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| Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Navy  |             |         |         |              |   |               |         |         |         | Date: March 2014 |                  |            |
|---|-------------|---------|---------|--------------|---|---------------|---------|---------|---------|------------------|------------------|------------|
| Appropriation/Budget Activity<br>1319: Research, Development, Test & Evaluation, Navy I BA 4: Advanced Component Development & Prototypes (ACD&P) |             |         |         |              | R-1 Program Element (Number/Name)<br>PE 0603562N I Submarine Tactical Warfare Sys |               |         |         |         |                  |                  |            |
| COST (\$ in Millions)   | Prior Years | FY 2013 | FY 2014 | FY 2015 Base | FY 2015 OCO #   | FY 2015 Total | FY 2016 | FY 2017 | FY 2018 | FY 2019          | Cost To Complete | Total Cost |
| Total Program Element   | 45.441      | 8.505   | 8.764   | 8.044        | -   | 8.044         | 8.896   | 9.145   | 9.215   | 9.417            | Continuing       | Continuing |
| 0770: Adv Sub Supp Equip Prog   | 9.406       | 3.648   | 3.855   | 3.343        | -   | 3.343         | 4.077   | 4.186   | 4.162   | 4.248            | Continuing       | Continuing |
| 1739: Submarine Arctic W/F Development  | 36.035      | 4.857   | 4.909   | 4.701        | -   | 4.701         | 4.819   | 4.959   | 5.053   | 5.169            | Continuing       | Continuing |

# The FY 2015 OCO Request will be submitted at a later date.

**A. Mission Description and Budget Item Justification**

The Submarine Tactical Warfare Systems program element is comprised of the Advanced Submarine Support Equipment Program (ASSEP) and the Submarine Special Operations Support Program. The objective is to improve submarine operational effectiveness through the development and implementation of advanced Research and Development (R&D). In order to provide improved operational effectiveness, R&D efforts are focused on Advanced Imaging Developments and Advanced Electronic Warfare Support (ES) Developments. A continuing need exists to improve these capabilities in view of the advancements in potential imaging counter detection, the need to support specialized missions, and the increasingly dense and sophisticated electronic environment caused by the proliferation of complex radar, communications, and navigation equipment of potential adversaries. Ongoing developments in 360 degree imaging systems and electro-optic infra-red vulnerability signature reduction technologies are supporting these needs.

The Submarine Arctic Warfare Development program responds to the increased threat of naval activity in the Arctic regions while continuously supporting the Navy's strategic objective of Assured Access and Combat Credibility. The U.S. Navy Submarine Force (SUBFOR) demonstrates existing Arctic Warfare capabilities, operational and tactical proficiency while developing advanced submarine research and development technology in unique cold water environments, under-ice conditions, and ice-covered shallow water regions during Ice Exercises (ICEX). ICEX provides the framework for various submarine research and development programs to conduct test and evaluation in Arctic regions or at periodic Ice Camps. Particular emphasis is placed on the areas of sonar operability, tactical surveillance, weapon utility, and other submarine support missions. Efforts include assessment of combat system effectiveness, development of Arctic specific improvements for existing sonar and weapons, development of class specific Arctic operational guidelines, and the testing of ice-capable submarine support structures. This program also provides SUBFOR a cadre of trained Arctic Operation Specialists (AOS) and an inventory of unique Arctic sensors to optimize submarine safety during under-ice operations.

