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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2017 Navy **Date:** February 2016

| <b>Appropriation/Budget Activity</b><br>1319: Research, Development, Test & Evaluation, Navy / BA 3: Advanced Technology Development (ATD) |                    |                |                |                     | <b>R-1 Program Element (Number/Name)</b><br>PE 0603114N / Power Projection Advanced Technology |                      |                |                |                |                |                         |                   |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|----------------|---------------------|------------------------------------------------------------------------------------------------|----------------------|----------------|----------------|----------------|----------------|-------------------------|-------------------|
| <b>COST (\$ in Millions)</b>                                                                                                               | <b>Prior Years</b> | <b>FY 2015</b> | <b>FY 2016</b> | <b>FY 2017 Base</b> | <b>FY 2017 OCO</b>                                                                             | <b>FY 2017 Total</b> | <b>FY 2018</b> | <b>FY 2019</b> | <b>FY 2020</b> | <b>FY 2021</b> | <b>Cost To Complete</b> | <b>Total Cost</b> |
| Total Program Element                                                                                                                      | 0.000              | 36.651         | 36.971         | 96.406              | -                                                                                              | 96.406               | 12.392         | 12.445         | 12.445         | 12.445         | Continuing              | Continuing        |
| 2911: Power Proj Adv Tech                                                                                                                  | 0.000              | 36.651         | 36.971         | 96.406              | -                                                                                              | 96.406               | 12.392         | 12.445         | 12.445         | 12.445         | Continuing              | Continuing        |

## A. Mission Description and Budget Item Justification

The efforts described in this Program Element (PE) are based on investment directions as defined in the Naval S&T Strategic Plan approved by the S&T Corporate Board of 20 January 2015. This strategy is based on needs and capabilities from Navy and Marine Corps guidance and input from the Naval Research Enterprise (NRE) stakeholders (including the Naval enterprises, the combatant commands, the Chief of Naval Operations (CNO), and Headquarters Marine Corps). It provides the vision and key objectives for the essential science and technology efforts that will enable the continued supremacy of U.S. Naval forces in the 21st century. The Strategy focuses and aligns Naval S&T with Naval missions and future capability needs that address the complex challenges presented by both rising peer competitors and irregular/asymmetric warfare. This program develops and demonstrates advanced technologies, including Electromagnetic (EM) Rail Gun for naval weapon systems. Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

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| <b>B. Program Change Summary (\$ in Millions)</b> | <b>FY 2015</b> | <b>FY 2016</b> | <b>FY 2017 Base</b> | <b>FY 2017 OCO</b> | <b>FY 2017 Total</b> |
|---------------------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| Previous President's Budget                       | 37.734         | 37.093         | 27.648              | -                  | 27.648               |
| Current President's Budget                        | 36.651         | 36.971         | 96.406              | -                  | 96.406               |
| Total Adjustments                                 | -1.083         | -0.122         | 68.758              | -                  | 68.758               |
| • Congressional General Reductions                | -              | -0.122         |                     |                    |                      |
| • Congressional Directed Reductions               | -              | -              |                     |                    |                      |
| • Congressional Rescissions                       | -              | -              |                     |                    |                      |
| • Congressional Adds                              | -              | -              |                     |                    |                      |
| • Congressional Directed Transfers                | -              | -              |                     |                    |                      |
| • Reprogrammings                                  | -              | -              |                     |                    |                      |
| • SBIR/STTR Transfer                              | -1.083         | 0.000          |                     |                    |                      |
| • Program Adjustments                             | 0.000          | 0.000          | 68.800              | -                  | 68.800               |
| • Rate/Misc Adjustments                           | 0.000          | 0.000          | -0.042              | -                  | -0.042               |

## Change Summary Explanation

Technical: Not applicable.

