| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy | | | | | | | | | | | Date: March 2019 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development* | | | | | R-1 Program Element (Number/Name)<br>PE 0205632N *I MK-48 ADCAP* | | | | | | | |
| **COST ($ in Millions)** | **Prior Years** | **FY 2018** | **FY 2019** | **FY 2020 Base** | **FY 2020 OCO** | **FY 2020 Total** | **FY 2021** | **FY 2022** | **FY 2023** | **FY 2024** | **Cost To Complete** | **Total Cost** |
| Total Program Element | 274.422 | 48.740 | 68.255 | 85.973 | - | 85.973 | 108.520 | 110.841 | 112.971 | 115.213 | Continuing | Continuing |
| 0366: *MK 48 ADCAP* | 274.422 | 48.740 | 68.255 | 85.973 | - | 85.973 | 108.520 | 110.841 | 112.971 | 115.213 | Continuing | Continuing |

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

MK-48 ADCAP (Advanced Capability) Research, Development, Test and Evaluation (RDT&E) program executes incremental development of weapon performance improvements in three development product areas: (1) Common Broadband Advanced Sonar System (CBASS), (2) Advanced Processor Builds (APBs), and (3) Torpedo Technology Insertion (TI). This Program Element (0205632N/0366) is tied to development programs that leverage a joint United States/Australia Armaments Cooperative Project (ACP) to develop MK-48 ADCAP CBASS; and Future Naval Capability (FNC) technologies developed by the Office of Naval Research (ONR).

Countermeasure (CM) sophistication and availability on the open market directly affects ADCAP kill proficiency and its ability to counter rapidly evolving threats. The focus of the MK-48 ADCAP Torpedo Research and Development (R&D) program is on hardware upgrades, rapid Commercial-Off-the-Shelf (COTS) insertion, and software APBs, in order to rapidly upgrade the ADCAP to counter evolving threats and maintain robust performance. The CBASS program developed and fielded a new sonar capable of identifying CMs and discriminating them from the target. CBASS Phase I achieved IOC in FY 2006. The Royal Australian Navy (RAN) is jointly participating to develop CBASS Phase II to improve shallow water performance and signed a Memorandum of Agreement (MOA) extension November 2009. The Memorandum Of Agreement (MOA) extension expires November 2019.

The MK-48 ADCAP Torpedo R&D program focuses on two specific areas near term; Torpedo APBs and hardware tech insertions. The CNO continues to stress shallow water as a critical operating area to counter third world diesel electric submarines. In water testing, in conjunction with laboratory simulation efforts, has shown that significant performance improvements can be made by implementing changes to weapon tactics and software algorithms. Development, implementation, and testing of these changes are being accomplished under the Torpedo APB program. The APB program also leverages the RAN joint torpedo program and FNC technologies developed by the ONR in the areas of torpedo broadband signal processing, tactics processing, and alertment. The Torpedo tech insertion program will leverage the MK-54 Lightweight torpedo algorithms.

The Torpedo Technology Insertion program will provide for evolutionary torpedo improvements and upgrades (including the transition and testing of advanced technologies from the R&D community). This approach will incorporate developmental testing of the FNC transitioning technologies for ADCAP upgrades in the areas of torpedo sensors, weapon/platform connectivity and improved fusing. These efforts will continue torpedo development investment at a lower cost and shorter term than traditional torpedo programs.

The MK 48 MOD 7 APB6/TI-1 Heavyweight Torpedo (HWT) program is an evolutionary upgrade to the MK 48 MOD 7 HWT; it will consist of an Operational Software (OPSW) upgrade referred to as APB 6 and a hardware upgrade referred to as TI-1. TI-1 will include a Guidance and Control (G&C) section upgrade, a redesigned TI-1 Warhead Electronics System (WES), and an Improved Post Launch Communications System (IPLCS). TI-1 will also include features from three Future Naval Capabilities (FNC) programs.

| Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy | Date: March 2019 |
|---|---|
| **Appropriation/Budget Activity**<br>1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development* | **R-1 Program Element (Number/Name)**<br>PE 0205632N *I MK-48 ADCAP* |

APB5 software upgrades are currently in process for MK-48 ADCAP torpedoes.
APB5+ software upgrades are currently in process for MK-48 ADCAP torpedoes. APB5+ enhancements are required to address Combat Control System (CCS)/MK48 pre and post launch interface issues which limit crew full implementation of the weapon and provide numerous capability enhancements requested and endorsed by the Fleet.

