Pwr Sys Assmt Range Testing - LSV Surf Roughness | 4 | 2010 | 1 | 2011 |
| STEALTH LSV/ISMS Next Gen Pwr Sys Assmt Range Testing - NGPS Blue Demo | 1 | 2013 | 2 | 2013 |
| STEALTH LSV/ISMS Next Gen Pwr Sys Assmt Range Testing - NGPS Gold Demo | 4 | 2013 | 1 | 2014 |
| STEALTH ISMS Continuous Active Sonar Range | 3 | 2014 | 4 | 2014 |
| STEALTH ISMS Maint & Repair | 1 | 2010 | 4 | 2013 |
| STEALTH ISMS VA Class Testing | 1 | 2010 | 4 | 2016 |
| STEALTH ISMS Ohio Replacement Acoustics | 1 | 2010 | 2 | 2013 |
| STEALTH ISMS Ohio Replacement Acoustics phase 2 | 3 | 2012 | 4 | 2012 |
| STEALTH LSV2 Maintenance RAV | 3 | 2013 | 4 | 2014 |
| STEALTH LSV2 Maintenance RAV phase 2 | 2 | 2010 | 2 | 2010 |
| STEALTH LSV2 Ohio Replacement Acoustics | 2 | 2012 | 3 | 2012 |
| STEALTH LSV2 Maintenance RAV phase 3 | 4 | 2012 | 4 | 2013 |
| STEALTH LSV2 Advanced Material Propeller | 1 | 2014 | 2 | 2014 |
| STEALTH LSV2 & ISMS Technology Refresh | 3 | 2014 | 4 | 2014 |
| STEALTH Sail Treatment Characterization | 1 | 2011 | 4 | 2011 |
| STEALTH Future Sail Trial VA Class | 1 | 2010 | 1 | 2011 |
| STEALTH Electromagnetic Signatures Project Arrangement (PA) w/UK | 2 | 2011 | 2 | 2013 |
| STEALTH Full-Scale Baseline Acoustic Trails | 1 | 2010 | 4 | 2014 |
| TOC SSN-6881 Class Main Ballast Tank Damping Treatment Configuration Test | 1 | 2010 | 4 | 2010 |
| TOC SSN-6881 Class Main Ballast Tank Damping Treatment Finalize Maint. Documentation | 1 | 2010 | 4 | 2010 |
| | 1 | 2011 | 4 | 2011 |

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY

1319: Research, Development, Test & Evaluation, Navy

BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE

PE 0603561N: (U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT

PROJECT

2033: Adv Submarine Systems Development

| | Start | | End | |
|--|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| TOC Hydraulic Elimination (Internal EA Systems) Develop Ball Valve TEMPALT Package | 1 | 2010 | 4 | 2010 |
| TOC Hydraulic Elimination (Internal EA Systems) Install Ball Valve TEMPALT | 1 | 2011 | 2 | 2011 |
| TOC Hydraulic Elimination (Internal EA Systems) Monitor Ball Valve TEMPALT At-Sea | 3 | 2011 | 4 | 2012 |
| TOC Hydraulic Elimination (Internal EA Systems) Develop Flood Control/SUBSAFE Spec | 1 | 2014 | 4 | 2014 |
| TOC Hydraulic Elimination (Internal EA Systems) Develop Flood Control/SUBSAFE Prototypes | 1 | 2015 | 4 | 2015 |
| TOC Hydraulic Elimination (Internal EA Systems) Develop Flood Control/SUBSAFE TEMPALT Plan | 1 | 2016 | 4 | 2016 |
| TOC Hydraulic Elimination (External EAS (UMM Only) Develop UMM Spec; TEMPALT and Navy T&E | 1 | 2010 | 2 | 2011 |
| TOC Hydraulic Elimination (External EAS (UMM Only) Install UMM TEMPALT | 2 | 2011 | 4 | 2011 |
| TOC Hydraulic Elimination (External EAS (UMM Only) Monitor UMM TEMPALT At-Sea | 1 | 2012 | 4 | 2012 |
| TOC Advanced CO2 Removal System Develop Spec and Breadboard, Build and Install Test Cubes | 1 | 2010 | 4 | 2010 |
| TOC Advanced CO2 Removal System Develop Perf Spec/ Manufacture and Test Material, Award Prototype Contract | 1 | 2011 | 4 | 2011 |
| TOC Advanced CO2 Removal System Design and Build Prototype, Vendor Test & Evaluation (T&E) | 1 | 2012 | 4 | 2012 |
| TOC Advanced CO2 Removal System Install & Test Prototype in Navy Lab, T&E | 1 | 2013 | 4 | 2013 |
| TOC Advanced CO2 Removal System Evaluate Prototype in Navy Lab, T&E | 1 | 2014 | 4 | 2014 |
| TOC Life Cycle Maintenance Cost Reduction Corrosion Analysis | 1 | 2010 | 4 | 2010 |
| TOC Life Cycle Maintenance Cost Reduction Technical Demonstration | 1 | 2011 | 4 | 2012 |
| TOC ONR FNC Electric Actuation Fabricate and Conduct Land Based Test/Dev TDP | 1 | 2013 | 4 | 2014 |
| TOC ONR FNC Electric Actuation Install OPALT | 2 | 2015 | 4 | 2015 |

UNCLASSIFIED

UNCLASSIFIED

Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy

DATE: February 2011

APPROPRIATION/BUDGET ACTIVITY

1319: Research, Development, Test & Evaluation, Navy
 BA 4: Advanced Component Development & Prototypes (ACD&P)

R-1 ITEM NOMENCLATURE

PE 0603561N: (U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT

PROJECT

2033: Adv Submarine Systems Development

| | Start | | End | |
|---|---------|------|---------|------|
| | Quarter | Year | Quarter | Year |
| Events by Sub Project | | | | |
| TOC ONR FNC Electric Actuation Monitor At-Sea | 1 | 2016 | 4 | 2016 |