Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Navy											Date: February 2016	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 0205632N *I MK-48 ADCAP*							
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**
Total Program Element	227.220	25.920	47.703	39.134	-	39.134	68.563	96.303	90.596	113.178	Continuing	Continuing
0366: *MK 48 ADCAP*	227.220	25.920	42.203	39.134	-	39.134	68.563	96.303	90.596	113.178	Continuing	Continuing
9999: *Congressional Adds*	0.000	0.000	5.500	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.500

A. Mission Description and Budget Item Justification

MK48 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. The budget enables Acquisition Category (ACAT) III development to address Chief of Naval Operations (CNO) defined capability-based requirements and mission needs. This program is tied to development programs that leverage a joint United States/Australia Armaments Cooperative Project (ACP) to develop MK48 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 probability and its ability to counter rapidly evolving threats. The focus of the MK-48 ADCAP torpedo program from FY 2001 and out shifted from being primarily concentrated on software block upgrade efforts towards coordinated hardware upgrades, rapid Commercial-Off-the-Shelf (COTS) insertion, and APBs to rapidly upgrade the ADCAP to counter evolving threats and maintain robust performance. The CBASS program developed and fielded a broadband sonar capable of identifying CMs and discriminating them from the target. CBASS Phase I achieved IOC in FY 2006 and Phase II was achieved in 2013. The Commonwealth of Australia Royal Navy (RAN) is jointly participating to develop CBASS APB5 to improve shallow water performance under a signed Memorandum of Agreement (MOA) extension November 2009. The MOA extension expires Nov 2019.

The MK48 ADCAP torpedo program focuses on two specific areas near term; torpedo APBs and hardware tech insertions. The CNO continues to stress shallow water (less than 600 feet) as a critical operating area to counter third world diesel electric submarines. Torpedo testing in shallow water has demonstrated that in-service ADCAP has less than full capability in this difficult environment. However, this 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 is 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 MK54 Lightweight Torpedo (LWT) algorithms. Further hardware investment involves development of Guidance & Control (G&C) replacement required to support ordinance requirements and development of Automated Test Equipment (ATE) replacement to improve comprehensive system testing of full up CBASS torpedoes.

The torpedo technology insertion program will provide for evolutionary torpedo improvements and upgrades (including the transition and testing of advanced technologies from the Science and Technology community). This approach will incorporate developmental testing of the FNC transitioning technologies for ADCAP upgrades in the areas of torpedo sensors, weapon/platform connectivity, warhead lethality, speed and endurance. These efforts will continue torpedo development investment at a lower cost and shorter term than traditional torpedo programs.

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Navy	Date: February 2016
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 0205632N *I MK-48 ADCAP*

APB5 software upgrades are currently in process for MK-48 ADCAP torpedoes.

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 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	25.952	42.206	38.351	-	38.351
Current President's Budget	25.920	47.703	39.134	-	39.134
Total Adjustments	-0.032	5.497	0.783	-	0.783
• Congressional General Reductions	-	-0.003			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	5.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.032	0.000			
• Program Adjustments	0.000	0.000	3.624	-	3.624
• Rate/Misc Adjustments	0.000	0.000	-2.841	-	-2.841

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2015	FY 2016
Project: 9999: *Congressional Adds*		
Congressional Add: *Upgrade Program*	0.000	5.500
Congressional Add Subtotals for Project: 9999	0.000	5.500
Congressional Add Totals for all Projects	0.000	5.500

Change Summary Explanation

Decrease in MK-48 ADCAP by $1.679M as required for the Department of the Navy to comply with the Bipartisan Budget Act of 2015.

FY17: Additional funds added to accelerate improvements to the MK48 Fuze into APB 5 and upgrade Environmental Centric Weapons Analysis Facility.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0205632N / *MK-48 ADCAP*	Project (Number/Name) 0366 / *MK 48 ADCAP*	

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
0366: *MK 48 ADCAP*	227.220	25.920	42.203	39.134	-	39.134	68.563	96.303	90.596	113.178	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

MK48 ADCAP 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 is tied to development programs that leverage a joint United States/Australia ACP to develop MK48 ADCAP; and FNC technologies being developed by the ONR.