Both FNC technologies and MK-54 LWT developments will be transitioned into ADCAP through APBs and technology insertion packages. Priorities for APBs and technology insertion are: (1) improved torpedo effectiveness through advanced processing algorithms, (2) advanced counter-countermeasure capability, and (3) a new array to improve torpedo effectiveness.

| B. Program Change Summary ($ in Millions) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---|---|---|---|---|
| Previous President's Budget | 68.553 | 94.155 | 87.224 | - | 87.224 |
| Current President's Budget | 48.740 | 68.255 | 85.973 | - | 85.973 |
| Total Adjustments | -19.813 | -25.900 | -1.251 | - | -1.251 |
| • Congressional General Reductions | - | - | | | |
| • Congressional Directed Reductions | - | -25.900 | | | |
| • Congressional Rescissions | - | - | | | |
| • Congressional Adds | - | - | | | |
| • Congressional Directed Transfers | - | - | | | |
| • Reprogrammings | - | - | | | |
| • SBIR/STTR Transfer | -0.313 | 0.000 | | | |
| • Rate/Misc Adjustments | 0.000 | 0.000 | -1.251 | - | -1.251 |
| • Congressional Directed Reductions Adjustments | -19.500 | - | - | - | - |

**Change Summary Explanation**

FY2020: Increased budget request is due to increased funding for APB 6 software development and TI-1 Hardware development contract and Hardware support. As APB 5 completes testing, support funding shifts from APB 5 to APB 6 software support. The FY2020 decrease in Test & Evaluation funds are due to reducing the number of in-water test events for APB 5 as the program completes Operational Testing.

| Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy | | | Date: March 2019 |
|---|---|---|---|
| Appropriation/Budget Activity<br>1319 / 7 | R-1 Program Element (Number/Name)<br>PE 0205632N / *MK-48 ADCAP* | Project (Number/Name)<br>0366 / *MK 48 ADCAP* | |

| COST ($ in Millions) | Prior Years | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0366: *MK 48 ADCAP* | 274.422 | 48.740 | 68.255 | 85.973 | - | 85.973 | 108.520 | 110.841 | 112.971 | 115.213 | Continuing | Continuing |
| Quantity of RDT&E Articles | | - | - | - | - | - | - | - | - | - | | |

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

MK-48 ADCAP RDT&E program executes incremental development of weapon performance improvements in two development product areas: (1) APBs, and (2) Torpedo Technology Insertion. The budget enables ACAT III development to address CNO defined capability-based requirements and mission needs. This Program Element (0205632N/0366) is tied to development programs that leverage a joint United States/Australia ACP to develop MK-48 ADCAP; and FNC technologies being developed by the ONR. APB Software upgrades will improve torpedo performance in challenging water and countered environments. Hardware technology insertions will improve weapon availability through development of a G&C replacement and an Automated Test Equipment replacement.

| B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---|---|---|---|---|
| ***Title:*** TORPEDO APB / TEST & EVLUATION | 48.740 | 68.255 | 85.973 | 0.000 | 85.973 |
| ***Articles:*** | - | - | - | - | - |
| ***FY 2019 Plans:***<br>Conduct Milestone - B Review.<br>APB 6 - Continue Software development.<br>APB 6 - Conduct System Functional Review (SFR).<br>TI-1 - Award Hardware Development Contract.<br>TI-1 - Conduct System Requirement Review (SRR).<br>APB 5+ - Preliminary Design Review (PDR)<br>APB 5+ - Software Build 2 (post-launch)<br>APB 5 - Continue APB 5 Operational Test events (OT-C, OT-D, OT-E).<br>Complete EC-WAF accreditation.<br>APB5+ - Engineering test runs using EC-WAF | | | | | |
| ***FY 2020 Base Plans:***<br>Continue APB 6 Software development.<br>Continue TI-1 Hardware development.<br>Conduct TI-1 System Functional Review (SFR).<br>Conduct APB 6/TI-1 Preliminary Design Review (PDR).<br>APB5+ - Conduct CDR<br>APB5+ - Conduct DTRR<br>APB5+ - conduct OTRR | | | | | |

| Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy | | Date: March 2019 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0205632N / *MK-48 ADCAP* | **Project (Number/Name)**<br>0366 / *MK 48 ADCAP* |

| B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each) | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total |
|---|---|---|---|---|---|
| APB 5 - Complete Operational Testing (OT).<br>APB5+ - Conduct Development Test (DT) in-water testing<br>APB5+ - Begin Operational Testing (OT)<br>***FY 2020 OCO Plans:***<br>N/A<br>***FY 2019 to FY 2020 Increase/Decrease Statement:***<br>Increase of 17.718 from FY 2019 to FY 2020 is due to additional effort for APB 6 software development and TI-1 hardware development and support. | | | | | |
| **Accomplishments/Planned Programs Subtotals** | 48.740 | 68.255 | 85.973 | 0.000 | 85.973 |

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

| Line Item | FY 2018 | FY 2019 | FY 2020 Base | FY 2020 OCO | FY 2020 Total | FY 2021 | FY 2022 | FY 2023 | FY 2024 | Cost To Complete | Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • WPN/3225: *MK-48 Torpedo ADCAP Mods* | 38.954 | 40.005 | 39.609 | - | 39.609 | 56.785 | 57.964 | 59.062 | 60.234 | 24.519 | 1,562.978 |
| • WPN/3117: *MK-48 Torpedo* | 79.771 | 103.616 | 114.050 | - | 114.050 | 218.465 | 186.509 | 199.179 | 203.155 | Continuing | Continuing |

**Remarks**

**D. Acquisition Strategy**

In FY 2016, a competitive contract was awarded to procure additional warshot torpedos and continue procurement of CBASS Kits. The Program will continue to execute competitive, build to print contracts, until inventory requirements are met and all Mod 6 torpedos are converted. Throughout the contract the program will execute life of type buys to minimize the impact of obsolescence avoiding redesign and qualification during a contract cycle. The next competitive contract is planned for FY 2021 and will include fuel tank and warhead electronic sections.

Continue to incrementally develop technology to pace the threats to be integrated into the production baseline. A competitive award for TI-1 hardware development is planned for FY 2019. This hardware will be used to upgrade the entire inventory.

**E. Performance Metrics**

Milestone reviews.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy | | | Date: March 2019 |
|---|---|---|---|
| Appropriation/Budget Activity<br>1319 / 7 | R-1 Program Element (Number/Name)<br>PE 0205632N / *MK-48 ADCAP* | Project (Number/Name)<br>0366 / *MK 48 ADCAP* | |

**Product Development ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2018 Cost | FY 2018 Award Date | FY 2019 Cost | FY 2019 Award Date | FY 2020 Base Cost | FY 2020 Base Award Date | FY 2020 OCO Cost | FY 2020 OCO Award Date | FY 2020 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Software Development - APB 5 / 5+ | WR | NUWC NPT : Newport RI | 30.431 | 8.528 | Oct 2017 | 9.057 | Oct 2018 | 2.594 | Nov 2019 | - | | 2.594 | Continuing | Continuing | Continuing |
| Software Development - APB 6 | WR | NUWC NPT : Newport RI | 7.463 | 10.985 | Oct 2017 | 16.774 | Oct 2018 | 17.799 | Nov 2019 | - | | 17.799 | Continuing | Continuing | Continuing |
| Hardware Development - TI-1 | WR | NUWC NPT : Newport RI | 14.716 | 6.699 | Oct 2017 | 5.798 | Oct 2018 | 4.163 | Nov 2019 | - | | 4.163 | Continuing | Continuing | Continuing |
| Hardware Development - TI-1 | C/CPIF | TBD : TBD | 0.000 | 0.000 | Mar 2018 | 5.071 | Mar 2019 | 36.253 | Dec 2019 | - | | 36.253 | Continuing | Continuing | Continuing |
| Hardware Development - Blue Wolf | C/CPFF | NUWC NPT : Newport RI | 0.000 | 0.000 | Mar 2018 | 5.000 | Mar 2019 | 5.000 | Nov 2019 | - | | 5.000 | 0.000 | 10.000 | - |
| Hardware Development - IPLCS | TBD | OTA : TBD | 0.000 | 0.087 | Jan 2018 | 5.462 | Oct 2018 | 5.462 | Nov 2019 | - | | 5.462 | Continuing | Continuing | Continuing |
| Hardware Development - IM | WR | Indian Head : Indian Head | 1.350 | 0.286 | Jan 2018 | 0.450 | Jan 2019 | 0.450 | Nov 2019 | - | | 0.450 | Continuing | Continuing | Continuing |
| Software Development - Sprial 4 / PY Development | WR | NUWC NPT : Newport RI | 31.839 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 31.839 | - |
| | | **Subtotal** | 85.799 | 26.585 | | 47.612 | | 71.721 | | - | | 71.721 | Continuing | Continuing | N/A |