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| Appropriation/Budget Activity<br>1319: Research, Development, Test & Evaluation, Navy I BA 4: Advanced Component Development & Prototypes (ACD&P) |         | R-1 Program Element (Number/Name)<br>PE 0603562N I Submarine Tactical Warfare Sys |              |                  |               |
| B. Program Change Summary (\$ in Millions)  | FY 2013 | FY 2014   | FY 2015 Base | FY 2015 OCO      | FY 2015 Total |
| Previous President's Budget   | 9.368   | 8.764   | 9.690        | -                | 9.690         |
| Current President's Budget  | 8.505   | 8.764   | 8.044        | -                | 8.044         |
| Total Adjustments   | -0.863  | -   | -1.646       | -                | -1.646        |
| • Congressional General Reductions  | -       | -   |              |                  |               |
| • Congressional Directed Reductions   | -       | -   |              |                  |               |
| • Congressional Rescissions   | -       | -   |              |                  |               |
| • Congressional Adds  | -       | -   |              |                  |               |
| • Congressional Directed Transfers  | -       | -   |              |                  |               |
| • Reprogrammings  | -       | -   |              |                  |               |
| • SBIR/STTR Transfer  | -0.092  | -   |              |                  |               |
| • Program Adjustments   | -       | -0.353  | -1.519       | -                | -1.519        |
| • Rate/Misc Adjustments   | -       | 0.353   | -0.127       | -                | -0.127        |
| • Congressional General Reductions Adjustments  | -0.771  | -   | -            | -                | -             |
| Change Summary Explanation  |         |   |              |                  |               |
| Cost/Funding:   |         |   |              |                  |               |
| All Projects: FY13 funding was reduced for Sequestration.   |         |   |              |                  |               |
| All Projects: FY15 funding was reduced due to the Department's decision to reduce contracted services.  |         |   |              |                  |               |
| All Projects: FY15 funding was reduced to properly phase program requirements in accordance with expenditures.                                    |         |   |              |                  |               |
| Schedule: Not applicable.   |         |   |              |                  |               |

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| Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy   |             |         |         |              |   |               |         |         |   | Date: March 2014 |                  |            |
| Appropriation/Budget Activity<br>1319 / 4   |             |         |         |              | R-1 Program Element (Number/Name)<br>PE 0603562N / Submarine Tactical Warfare Sys |               |         |         | Project (Number/Name)<br>0770 / Adv Sub Supp Equip Prog |                  |                  |            |
| COST (\$ in Millions)   | Prior Years | FY 2013 | FY 2014 | FY 2015 Base | FY 2015 OCO #   | FY 2015 Total | FY 2016 | FY 2017 | FY 2018   | FY 2019          | Cost To Complete | Total Cost |
| 0770: Adv Sub Supp Equip Prog   | 9.406       | 3.648   | 3.855   | 3.343        | -   | 3.343         | 4.077   | 4.186   | 4.162   | 4.248            | Continuing       | Continuing |
| Quantity of RDT&E Articles  | 0.000       | -       | -       | -            | -   | -             | -       | -       | -   | -                |                  |            |
| # The FY 2015 OCO Request will be submitted at a later date.  |             |         |         |              |   |               |         |         |   |                  |                  |            |
| A. Mission Description and Budget Item Justification  |             |         |         |              |   |               |         |         |   |                  |                  |            |
| A continuing need exists to improve Imaging and Electronic Warfare support (EW) capabilities in view of the advancements in potential imaging counter detection and the increasingly dense electromagnetic environment caused by the proliferation of complex radar, communications, and navigation equipment of potential adversaries. Improvements are necessary for submarine EW and Imaging to be operationally effective in the following mission areas: Joint Littoral Warfare, Joint Surveillance, Space and Electronic Warfare, Intelligence Collection, Maritime Protection, and Joint Strike. The program is divided into two project categories: Advanced Imaging Project Development and Advanced Electronic Warfare Support Project Development. Both of these categories will allow for the mitigation of submarine masts, periscopes, and sensors to visual, radar, and infrared detection. Evaluation of state of the art technology to implement periscope/mast improvements via EW electromagnetic and electro-optic sensors resulting in improved capability. Engineering Demonstration Models (EDMs) are developed, evaluated, and validated in the lab and through at-sea testing.   |             |         |         |              |   |               |         |         |   |                  |                  |            |
| The Advanced Imaging Project Development projects include the development of the Affordable Modular Panoramic Photonics Mast (AMPPM) which introduces several groundbreaking technologies such as individually replaceable capability modules (allowing a vast array of capability combinations without supporting redesign) as well as presenting live 360 degree High Definition video (greatly increasing situational awareness and reducing scope exposure time.) Also in support of AMPPM advanced materiel Electro-Optic/Infrared (EO/IR) Vulnerability Signature Reduction; Mast Test Vehicle (MTV) testing and Imaging Engineering Measurement Program. The Advanced EW Development projects include the development of: Distant ES Support and Remote Log-In; Rapid Reprogramming Threat Libraries; Specific Emitter Identification (SEI) Improvements; Radar Vulnerability Tool; Enhanced DeInterleavers; ES Correlator; Low Probability of Intercept (LPI) Direction Finding (DF); Embedded Built-in Test (BIT); EW on-Board Trainer (OBT); Multi-function Modular Mast (MMM) Payloads and Next Generation EW Systems Algorithms and Applications. OPNAV direction provided for Next Generation EW in reference dated 17 June 12, SER N97/12U144401. |             |         |         |              |   |               |         |         |   |                  |                  |            |
| All programs funded in this project are non-Acquisition Category (ACAT) programs. The test articles identified consist of critical components that will be fully developed during Engineering Manufacturing and Development phase into EDMs.  |             |         |         |              |   |               |         |         |   |                  |                  |            |
| B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)  |             |         |         |              |   |               |         |         | FY 2013   | FY 2014          | FY 2015          |            |
| Title: Advanced Imaging Project Development   |             |         |         |              |   |               |         |         | 2.025   | 2.434            | 2.141            |            |
|   |             |         |         |              |   |               |         |         | Articles: -   | -                | -                |            |
| FY 2013 Accomplishments:  |             |         |         |              |   |               |         |         |   |                  |                  |            |
| 360 Degree Medium Wave Infrared (MWIR) Lab Demo and Pierside Testing  |             |         |         |              |   |               |         |         |   |                  |                  |            |

