A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program develops Commercial-Off-The-Shelf (COTS) based software and hardware upgrades to integrate improved weapons and tactical control capabilities for multiple submarine Classes (SSN688, 688I, SSGN, SEAWOLF, and VIRGINIA (Post Shakedown Availability)). The hardware upgrades (technology insertions) will be developed on a bi-annual basis to provide improved capability and address COTS obsolescence. The AN/BYG-1 is the combat control system common across all submarine platforms which incorporates tactical control, weapon control and tactical Local Area Network (LAN) functions into a single development program. Funding also accommodates the annual integration of Advanced Processing Builds (APBs) software to both tactical control (APB(T)) and weapon control (APB(W)) subsystems. The tactical control integration effort incorporates the integration of other sensor (ESM, sonar, radar, etc.) inputs to provide a common operation picture and improve situational awareness in an information assurance (IA) compliant environment. The weapon control development effort provides improvements to the weapons control subsystem based on improvements to missiles and torpedos. AN/BYG-1 allows the submarine Navy to rapidly update the ship safety tactical picture, integrates the common tactical picture into the battlegroup, improves torpedo interfaces and provides tactical TOMAHAWK (TOMAHAWK Block IV) capability.

This program also develops and tests a Common Weapon Launcher (CWL), a COTS-based software weapons launch capability for all SSN688/688I and Virginia Class submarines. This upgrade provides a more reliable capability for launching missiles and torpedos from submarines while providing the architecture to support the introduction of the next generation of payloads and sensors.

Funding was provided in Fiscal Year 2005 to explore the feasibility of an alternative concept to the current process for submarine maintenance, training and logistics infrastructure for the AN/BYG-1 system. A submarine maintenance free operating period would minimize the need for maintenance support products, maintenance training/trainers and maintenance and logistics infrastructures by developing a highly available submarine combat system. At-sea maintenance would be by keyboard action only and Original Equipment Manufacturers would provide pier-side maintenance and supply support. This would allow operators to focus on system employment versus system maintenance, while harnessing commercial processes and infrastructure for maintenance training and supply support.
B. Accomplishments/Planned Program (Cont.)

<table>
<thead>
<tr>
<th>RDT&amp;E, N /BA-5</th>
<th>PROJECT NUMBER AND NAME</th>
<th>FY 05</th>
<th>FY 06</th>
<th>FY 07</th>
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<tbody>
<tr>
<td>0604562N/SUBMARINE TACTICAL WARFARE SYSTEM</td>
<td>0236/SSN COMB CONT SYS IMP (ENG)</td>
<td>3.000</td>
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FY05: Continued to resolve DT/OT discrepancies associated with AN/BYG-1 TI00/TI02.

<table>
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<th>FY 07</th>
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<td>0604562N/SUBMARINE TACTICAL WARFARE SYSTEM</td>
<td>0236/SSN COMB CONT SYS IMP (ENG)</td>
<td>16.500</td>
<td>6.100</td>
<td>0.500</td>
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FY05: Continued development, integration and test of the next generation AN/BYG-1 (TI04) for SSN 688I/SSN 21 Class submarines scheduled for delivery in FY05.
FY06: Continue development, integration and test of the next generation AN/BYG-1 (TI04) for SSN 688 Class/ SSGN submarines scheduled for delivery in FY06.
FY07: Complete development, integration and test of the next generation AN/BYG-1 (TI04) for 688 Class/SSGN submarines scheduled for delivery in FY07.