**Remarks**

Increased funding in FY20 to NUWC, Newport for APB 6 software development and for the TI-1 development Contract; reduced funding for APB 5 in FY20 as testing completes.

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2018 Cost | FY 2018 Award Date | FY 2019 Cost | FY 2019 Award Date | FY 2020 Base Cost | FY 2020 Base Award Date | FY 2020 OCO Cost | FY 2020 OCO Award Date | FY 2020 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Software Development - APB 5 | WR | NUWC NPT : Newport RI | 30.643 | 4.500 | Oct 2017 | 3.130 | Oct 2018 | 2.200 | Oct 2019 | - | | 2.200 | Continuing | Continuing | Continuing |
| Software Development - APB 6 | WR | NUWC NPT : Newport RI | 0.251 | 1.294 | Oct 2017 | 1.195 | Oct 2018 | 1.652 | Oct 2019 | - | | 1.652 | Continuing | Continuing | Continuing |
| Software Development - APB 6 | WR | NUWC KPT : Keyport WA | 0.899 | 0.723 | Oct 2017 | 0.230 | Oct 2018 | 0.435 | Oct 2019 | - | | 0.435 | Continuing | Continuing | Continuing |
| Software Development / PY Development | Various | Various : Not Specified | 36.317 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 36.317 | - |

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy | | | Date: March 2019 |
|---|---|---|---|
| Appropriation/Budget Activity<br>1319 / 7 | R-1 Program Element (Number/Name)<br>PE 0205632N / *MK-48 ADCAP* | Project (Number/Name)<br>0366 / *MK 48 ADCAP* | |

**Support ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2018 Cost | FY 2018 Award Date | FY 2019 Cost | FY 2019 Award Date | FY 2020 Base Cost | FY 2020 Base Award Date | FY 2020 OCO Cost | FY 2020 OCO Award Date | FY 2020 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Integrated Logistics Support | WR | NUWC NPT : Newport RI | 2.243 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 2.243 | - |
| Systems Engineering WCF | C/LH | NUWC NPT : Newport RI | 17.750 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 17.750 | - |
| Systems Engineering | Various | NUWC NPT : Newport RI | 0.676 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 0.676 | - |
| | | **Subtotal** | 88.779 | 6.517 | | 4.555 | | 4.287 | | - | | 4.287 | Continuing | Continuing | N/A |

**Remarks**

As APB 5 completes testing, support funding shifts from APB 5 to APB 6 software support.