APB software upgrades will improve torpedo performance in challenging shallow water and countered environments through incorporation of new algorithms designed to address broadband, multiband, classifications and tactics processing changes. Hardware technology insertions will improve weapon performance against slow/low doppler targets. It provides improved target detection at long and short ranges and improved counter measure rejection in countered and shallow water scenarios. Availability will be improved through development of a G&C replacement and an ATE replacement.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: TORPEDO APB	11.057	24.573	26.711	0.000	26.711
Articles:	-	-	-	-	-
FY 2015 Accomplishments: Continued APB 5 development. Continued development of Automated Test Equipment (ATE) replacement.					
FY 2016 Plans: Continue APB 5 development. Start APB 6 development. Start transition of Fuze and ASuW FNC products to include requirement documentation to be completed, model updates, software integration, in-water and land-based testing, and performance matrix testing.					
FY 2017 Base Plans: Continue APB 6 development. Award TI-1 (112 Element Array) Development Contract					
FY 2017 OCO Plans: N/A					
Title: TEST & EVALUATION	14.863	17.630	12.423	0.000	12.423
Articles:	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0205632N / *MK-48 ADCAP*	**Project (Number/Name)** 0366 / *MK 48 ADCAP*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
FY 2015 Accomplishments: Conducted 2 APB 5 in-water engineering events, with 16 firings over 5 days, and follow-on analysis and reports. Conducted 2 Demos (GPS Coms and Long Range Propulsion). ***FY 2016 Plans:*** Start APB 5 Developmental Testing (DT); 4 major DT events with 73 firings over ~14 days at sea as well as follow-on analysis and reports for each event. Continue Build-Test-Build development. ***FY 2017 Base Plans:*** Conduct APB 5 testing (DT). ***FY 2017 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	25.920	42.203	39.134	0.000	39.134

C. Other Program Funding Summary ($ in Millions)

Line Item	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
• WPN/3225: *MK-48 Torpedo ADCAP Mods*	40.863	56.730	46.139	-	46.139	38.630	40.389	41.163	58.488	267.718	1,632.248
• WPN/3117: *MK-48 Torpedo*	2.153	60.438	44.537	-	44.537	46.979	72.906	98.093	171.534	Continuing	Continuing

Remarks

D. Acquisition Strategy

Sole source production contract awarded in FY 2004 for MK48 ADCAP MODS, MK-54 LWT, and CBASS kits, including RAN units. A full and competitive procurement for MK48 Mod 7 CBASS production kits was awarded in March 2011 with a FY 2010/2011 base year and four option years for FY 2012-2015. A new FY16 competitive contract will be awarded to continue procurement of CBASS Kits.

A new FY16 competitive contract will be awarded to procure additional warshot torpedoes.

E. Performance Metrics

Milestone reviews.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy			Date: February 2016
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0205632N / *MK-48 ADCAP*	Project (Number/Name) 0366 / *MK 48 ADCAP*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary 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	-
Primary Software Development - APB 5	WR	NUWC NPT : Newport RI	2.388	5.952	Oct 2014	13.129	Oct 2015	11.024	Oct 2016	-		11.024	Continuing	Continuing	Continuing
Primary Hardware Development - Spiral 4 / PY Development	WR	NUWC NPT : Newport RI	31.201	0.000		0.000		0.000		-		0.000	0.000	31.201	-
Primary Hardware Development - APB 5	WR	NUWC NPT : Newport RI	2.255	5.500	Oct 2014	7.125	Jan 2016	4.546	Oct 2016	-		4.546	Continuing	Continuing	Continuing
Primary Software Development - IM	WR	Indian Head : Indian Head	0.450	0.000	Oct 2014	0.450	Jan 2016	0.450	Oct 2016	-		0.450	Continuing	Continuing	Continuing
Hardware Development - TI-1	C/CPFF	New - TBD : TBD	0.000	0.000		0.000		6.176	Aug 2017	-		6.176	0.000	6.176	-
		Subtotal	68.133	11.452		20.704		22.196		-		22.196	-	-	-