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| Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Navy                                                                                            |                                                                                                       | Date: February 2016 |
| <b>Appropriation/Budget Activity</b><br>1319: <i>Research, Development, Test &amp; Evaluation, Navy / BA 3: Advanced Technology Development (ATD)</i> | <b>R-1 Program Element (Number/Name)</b><br>PE 0603114N / <i>Power Projection Advanced Technology</i> |                     |
| Schedule: Not applicable.                                                                                                                             |                                                                                                       |                     |

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|---------------------------------------------------------|-------------|---------|---------|--------------|------------------------------------------------------------------------------------------------|---------------|---------|---------|------------------------------------------------------------|---------------------|------------------|------------|
| Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy |             |         |         |              |                                                                                                |               |         |         |                                                            | Date: February 2016 |                  |            |
| Appropriation/Budget Activity<br>1319 / 3               |             |         |         |              | R-1 Program Element (Number/Name)<br>PE 0603114N / <i>Power Projection Advanced Technology</i> |               |         |         | Project (Number/Name)<br>2911 / <i>Power Proj Adv Tech</i> |                     |                  |            |
| COST (\$ in Millions)                                   | Prior Years | FY 2015 | FY 2016 | FY 2017 Base | FY 2017 OCO                                                                                    | FY 2017 Total | FY 2018 | FY 2019 | FY 2020                                                    | FY 2021             | Cost To Complete | Total Cost |
| 2911: <i>Power Proj Adv Tech</i>                        | 0.000       | 36.651  | 36.971  | 96.406       | -                                                                                              | 96.406        | 12.392  | 12.445  | 12.445                                                     | 12.445              | Continuing       | Continuing |

## A. Mission Description and Budget Item Justification

This project supports the Time Critical Strike (TCS) and ForceNet FNC components which address technological issues associated with the development of strike weapons that significantly decrease the launch to engagement timeline; provide the Navy of the future the ability to quickly locate, target, and strike critical targets; and enhance mission capabilities and operational utility of Naval forces by dramatically increasing the autonomy, performance, and affordability of Naval organic, Unmanned Vehicle systems. The Navy is furthering the development of solid state, high energy laser technology for use as a weapon system on future surface ships.

## B. Accomplishments/Planned Programs (\$ in Millions)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>FY 2015</b> | <b>FY 2016</b> | <b>FY 2017 Base</b> | <b>FY 2017 OCO</b> | <b>FY 2017 Total</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|---------------------|--------------------|----------------------|
| <b>Title:</b> PRECISION STRIKE TECHNOLOGY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 36.651         | 36.971         | 96.406              | 0.000              | 96.406               |
| <p><b>Description:</b> The focus of this activity is on those technologies that will support the Naval Precision Strike Operations and provide the Navy of the future the ability to quickly locate, target, and strike critical targets. This activity includes support to the following FNC Enabling Capabilities (ECs): Advanced Naval Fires Technology, Hostile Fire Detection and Response, Dynamic Target Engagement &amp; Enhanced Sensor Capabilities, and Discriminate and Provide Terminal Guidance for Weapons Targeted at Moving Targets.</p> <p>Solid State Laser program funding continues in PE 0602114N for FY 2015.</p> <p>FY 2016 to FY 2017 increase in funding is due to Solid State Laser Technology Maturation Program (SSL-TM) program entering its fabrication and testing phase.</p> <p><b>FY 2015 Accomplishments:</b><br/>           Electromagnetic (EM) Railgun<br/>           -Continued development and testing of projectile component concepts at 32 MJ muzzle energy tests.<br/>           -Continued ship integration study efforts.<br/>           -Continued next generation industry repetitive rate launcher development and test planning.<br/>           -Continued next generation repetitive rate pulsed power fabrication in support of future repetitive rate launcher testing.<br/>           -Continued fabrication of rep rate lab launcher for testing of barrel life components.<br/>           -Continued next generation industry rep rate launcher preliminary design.<br/>           -Continued component fabrication and testing of repetitive firing rate barrel life with EM lab launcher at tactically relevant muzzle energy.</p> |                |                |                     |                    |                      |