**Test and Evaluation ($ in Millions)**

| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2018 Cost | FY 2018 Award Date | FY 2019 Cost | FY 2019 Award Date | FY 2020 Base Cost | FY 2020 Base Award Date | FY 2020 OCO Cost | FY 2020 OCO Award Date | FY 2020 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Test & Evaluation - APB 5 | WR | NUWC NPT : Newport RI | 15.804 | 6.185 | Oct 2017 | 5.282 | Oct 2018 | 3.370 | Oct 2019 | - | | 3.370 | Continuing | Continuing | Continuing |
| Test & Evaluation - APB 5 | WR | NUWC KPT : Keyport WA | 25.795 | 6.212 | Oct 2017 | 7.104 | Oct 2018 | 4.160 | Oct 2019 | - | | 4.160 | Continuing | Continuing | Continuing |
| Test & Evaluation - APB 5 | WR | OPTEVFOR : Norfolk VA | 10.365 | 0.830 | Jun 2018 | 1.631 | May 2019 | 0.515 | May 2020 | - | | 0.515 | Continuing | Continuing | Continuing |
| Test & Evaluation - APB 6 | C/CPFF | ARL / PSU : State College PA | 0.298 | 0.575 | Apr 2018 | 1.510 | Apr 2019 | 1.344 | Oct 2019 | - | | 1.344 | Continuing | Continuing | Continuing |
| Modeling & Simulation | WR | NUWC NPT : Newport RI | 9.745 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 9.745 | Continuing |
| Modeling & Simulation | C/CPFF | ARL / PSU : State College PA | 14.112 | 0.000 | | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 14.112 | Continuing |
| Test & Evaluation - Spiral 4 / PY | WR | NUWC NPT : Newport RI | 17.086 | 1.290 | Jun 2018 | 0.000 | | 0.000 | | - | | 0.000 | 0.000 | 18.376 | - |
| | | **Subtotal** | 93.205 | 15.092 | | 15.527 | | 9.389 | | - | | 9.389 | Continuing | Continuing | N/A |

**Remarks**

Decrease in T&E funds due to reduced number of in-water test events for APB 5.

| Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Navy | | | Date: March 2019 |
|---|---|---|---|
| Appropriation/Budget Activity<br>1319 / 7 | R-1 Program Element (Number/Name)<br>PE 0205632N / *MK-48 ADCAP* | Project (Number/Name)<br>0366 / *MK 48 ADCAP* | |