Remarks

Funds torpedo, modeling and simulation hardware and software development, including the engineering and project manager's costs. FY 17 increased funding provided for new TI-1 hardware development contract award.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development	WR	NUWC NPT : Newport RI	19.899	3.353	Oct 2014	3.353	Oct 2015	3.983	Oct 2016	-		3.983	Continuing	Continuing	Continuing
Software Development	Various	Various : Not Specified	36.317	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Integrated Logistics Support	WR	NUWC NPT : Newport RI	2.243	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering WCF	WR	NUWC NPT : Newport RI	17.750	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering	Various	NUWC NPT : Newport RI	0.676	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy			Date: February 2016
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0205632N / *MK-48 ADCAP*	Project (Number/Name) 0366 / *MK 48 ADCAP*	

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	76.885	3.353		3.353		3.983		-		3.983	-	-	-

Remarks

Funds activity program support costs, post test and evaluation WAF analysis, and WAF facilities costs.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test & Evaluation - Spiral 4 / PY	WR	NUWC NPT : Newport RI	17.086	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Test & Evaluation - APB 5	WR	NUWC NPT : Newport RI	0.932	2.986	Oct 2014	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Developmental Testing - APB 5	WR	NUWC NPT : Newport RI	0.000	0.000		5.418	Oct 2015	3.183	Oct 2016	-		3.183	Continuing	Continuing	Continuing
Test & Evaluation	WR	Operational Test Force : Norfolk VA	8.820	0.450	Oct 2014	0.545	Jul 2016	0.900	Jul 2017	-		0.900	Continuing	Continuing	Continuing
Modeling & Simulation	WR	NUWC NPT : Newport RI	9.745	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Modeling & Simulation	C/CPFF	ARL / PSU : State College PA	9.530	1.584	Dec 2014	1.476	Apr 2016	1.522	Apr 2017	-		1.522	Continuing	Continuing	Continuing
Test & Evaluation - Spiral 4 / PY	WR	NUWC Keyport (KPT) : Keyport WA	29.437	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Test & Evaluation - APB 5	WR	NUWC Keyport (KPT) : Keyport WA	1.609	5.548	Oct 2014	0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Developmental Testing - APB 5	WR	NUWC Keyport (KPT) : Keyport WA	0.000	0.000		10.190	Oct 2015	6.818	Oct 2016	-		6.818	Continuing	Continuing	Continuing
		Subtotal	77.159	10.568		17.629		12.423		-		12.423	-	-	-

Remarks

Funds in-water run costs and personnel to support such events and modeling and simulation performance evaluation.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0205632N / *MK-48 ADCAP*	**Project (Number/Name)** 0366 / *MK 48 ADCAP*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/FFP	Alion Science : Mclean VA	3.936	0.454	Oct 2014	0.468	Jan 2016	0.482	Oct 2016	-		0.482	Continuing	Continuing	Continuing
Travel	WR	NAVSEA : Washington DC	1.107	0.093	Oct 2014	0.049	Oct 2015	0.050	Oct 2016	-		0.050	Continuing	Continuing	Continuing
		Subtotal	5.043	0.547		0.517		0.532		-		0.532	-	-	-

Remarks

Funds program support, program travel, and OPTEVFOR travel.

	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	227.220	25.920		42.203		39.134		-		39.134	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0205632N / *MK-48 ADCAP*	**Project (Number/Name)** 0366 / *MK 48 ADCAP*