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| Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |                                                                                                | Date: February 2016 |                                                            |                |                  |
| Appropriation/Budget Activity<br>1319 / 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  | R-1 Program Element (Number/Name)<br>PE 0603114N / <i>Power Projection Advanced Technology</i> |                     | Project (Number/Name)<br>2911 / <i>Power Proj Adv Tech</i> |                |                  |
| B. Accomplishments/Planned Programs (\$ in Millions)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  | FY 2015                                                                                        | FY 2016             | FY 2017<br>Base                                            | FY 2017<br>OCO | FY 2017<br>Total |
| Weapons System Improvement<br>-Continued kill-chain studies to identify and recommend engineering trades to enable weapon system interoperability and data fusion alternatives. These studies will assess engineering feasibility of various kill-chain options and assess the capability provided.<br><br>Solid State Laser Technology Quick Reaction Capability (SSL-QRC)<br>- Completed development of the Solid State Laser Quick Response Capability (SSL-QRC) to upgrade the NAVSEA developed Laser Weapons System (LaWS).<br>- Completed integration and installation of LaWS on a Naval Surface combatant to support the extended demonstration in the Persian Gulf.<br><br>Solid State Laser Technology Maturation Program (SSL-TM)<br>- Continued development of a maritime laser weapons system through competitive procurement.<br>- Initiated Laser System engineering integration trade studies and design with contractor developed designs. This system will be capable of supporting missions such as small boat, UAV, and ISR disruption and defeat. This work included scientific and engineering trade studies to support integration and test of an advanced development system. This system will include a maritime beam director and high power, solid state laser (SSL) that is capable of tracking and engaging a surface or airborne target at a suitable stand-off distance in the maritime environment and includes efforts to measure atmospheric absorption and turbulence.<br>-Continued development of the Hybrid Predictive Avoidance Safety System (HPASS) to de-conflict laser system operations with friendly sensors and platforms.<br><br><b>FY 2016 Plans:</b><br>Electromagnetic (EM) Railgun<br>- Continue all efforts of FY 2015, unless noted as completed above.<br><br>Weapons System Improvement<br>- Continue all efforts of FY 2015, unless noted as completed above.<br><br>Solid State Laser Technology Quick Reaction Capability (SSL-QRC)<br>- Continue all efforts of FY 2015, unless noted as completed above. |  |                                                                                                |                     |                                                            |                |                  |

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------|------------------------|--------------------------|
| <b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2017 Navy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |                                                                                                       |                | <b>Date:</b> February 2016                                        |                        |                          |
| <b>Appropriation/Budget Activity</b><br>1319 / 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  | <b>R-1 Program Element (Number/Name)</b><br>PE 0603114N / <i>Power Projection Advanced Technology</i> |                | <b>Project (Number/Name)</b><br>2911 / <i>Power Proj Adv Tech</i> |                        |                          |
| <b>B. Accomplishments/Planned Programs (\$ in Millions)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |                                                                                                       |                |                                                                   |                        |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  | <b>FY 2015</b>                                                                                        | <b>FY 2016</b> | <b>FY 2017<br/>Base</b>                                           | <b>FY 2017<br/>OCO</b> | <b>FY 2017<br/>Total</b> |
| Solid State Laser Technology Maturations Program (SSL-TM)<br>- Continue all efforts of FY 2015, unless noted as completed above.<br>- Continue development of the Hybrid Predictive Avoidance Safety System (HPASS) to deconflict laser system operations with friendly sensors and platforms.<br>- Initiate land based testing of system and system components.<br><br><b>FY 2017 Base Plans:</b><br>Electromagnetic (EM) Railgun<br>- Continue all efforts of FY 2016, unless noted as completed.<br>- Complete repetitive rate pulsed power fabrication in support of the future repetitive rate launcher testing.<br><br>Weapons System Improvement<br>- Continued all efforts of FY 2016, unless noted as completed above.<br><br>Solid State Laser Technology Maturation Program (SSL-TM)<br>- Continue all efforts of FY 2016, unless noted as completed above.<br>- Initiate land based testing of system and system components.<br><br><b>FY 2017 OCO Plans:</b><br>N/A |  |                                                                                                       |                |                                                                   |                        |                          |
| <b>Accomplishments/Planned Programs Subtotals</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  | 36.651                                                                                                | 36.971         | 96.406                                                            | 0.000                  | 96.406                   |
| <b>C. Other Program Funding Summary (\$ in Millions)</b><br>N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |                                                                                                       |                |                                                                   |                        |                          |
| <b>Remarks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                                                                                                       |                |                                                                   |                        |                          |
| <b>D. Acquisition Strategy</b><br>N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                                                                                                       |                |                                                                   |                        |                          |
| <b>E. Performance Metrics</b><br>The metrics used are programmatic milestones and technical milestones, such as completion of technical trade studies examining suitable technologies for subsequent prototype development; incremental laboratory and field testing of components and sub-systems; and delivery of industry-developed prototypes for demonstration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |                                                                                                       |                |                                                                   |                        |                          |

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