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| Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy   |   | Date: March 2014  |            |            |
| Appropriation/Budget Activity<br>1319 / 4   | R-1 Program Element (Number/Name)<br>PE 0603562N / Submarine Tactical Warfare Sys | Project (Number/Name)<br>0770 / Adv Sub Supp Equip Prog |            |            |
| B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)  |   | FY 2013   | FY 2014    | FY 2015    |
| 360 Degree Affordable Modular Panoramic Photonics Mast (AMPPM) Short Wave Infrared (SWIR) camera and Hyperspectral camera Critical Design Reviews (CDR)<br>EO/IR Mast Signature Reduction: Continuation of EO/IR TDA GUI Development /Multi Thread Development<br>Electro-Optic/Infrared Vulnerability Signature Reduction Lab Test<br>Universal Mast Controller S/W & H/W Development/Test, EDM# 1 & 2 Delivery<br>LPPM Initial Design Review (IDR), Final Design Review (FDR)<br>Head Window Water Shedding Pierside Testing<br><b>FY 2014 Plans:</b><br>LPPM Lab Test/Sell Off<br>360 Degree Imaging (ONR) Development, AMPPM - Lab Testing SWIR and Hyperspectral<br>Universal Mast Controller S/W & H/W Development/Test, EDM# 3 Delivery<br>Electro-Optic/Infrared Vulnerability Signature Reduction Lab Test<br>Radio Frequency over Fiber (RFoF) Lab Demo<br>Covert Electronic Support Measures (ESM) FDR/Lab Demo<br><b>FY 2015 Plans:</b><br>360 Imaging (ONR) - AMPPM - FNC Lab Testing<br>360 Imaging (ONR) - AMPPM - FNC Pierside Testing<br>Low Profile Photonics Mast At-sea Test<br>RFoF Lab Demo At Sea Test<br>Covert ESM At Sea Test |   |   |            |            |
| Title: Advanced Electronic Warfare Support (EW) Project Development<br><br><b>FY 2013 Accomplishments:</b><br>Distant Support and Remote Log-in At-Sea Testing<br>Rapid Reprogramming of Threat Libraries At-sea Testing<br>ES Server (Correlator) At-Sea Testing<br>ES Vulnerability Tool / Tactical Decision Aid Development CDR and Lab Demo<br>Enhanced DeInterleavers Development<br>LPI DF / Localization Development<br>Embedded Built-in Test (BIT) Development<br>Next Gen EW Development<br>RFoF Development/FDR  |   | Articles:<br>1.623<br>-                                 | 1.421<br>- | 1.202<br>- |