**Management Services ($ in Millions)**

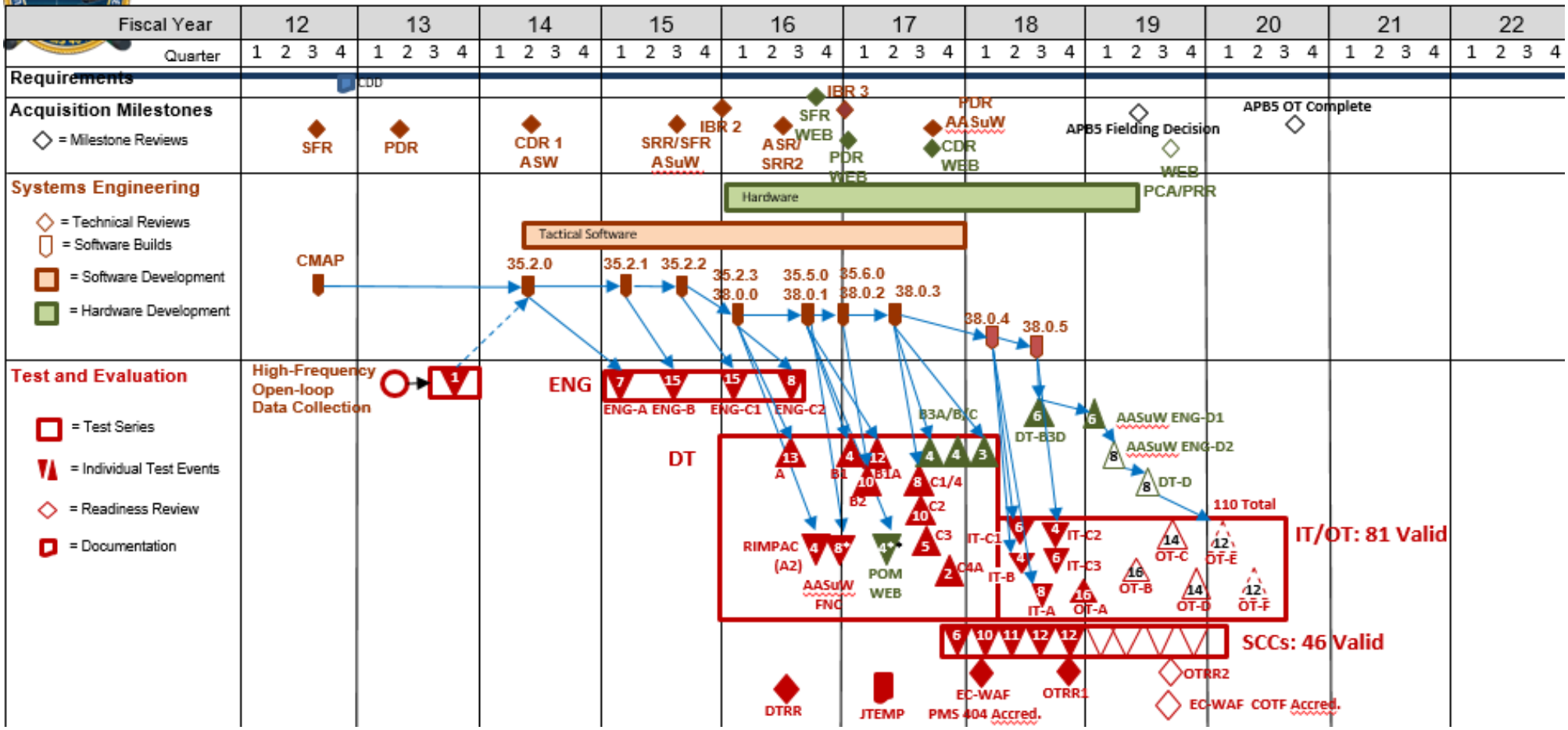
| Cost Category Item | Contract Method & Type | Performing Activity & Location | Prior Years | FY 2018 Cost | FY 2018 Award Date | FY 2019 Cost | FY 2019 Award Date | FY 2020 Base Cost | FY 2020 Base Award Date | FY 2020 OCO Cost | FY 2020 OCO Award Date | FY 2020 Total Cost | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Program Management | C/CPFF | Alion Science : Mclean VA | 5.340 | 0.496 | Nov 2017 | 0.511 | Dec 2018 | 0.526 | Dec 2019 | - | | 0.526 | 0.000 | 6.873 | - |
| Travel | WR | NAVSEA : Washington DC | 1.299 | 0.050 | Nov 2017 | 0.050 | Dec 2018 | 0.050 | Dec 2019 | - | | 0.050 | 0.000 | 1.449 | - |
| | | **Subtotal** | 6.639 | 0.546 | | 0.561 | | 0.576 | | - | | 0.576 | 0.000 | 8.322 | N/A |

| | Prior Years | FY 2018 | | FY 2019 | | FY 2020 Base | | FY 2020 OCO | | FY 2020 Total | Cost To Complete | Total Cost | Target Value of Contract |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Cost Totals** | 274.422 | 48.740 | | 68.255 | | 85.973 | | - | | 85.973 | Continuing | Continuing | N/A |