<table>
<thead>
<tr>
<th>RDT&amp;E, N /BA-5</th>
<th>PROJECT NUMBER AND NAME</th>
<th>FY 05</th>
<th>FY 06</th>
<th>FY 07</th>
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<td>0604562N/SUBMARINE TACTICAL WARFARE SYSTEM</td>
<td>0236/SSN COMB CONT SYS IMP (ENG)</td>
<td>4.083</td>
<td>11.233</td>
<td>11.188</td>
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</table>

FY05: Began engineering development process for selection and prototyping of new technologies for TI06.
FY06: Continue development, integration and test of the next generation AN/BYG-1 (TI06) for 688/688I Class submarines scheduled for delivery in FY07.
FY07: Continue development, integration and test of the next generation AN/BYG-1 (TI06) for 688/688I Class submarines scheduled for delivery in FY07.
<table>
<thead>
<tr>
<th>Appropriation/Budget Activity</th>
<th>Program Element Number and Name</th>
<th>Project Number and Name</th>
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<td>RDT&amp;E, N /BA-5</td>
<td>0604562N/ SUBMARINE TACTICAL WARFARE SYSTEM</td>
<td>0236/SSN COMB CONT SYS IMP (ENG)</td>
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### B. Accomplishments/Planned Program (Cont.)

<table>
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<th>AN/BYG-1 TI08</th>
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<th>FY 06</th>
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<td>Accomplishments/Effort/Subtotal Cost</td>
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FY07: Begin engineering development process for selection and prototyping of new technologies for TI08 for 688/VA Class/SSGN/SSN 21 Class submarines.

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<th>Advanced Processor Builds</th>
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<td>Accomplishments/Effort/Subtotal Cost</td>
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<td>15.189</td>
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<td>RDT&amp;E Articles Quantity</td>
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</table>

FY05: Began integration of APB(T)-05 and APB(W)-04 into BYG-1. Completed APB-04 integration into AN/BYG-1 baseline.
FY06: Begin integration of APB(T)-06 and APB(W)-05/06 into BYG-1. Complete APB-05 integration into AN/BYG-1 baseline.
FY07: Begin integration of APB(T)-07 and APB(W)-07 into BYG-1. Complete APB-06 integration into AN/BYG-1 baseline.

<table>
<thead>
<tr>
<th>Testing</th>
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<td>Accomplishments/Effort/Subtotal Cost</td>
<td>6.000</td>
<td>3.500</td>
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<td>RDT&amp;E Articles Quantity</td>
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FY05: Planned and began conduct of Development Testing of AN/BYG-1 TI04 on 688I/SSN 21 Class submarines.
FY06: Continue FOT&E for AN/BYG-1 TI04 on SSN 688I Class/SSGN/SSN 21 Class submarines. Complete FOT&E on 688I Class submarines.
FY07: Complete FOT&E for AN/BYG-1 APB-05 on 688 Class/SSGN/SSN 21 Class submarines. Complete FOT&E on SSN 21 and SSGN Class submarines.

R-1 SHOPPING LIST - Item No. 116

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UNCLASSIFIED
B. Accomplishments/Planned Program (Cont.)

<table>
<thead>
<tr>
<th>Common Weapon Launcher</th>
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<th>FY 07</th>
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<td>RDT&amp;E Articles Quantity</td>
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FY06-FY07: Develop, integrate and test Common Weapon Launcher (CWL).
### C. PROGRAM CHANGE SUMMARY:

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<tr>
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<th>FY 2006</th>
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<td>FY2007 President Budget</td>
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<tr>
<td>Total Adjustments</td>
<td>-2.042</td>
<td>-0.616</td>
<td>-3.433</td>
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</table>

**Summary of Adjustments:**
- Programmatic/Other Adjustments: -1.042, -0.670
- Execution Realignments: -1.000
- Inflation: 0.245
- Fuel Rates: 0.055
- Pay Rates: 0.035
- Recissions/Reductions: -0.616, -3.098

**TOTAL:** -2.042, -0.616, -3.433

### Schedule:
- None

### Technical:
- None
D. OTHER PROGRAM FUNDING SUMMARY:

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<td>OPN/BA-4 5420</td>
<td>111.226</td>
<td>132.072</td>
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<td>106.799</td>
<td>113.303</td>
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Related RDT&E:
- PE 0204229N (Tomahawk & Tomahawk Missile Planning Center)
- PE 0205632N (MK 48 ADCAP)
- PE 0603504N (Advanced Submarine Combat Systems Dev.)
- PE 0604503N (SSN-688 and Trident Modernization)
- PE 0604707N (Submarine Electronic Warfare Architecture/Eng. Support)