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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2015 Navy   |   | <b>Date:</b> March 2014   |                |
| <b>Appropriation/Budget Activity</b><br>1319 / 4   | <b>R-1 Program Element (Number/Name)</b><br>PE 0603562N / <i>Submarine Tactical Warfare Sys</i> | <b>Project (Number/Name)</b><br>0770 / <i>Adv Sub Supp Equip Prog</i> |                |
| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>  |   | <b>FY 2013</b>  | <b>FY 2014</b> |
| Covert ESM Development   |   |   |                |
| <b>FY 2014 Plans:</b><br>ES Vulnerability Tool / Tactical Decision Aid Lab Demo<br>ES Server (Valkyrie) CDR<br>Enhanced DeInterleavers SBIR Lab Demo<br>LPI DF / Localization Development/CDR<br>Embedded Built-in Test (BIT) Development/CDR<br>ES Server (Valkyrie) Development  |   |   |                |
| <b>FY 2015 Plans:</b><br>ES Vulnerability Tool / Tactical Decision Aid At-Sea Test/Lab Demo<br>ES Server (Valkyrie) Lab Demo<br>Enhanced DeInterleavers Lab Demo (2)<br>LPI DF / Localization Lab Demo<br>Embedded Built-in Test (BIT) Lab Demo<br>OnBoard Trainer Development   |   |   |                |
| <b>Accomplishments/Planned Programs Subtotals</b>  |   | 3.648   | 3.855          |
| <b>C. Other Program Funding Summary (\$ in Millions)</b><br>N/A  |   |   |                |
| <b>Remarks</b>   |   |   |                |
| <b>D. Acquisition Strategy</b><br>This project optimizes technology insertion using a build-test-build approach to support EW and Imaging operational needs. Operational needs have been based on the tactical requirements identified in CNO letters, Serial N77/3U629212, dated 04 Sep 03, CNO Ltr Ser N772/5U936037 dtd 13 JUN 2005, CNO Ltr Ser N776/4U786103 dtd 1 APR 2004, COMSUBLANT/ COMSUBPAC, Virginia Class SSN Operational Requirements Documentation objectives, ORD for Photonics (ORD #365-87-94) [dtd JUL 1994], Operational Requirements Document (ORD) for ES (ORD # 570-77-00) [dtd 20 DEC 2000], ORD for ISIS (ORD #663-77-05) [dtd MAR 2005], Capability Development Document (CDD) for Submarine EW Systems (Ver-DRAFT), Common Submarine Imaging System (CSIS) (CDD# 849-87-11) dtd 22 Dec 2011 for Submarine Imaging Systems and JOINT COMMAND SUBMARINE FORCE/COMMANDER SUBMARINE FORCE Ltr Ser# N00/00621 dtd 24 Oct 2011. Project efforts develop submarine unique improvements to mast, periscope, and EW electromagnetic spectrum and electro-optic sensors based on emerging technologies that are available from DoD Exploratory Development Programs, industry Independent Research and Development, and other sources. Engineering Demonstration Models (EDMs) will be developed to provide a realistic method of evaluating the improvements, including deployment on submarines for testing. |   |   |                |

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| Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy   |  | Date: March 2014   |
| Appropriation/Budget Activity<br>1319 / 4   | R-1 Program Element (Number/Name)<br>PE 0603562N / <i>Submarine Tactical Warfare Sys</i> | Project (Number/Name)<br>0770 / <i>Adv Sub Supp Equip Prog</i> |
| <b>E. Performance Metrics</b><br>The RDD program goal is to respond to urgent operational needs within 30 days and provide for rapid development and fielding of prototype solutions within 270 days. |  |  |

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Exhibit R-4, RDT&amp;E Schedule Profile: PB 2015 Navy