**Remarks**

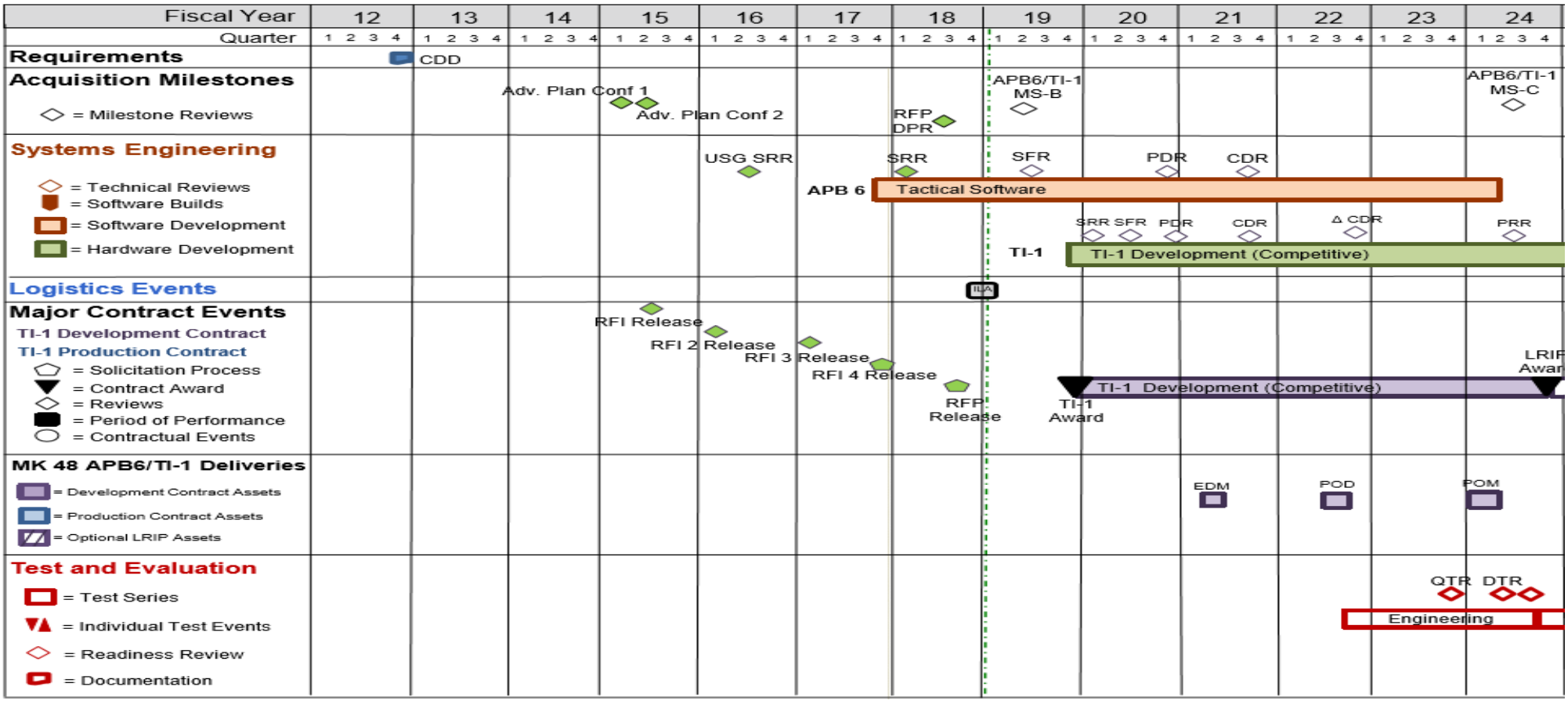
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy | | Date: March 2019 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0205632N / *MK-48 ADCAP* | **Project (Number/Name)**<br>0366 / *MK 48 ADCAP* |