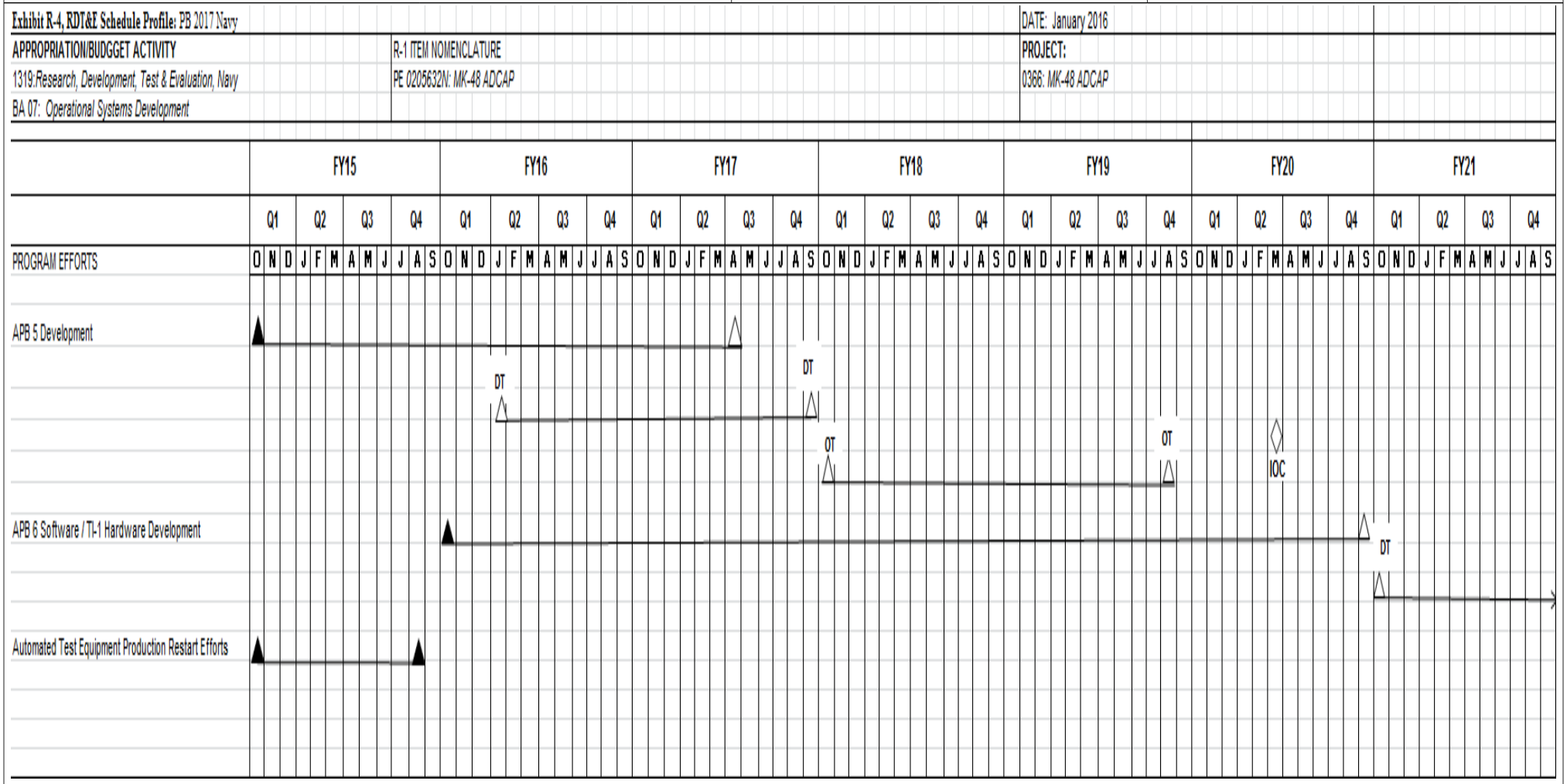

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0205632N / *MK-48 ADCAP*	**Project (Number/Name)** 0366 / *MK 48 ADCAP*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0366				
APB 5 Development: APB 5 Development	1	2015	3	2017
APB 5 Development: APB 5 Developmental Test (DT)	2	2016	4	2017
APB 5 Development: APB 5 Operation Test (OT)	1	2018	4	2019
APB 5 Development: APB 5 IOC	2	2020	2	2020
APB 6 Software / TI-1 Hardware Development: APB 6 Development	1	2016	4	2021
Automated Test Equipment Production Restart Efforts: Automated Test Equipment Production Restart Efforts	1	2015	4	2015