Date: March 2014

Appropriation/Budget Activity

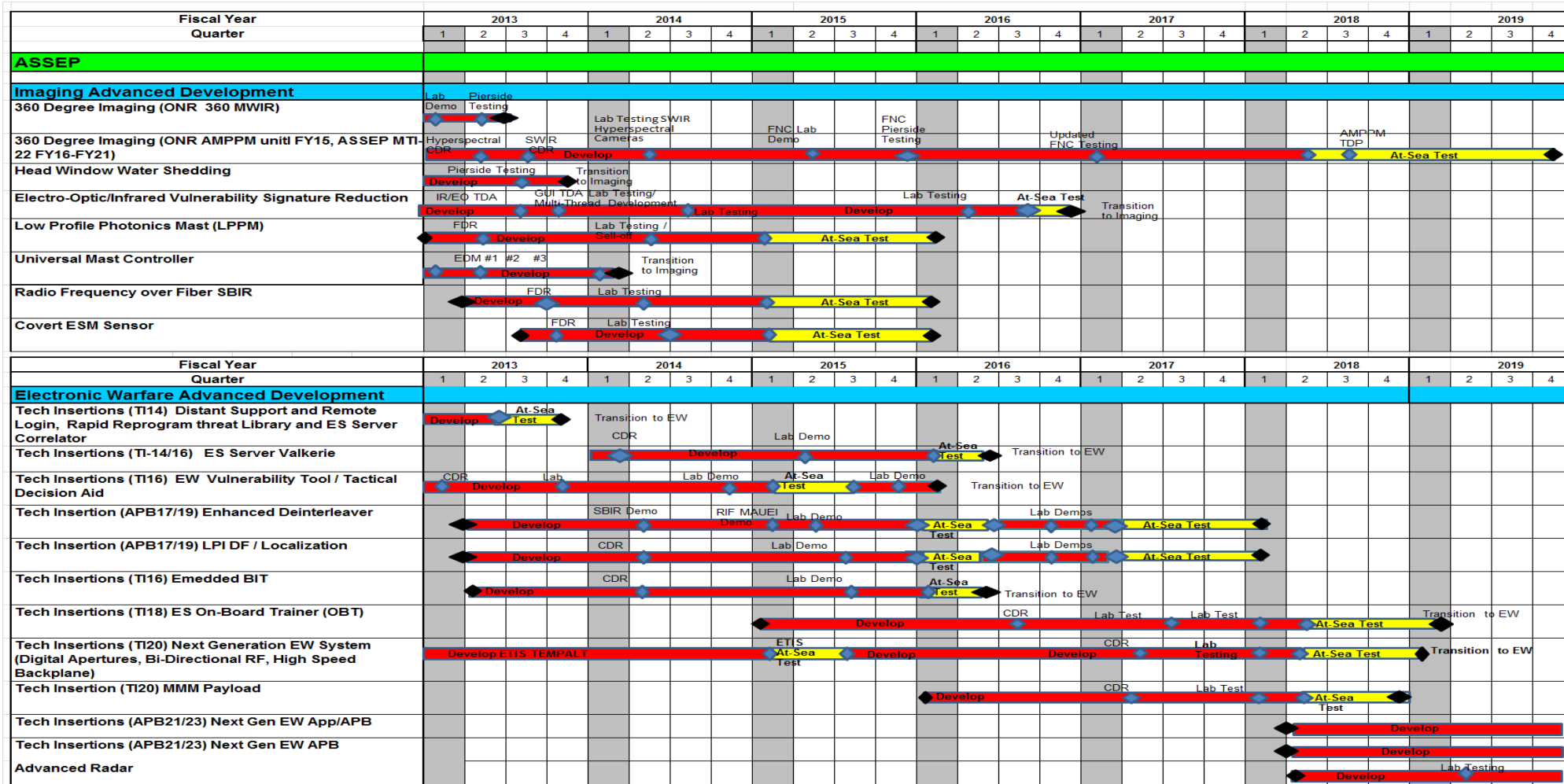
1319 / 4

R-1 Program Element (Number/Name)