# MK 48 MOD 7 APB5 Acquisition Schedule



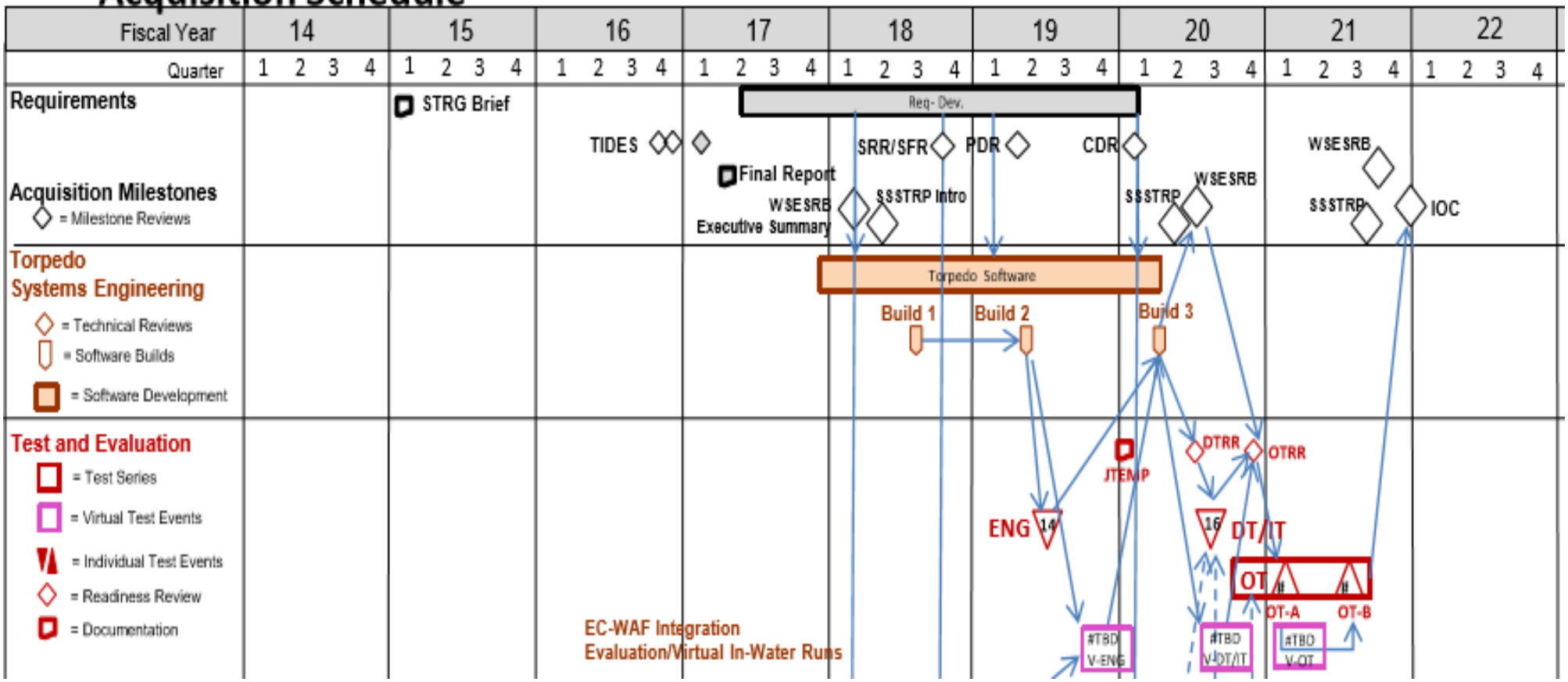
| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy | | Date: March 2019 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0205632N / *MK-48 ADCAP* | **Project (Number/Name)**<br>0366 / *MK 48 ADCAP* |

# MK 48 APB6/TI-1 Acquisition Schedule



| Exhibit R-4, RDT&E Schedule Profile: PB 2020 Navy | | Date: March 2019 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0205632N / *MK-48 ADCAP* | **Project (Number/Name)**<br>0366 / *MK 48 ADCAP* |

# MK 48 MOD 7 APB5+ Acquisition Schedule



| Exhibit R-4A, RDT&E Schedule Details: PB 2020 Navy | | Date: March 2019 |
|---|---|---|
| **Appropriation/Budget Activity**<br>1319 / 7 | **R-1 Program Element (Number/Name)**<br>PE 0205632N / *MK-48 ADCAP* | **Project (Number/Name)**<br>0366 / *MK 48 ADCAP* |

## Schedule Details

| | Start | | End | |
|---|---|---|---|---|
| **Events by Sub Project** | **Quarter** | **Year** | **Quarter** | **Year** |
| ***Proj 0366*** | | | | |
| APB 5 Development: Continue APB 5 Developmental Test (DT) | 1 | 2018 | 2 | 2018 |
| APB 5 Development: APB 5 Operation Test (IT/OT) | 2 | 2018 | 3 | 2020 |
| APB 5 Development: APB 5 IOC | 4 | 2021 | 4 | 2021 |
| APB 6 Software / TI-1 Hardware Development: APB 6 Development | 1 | 2018 | 2 | 2024 |
| APB 6 Software / TI-1 Hardware Development: TI-1 Development | 4 | 2019 | 4 | 2024 |
| APB 6 Software / TI-1 Hardware Development: APB 6/TI-1 Developmental Test (DT) | 3 | 2023 | 4 | 2024 |