E. ACQUISITION STRATEGY: AN/BYG-1:
- Competitive contracts awarded in Dec 02 which started the development of a combat control system which segregates tactical control from weapons control system.
- This budget integrates APBs developed by the advanced development community.
- Advanced Processing Builds-Weapons (APB (W)) integration associated with AN/BYG-1 began FY2005 and will be Released-To-Fleet bi-annually and concurrently with an annual APB(T) product. APB(W) are integrated bi-annually due to increased time for weapon certification and safety issues.
- Follow-On contract for both tactical and weapons control subsystems are planned for award in FY2006.
- This program has been tailored in accordance with the new DoD5000 directive to incorporate annual MDA production reviews.
- A competitive Phase 3 Small Business & Innovative Research (SBIR) contract was awarded for the CWL development.

F. MAJOR PERFORMERS:

- NUWC Newport, RI - Government Engineering
- Progeny Systems, VA - CWL, Information Assurance (IA) and Multi-tube Weapon Simulator (MTWS) Developer
## Exhibit R-3 Cost Analysis (page 1)

### Appropriation/Budget Activity

**RDT&E, N** / **BA-5**

### Program Element

**0604562N/SUBMARINE TACTICAL WARFARE SYSTEM**

### Project Number and Name

**0236/SSN COMB CONT SYS IMP (ENG)**

### Exhibit R-2, RDTEN Budget Item Justification

(Exhibit R-2, page 7 of 11)

### Date:

February 2006

### Cost Categories

<table>
<thead>
<tr>
<th>Cost Categories</th>
<th>Contract Method &amp; Type</th>
<th>Total FY Activity &amp; Location Cost</th>
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<th>FY 05 Award Date</th>
<th>FY 06 Cost</th>
<th>FY 06 Award Date</th>
<th>FY 07 Cost</th>
<th>FY 07 Award Date</th>
<th>Cost to Complete</th>
<th>Total Cost</th>
<th>Target Value of Contract</th>
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<tbody>
<tr>
<td>Multi-Tube Weapon Simulator</td>
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<td>Progeny</td>
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<td>AN/BYG-1 Tech Insertion</td>
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<td>9.306</td>
<td>10/04</td>
<td>8.347</td>
<td>10/05</td>
<td>8.028</td>
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<td>AN/BYG-1 Tech Insertion</td>
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<td>MITRE</td>
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<td>Common Weapon Launcher</td>
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<td>COTS Hardware &amp; Software</td>
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### Development Support Equipment

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<th>Contract Method &amp; Type</th>
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<th>FY 05 Award Date</th>
<th>FY 06 Cost</th>
<th>FY 06 Award Date</th>
<th>FY 07 Cost</th>
<th>FY 07 Award Date</th>
<th>Cost to Complete</th>
<th>Total Cost</th>
<th>Target Value of Contract</th>
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</thead>
<tbody>
<tr>
<td>APB Software Integration</td>
<td>CPIF/CPAF</td>
<td>General Dynamics (GD AIS)</td>
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<td>10/05</td>
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<td>Subtotal Support</td>
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<td>48.950</td>
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### Remarks:

- Multi-Tube Weapon Simulator
- AN/BYG-1 Tech Insertion
- Government Engineering
- AN/BYG-1 Tech Insertion
- Common Weapon Launcher
- COTS Hardware & Software
- Subtotal Product Development
- Development Support Equipment
- APB Software Integration
- APB Software Integration
- APB Software Integration
- Software Development
- Subtotal Support

R-1 SHOPPING LIST - Item No. 116
### Exhibit R-3 Cost Analysis (page 2)