PE 0603562N / Submarine Tactical Warfare Sys

Project (Number/Name)

0770 / Adv Sub Supp Equip Prog



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|---|-------------|---------|---------|--------------|---|---------------|---------|---------|--|------------------|------------------|------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy   |             |         |         |              |   |               |         |         |  | Date: March 2014 |                  |            |
| Appropriation/Budget Activity<br>1319 / 4   |             |         |         |              | R-1 Program Element (Number/Name)<br>PE 0603562N / Submarine Tactical Warfare Sys |               |         |         | Project (Number/Name)<br>1739 / Submarine Arctic W/F Development |                  |                  |            |
| COST (\$ in Millions)   | Prior Years | FY 2013 | FY 2014 | FY 2015 Base | FY 2015 OCO #   | FY 2015 Total | FY 2016 | FY 2017 | FY 2018  | FY 2019          | Cost To Complete | Total Cost |
| 1739: Submarine Arctic W/F Development  | 36.035      | 4.857   | 4.909   | 4.701        | -   | 4.701         | 4.819   | 4.959   | 5.053  | 5.169            | Continuing       | Continuing |
| Quantity of RDT&E Articles  | 0.000       | -       | -       | -            | -   | -             | -       | -       | -  | -                |                  |            |
| # The FY 2015 OCO Request will be submitted at a later date.  |             |         |         |              |   |               |         |         |  |                  |                  |            |
| A. Mission Description and Budget Item Justification  |             |         |         |              |   |               |         |         |  |                  |                  |            |
| The Submarine Arctic Warfare Development project responds to the increased threat of submarine and surface ship activity in Arctic regions of the world through the development of advanced submarine concepts. It places particular emphasis on submarine operability and mission support in unique, cold, ice-covered environments. Efforts include assessment of combat system effectiveness, weapons testing, use of high frequency sonars in Arctic regions, testing of ice-capable submarine structures, and development of class-specific Arctic operational guidelines. This project also provides the framework for various research and development programs to conduct test and evaluation in shallow water and Arctic regions.  |             |         |         |              |   |               |         |         |  |                  |                  |            |
| B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)  |             |         |         |              |   |               |         |         |  | FY 2013          | FY 2014          | FY 2015    |
| Title: Conduct ICEX and Arctic Transit Mission, ICEX Workup and Training, Ice Camps   |             |         |         |              |   |               |         |         |  | 4.857            | 4.909            | 4.701      |
|   |             |         |         |              |   |               |         |         |  | Articles: -      | -                | -          |
| FY 2013 Accomplishments:  |             |         |         |              |   |               |         |         |  |                  |                  |            |
| Conducted ICEX mission 1-2013. Continued planning and support for ICEX mission 1-2014 and Ice Camp 1-2014. Supported Arctic deployments, including inter-Fleet transfers, as required by the SUBFOR Commanders. Investigated, researched, developed and deployed new systems for Arctic submarine support. Supported testing and tactical development required to improve submarine Arctic operability and warfighting. Installed and tested mission/tactical grade equipment on SSN 688I and SSN 21 Class platforms. Developed a High Frequency Active (HFA) under-ice sonar training product. Evaluated under-ice HFA training product during Arctic training sessions. Procured two additional EdgeTech 220 Side Scan systems to support SSN 688I/774 Class Submarines. Developed and tested new display software for the Commercial Off The Shelf (COTS) SEABIRD Conductivity, Temperature, and Depth (CTD) probes. |             |         |         |              |   |               |         |         |  |                  |                  |            |
| FY 2014 Plans:  |             |         |         |              |   |               |         |         |  |                  |                  |            |
| Conduct Arctic work-up training and ICEX mission 1-2014. Evaluate new display software for the COTS SEABIRD CTD probes. Support Arctic deployments, including inter-Fleet transfers, as required by the SUBFOR Commanders. Investigate, research, develop and deploy new systems for Arctic submarine support. Support testing and tactical development required to improve submarine Arctic operability and warfighting.   |             |         |         |              |   |               |         |         |  |                  |                  |            |
| FY 2015 Plans:  |             |         |         |              |   |               |         |         |  |                  |                  |            |