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy			Date: February 2016
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0205632N / *MK-48 ADCAP*	Project (Number/Name) 9999 / *Congressional Adds*	

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
9999: *Congressional Adds*	0.000	0.000	5.500	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	5.500
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

MK48 Heavyweight Torpedo APB5+ enhancements are required to address 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 STRG. APB5+ modernizes the torpedo-to-CCS interface, improves Pk, increases platform safety, provides platform data decoupling the CCS/MK48 operational software interdependence, and would enable torpedo operational software (OPSW) updates while deployed through the CCS. APB5+ also corrects numerous HARs and provides new CCS/MK48 interface protocol (Ethernet over DDL.) Specific mods include the interlaced telemetry, iFENCE, TMA updates, ballistics in payload, new waypoints. Secondary affect will be to improve overall CCS/MK48 program alignment and/or efficiency.

APB5+ will provide increased platform safety and will enable future payload-to-platform capabilities providing for full utilization of platform data to the weapon (as well as data from the weapon to the platform) with the cumulative effect of increasing Pk. APB5+ addresses safety HARs and modernizes the torpedo to weapon interface to enable more effective communications.

APB5+ requires a corresponding Combat Control System modification to capabilities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016
Congressional Add: Upgrade Program	0.000	5.500
FY 2015 Accomplishments: N/A		
FY 2016 Plans: Update Interface Design Specification Conduct Future Torpedo Studies Design Advanced Weapon Performance Models		
Congressional Adds Subtotals	0.000	5.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0205632N / *MK-48 ADCAP*	**Project (Number/Name)** 9999 / *Congressional Adds*

E. Performance Metrics

Milestone review

Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy			Date: February 2016
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 0205632N / *MK-48 ADCAP*	Project (Number/Name) 9999 / *Congressional Adds*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2015 Cost	FY 2015 Award Date	FY 2016 Cost	FY 2016 Award Date	FY 2017 Base Cost	FY 2017 Base Award Date	FY 2017 OCO Cost	FY 2017 OCO Award Date	FY 2017 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primarily Software Development	WR	NUWC NPT : Newport RI	0.000	0.000		5.500	Feb 2016	0.000		-		0.000	0.000	5.500	-
		Subtotal	0.000	0.000		5.500		0.000		-		0.000	0.000	5.500	-

	Prior Years	FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		5.500		0.000		-		0.000	0.000	5.500	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0205632N / *MK-48 ADCAP*	**Project (Number/Name)** 9999 / *Congressional Adds*

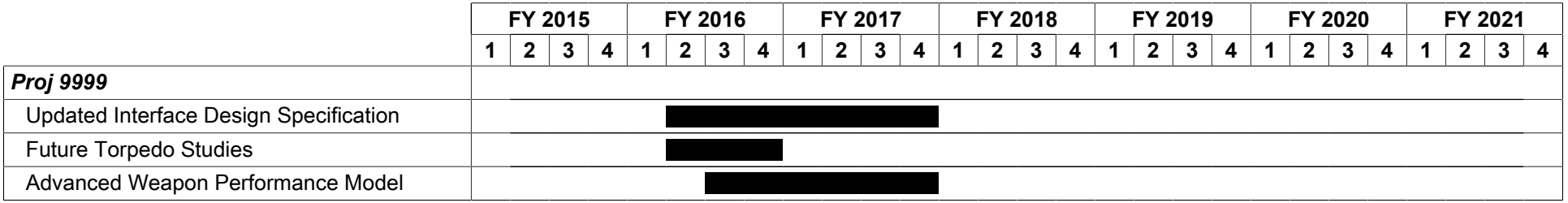

Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 0205632N / *MK-48 ADCAP*	**Project (Number/Name)** 9999 / *Congressional Adds*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 9999				
Updated Interface Design Specification	2	2016	4	2017
Future Torpedo Studies	2	2016	4	2016
Advanced Weapon Performance Model	3	2016	4	2017