**APPROPRIATION/BUDGET ACTIVITY**  
RDT&E, N / BA-5

**PROGRAM ELEMENT**  
0604562N/SUBMARINE TACTICAL WARFARE SYSTEM

**PROJECT NUMBER AND NAME**  
0236/SSN COMB CONT SYS IMP (ENG)

<table>
<thead>
<tr>
<th>Cost Categories</th>
<th>Method Activity &amp; Location</th>
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<th>FY 07 Award Date</th>
<th>Cost to Complete</th>
<th>Target Value of Contract</th>
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<tbody>
<tr>
<td>Developmental Test &amp; Evaluation</td>
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<td>Operational Test &amp; Evaluation</td>
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**Subtotal T&E**  
18.276  6.000  3.500  4.300  0.000  32.076

**Remarks:**

| Contractor Engineering Support          |                           | 0.000            |                  |            |                  |            |                  |                  |                        |
| Government Engineering Support          |                           | 0.000            |                  |            |                  |            |                  |                  |                        |
| Program Management Support              | CPFF                      | 8.731            | 10/04            | 0.302      | 0.000            | 0.000      |                  | CONT             | CONT                   |
| Travel                                  | PD                        | 0.350            |                  |            |                  |            |                  |                  | 0.350                  |
| Labor (Research Personnel)              |                           | 0.000            |                  |            |                  |            |                  |                  |                        |
| SBIR Assessment                         |                           | 0.000            |                  |            |                  |            |                  |                  |                        |
| Subtotal Management                     |                           | 9.081            | 0.302            | 0.000      | 0.000            | 0.000      | 9.383            |                  |                        |

**Remarks:**

**Total Cost**  
188.620  45.455  40.074  51.656  0.000  325.804

**Remarks:**
## Acquisition Milestones

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<td>APB I&amp;T, Certification</td>
<td>APB-04</td>
<td>APB-05</td>
<td>APB-06</td>
<td>APB-07</td>
<td>APB-08</td>
<td>APB-09</td>
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<tr>
<td>AN/BYG-1 Tech Insertion, Development, I&amp;T Certification</td>
<td>TI-06</td>
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<td>Common Weapon Launcher (CWL)</td>
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## Test & Evaluation Milestones

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<td>CWL</td>
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## Production

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R-1 SHOPPING LIST - Item No. 116
### Exhibit R-4a, Schedule Detail

<table>
<thead>
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<th>APPROPRIATION/BUDGET ACTIVITY</th>
<th>PROGRAM ELEMENT</th>
<th>PROJECT NUMBER AND NAME</th>
<th>DATE: February 2006</th>
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<tbody>
<tr>
<td><strong>RDT&amp;E, N / BA-5</strong></td>
<td>0604562N / Submarine Tactical Warfare System</td>
<td>0236 / Submarine Combat System Improvements</td>
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<td>AN/BYG-1 (T104) - Development</td>
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<tr>
<td>AN/BYG-1 - APB05 Integration &amp; Test, Certification</td>
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<tr>
<td>AN/BYG-1 (T106) - Development</td>
<td>2Q - 4Q</td>
<td>1Q - 4Q</td>
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**R-1 SHOPPING LIST - Item No. 116**

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**UNCLASSIFIED**

**Exhibit R-2, RDTEN Budget Item Justification**

(Exhibit R-2, page 10 of 11)
### CONGRESSIONAL PLUS-UPS:

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<td>1950C Submarine Open Architecture Technology Insertion</td>
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**FY06:** Re-engineer and migrate unique military standard sensors, electronics, and software system components to common COTS based architectures and technologies. Identify and migrate high risk/high reward components of AN/BYG-1, as well as identify opportunities for commonality across sub and surface ship electronic subsystems.

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<td>9850N Automated Submarine Command and Control Center</td>
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Transition weapons launch technology efforts required to accelerate hardware and software production, integration and installation of Weapon Launch System Technology Refresh Improvements for both Virginia Class and In-Service Submarines.

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<td>9851N Bandwidth Management for Distance Support</td>
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Develops common software applications and tools that will optimize the bandwidth allocated to Distance Support and the Afloat Integrated Learning Environment (AILE).