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| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2015 Navy  |   | <b>Date:</b> March 2014  |                |
| <b>Appropriation/Budget Activity</b><br>1319 / 4  | <b>R-1 Program Element (Number/Name)</b><br>PE 0603562N / <i>Submarine Tactical Warfare Sys</i> | <b>Project (Number/Name)</b><br>1739 / <i>Submarine Arctic W/F Development</i> |                |
| <b>B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)</b>   |   | <b>FY 2013</b>   | <b>FY 2014</b> |
| Support Arctic deployments, including inter-Fleet transfers, as required by the SUBFOR Commanders. Investigate, research, develop and deploy new systems for Arctic submarine support. Support testing and tactical development required to improve submarine Arctic operability and warfighting.   |   |  |                |
| <b>Accomplishments/Planned Programs Subtotals</b>   |   | 4.857  | 4.909          |
| <b>C. Other Program Funding Summary (\$ in Millions)</b><br>N/A   |   |  |                |
| <b>Remarks</b>  |   |  |                |
| <b>D. Acquisition Strategy</b><br>Use sole source and competitively awarded contracts through the Fleet Logistics Center (FLC) regional contracting office for equipment and technical services. The NAVSEA University Affiliated Research Center (UARC) omnibus contract is used for procurement of logistics support for Ice Camps and Conductivity, Temperature, and Depth (CTD) probe display software development. |   |  |                |
| <b>E. Performance Metrics</b><br>Conduct and support Arctic deployments, including inter-Fleet transfers, as required by the SUBFOR Commanders.   |   |  |                |

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| Exhibit R-4, RDT&E Schedule Profile: PB 2015 Navy |                        |    |    |    |               |    |    |    |         |    |    | Date: March 2014  |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
| Appropriation/Budget Activity<br>1319 / 4         |                        |    |    |    |               |    |    |    |         |    |    | R-1 Program Element (Number/Name)<br>PE 0603562N / Submarine Tactical Warfare Sys |         |    |    |    |               |    |    | Project (Number/Name)<br>1739 / Submarine Arctic W/F Development |         |    |    |    |         |    |    |    |
| Proj 1739   | FY 2013                |    |    |    | FY 2014       |    |    |    | FY 2015 |    |    |   | FY 2016 |    |    |    | FY 2017       |    |    |  | FY 2018 |    |    |    | FY 2019 |    |    |    |
|   | 1Q                     | 2Q | 3Q | 4Q | 1Q            | 2Q | 3Q | 4Q | 1Q      | 2Q | 3Q | 4Q  | 1Q      | 2Q | 3Q | 4Q | 1Q            | 2Q | 3Q | 4Q   | 1Q      | 2Q | 3Q | 4Q | 1Q      | 2Q | 3Q | 4Q |
| Arctic Deployment (at Sea)                        |                        |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
|   | Arctic Deployment      |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
| ICEX Mission (at Sea)                             |                        |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
|   | ICEX 2013              |    |    |    | ICEX 2014     |    |    |    |         |    |    |   |         |    |    |    | ICEX 2017     |    |    |  |         |    |    |    |         |    |    |    |
| Arctic Transit Mission (at Sea)                   |                        |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
|   | Arctic Transit Mission |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
| Arctic Workup (at Sea)                            |                        |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
|   | Arctic Workup          |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
| Arctic Training                                   |                        |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
|   | Arctic Training        |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
| Ice Camp (Arctic Ocean)                           |                        |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |
|   |                        |    |    |    | Ice Camp 2014 |    |    |    |         |    |    |   |         |    |    |    | Ice Camp 2017 |    |    |  |         |    |    |    |         |    |    |    |
| 2015PB - 0603562N - 1739                          |                        |    |    |    |               |    |    |    |         |    |    |   |         |    |    |    |               |    |    |  |         |    |    |    |         |    |    |    |