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

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603506N / <i>Surface Ship Torpedo Defense</i>
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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	553.061	56.802	71.300	87.066	-	87.066	80.573	83.597	44.127	52.167	Continuing	Continuing
0225: <i>Surface Ship Torpedo Defense (SSTD)</i>	553.061	56.802	71.300	87.066	-	87.066	80.573	83.597	44.127	52.167	Continuing	Continuing

A. Mission Description and Budget Item Justification

The growth between FY 2016 and FY 2017 funding requested is to enable the transition to production of the Anti-Torpedo Torpedo (ATT) to industry and to allow industry to demonstrate manufacturing processes to ensure delivery of a product within cost and schedule. During FY 2017, the CAT program will reach Milestone B and commence the Engineering and Manufacturing Development phase of the program. The TWS program will perform first article testing prior to the start of LRIP in FY 2018.

The Surface Ship Torpedo Defense (SSTD) program provides a detect-to-engage layered torpedo defense capability. The four major efforts that comprise SSTD and the AN/SLQ-25 (NIXIE) system, Torpedo Warning System (TWS), the Countermeasure Anti-Torpedo (CAT) and Acoustic Device Countermeasure (ADC MK2 Mod4). CAT and TWS are development programs. The CAT program develops a canisterized Anti-Torpedo Torpedo (ATT) and is anticipated to be an ACAT II program. The TWS develops the required torpedo detection, classification and localization (TDCL) ship systems and is an ACAT III program. The TWS and CAT systems make up the Anti-Torpedo Torpedo Defense System (ATTDS).

The program will develop and field six ATTDS Engineering Design Model (EDM) systems on CVNs. Each EDM system consists of one TWS and eight CATs. The systems were accelerated due to the lack of hard-kill torpedo defense on High Value Units (HVUs) which has been exacerbated by recent real-world events and evolving threats. The systems provide a hard-kill torpedo defense capability in advance of the IOC as part of the program of record. The program delivered one hybrid prototype system in FY13 on USS GHW BUSH. The next prototype was delivered in FY14; this system was delivered in a roll-on/roll-off (RO-RO) configuration and installed on USS Roosevelt. The program will build and install one additional RO-RO (USS Eisenhower) and one EDM (USS Truman) in FY15. The program will build and install two EDMs (USS Roosevelt (RO/RO to EDM) and USS NIMITZ) in FY16. In FY17 the ATTDS program will award a competitive contract to validate the CAT Technical Data Package which will lead to the production of the proof of manufacturing (POM) units in FY18. The program will also perform first article testing on the TWS system in FY17.

Overall, our program will continue to focus on first providing torpedo defense capability to High Value Units (HVU). For the Initial Operational Capability (IOC) the system will be installed on one CVN and one Combat Logistics Force (CLF) ship (both HVUs) with IOC in FY22.

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Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603506N / <i>Surface Ship Torpedo Defense</i>
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B. Program Change Summary (\$ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	50.781	77.385	76.221	-	76.221
Current President's Budget	56.802	71.300	87.066	-	87.066
Total Adjustments	6.021	-6.085	10.845	-	10.845
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-6.085			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	7.100	0.000			
• SBIR/STTR Transfer	-1.079	0.000			
• Program Adjustments	0.000	0.000	12.215	-	12.215
• Rate/Misc Adjustments	0.000	0.000	-1.370	-	-1.370

Change Summary Explanation

The FY 2015 changes reflect a reduction of \$1.079 million as a result of SBIR transfer and a \$7.1M reprogramming for at sea integration testing.

The FY 2016 funding request reflects reduction of \$6.085 million for In House Systems Engineering growth (\$3.585 million) and Systems Development growth (\$2.500 million).

The FY 2017 funding reflects an increase of \$15.900 million to enable the transition to production of the ATT to industry and to allow industry to demonstrate manufacturing processes to ensure delivery of a product within cost and schedule. During FY 2017, the CAT program will reach Milestone B and commence the Engineering and Manufacturing Development phase of the program. The TWS program will perform first article testing prior to the start of LRIP in FY2018. Also, FY2017 reflects decreases of \$1.370 million as a result of rates/miscellaneous adjustments and \$3.685 million for the Department of the Navy to comply with the Bipartisan Budget Act of 2015.

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Exhibit R-2A, RDT&E Project Justification: PB 2017 Navy										Date: February 2016		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603506N / <i>Surface Ship Torpedo Defense</i>				Project (Number/Name) 0225 / <i>Surface Ship Torpedo Defense (SSTD)</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
0225: <i>Surface Ship Torpedo Defense (SSTD)</i>	553.061	56.802	71.300	87.066	-	87.066	80.573	83.597	44.127	52.167	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Surface Ship Torpedo Defense (SSTD) program provides a layered torpedo defense capability with four efforts; two of which are currently in development. The Countermeasure Anti-Torpedo (CAT) program develops a canisterized Anti-Torpedo Torpedo (ATT). The Torpedo Warning System (TWS) develops the required TDCL systems. The Countermeasure TWS and CAT systems make up the Anti-Torpedo Torpedo Defense System (ATTDS)

The program will develop and field six ATTDS EDM systems on CVNs, two of which will be delivered in a RO-RO configuration and one hybrid prototype system on USS GHW BUSH. The program delivered one hybrid prototype EDM system in FY13 on USS GHW BUSH. The next system was delivered in FY14; this system was delivered in a roll-on/roll-off (RO-RO) configuration and installed on USS Roosevelt. The program installed one additional RO-RO (USS Eisenhower) and one EDM (USS Truman) in FY15. The program will build and install two EDMs (USS Roosevelt (RO/RO to EDM) and USS NIMITZ) in FY16.

ATTDS system will be installed on one CVN and one Combat Logistics Force (CLF) ship (both HVUs) with IOC defined as FY22.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Title: Countermeasure Anti-Torpedo (CAT)	28.566	38.300	50.981	0.000	50.981
Articles:	12	-	25	-	25
FY 2015 Accomplishments:					
Continue land based and in-water testing of EDM-2 ATT thermal engine variant.					
Build CATs for FY15 EDM systems and procure long lead material for FY16 EDM systems.					
Conduct follow-on software development and testing for ATT SALVO capability.					
FY 2016 Plans:					
Complete land based software development and in-water testing of the EDM-2 thermal engine variant.					
Assemble and deliver CAT systems purchased in FY15.					
Complete follow-on software development and testing for ATT SALVO capability.					
Conduct two independent integrated in-water tests on CVNs with TWS systems for the development of the initial ATT SALVO Capability.					

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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603506N / <i>Surface Ship Torpedo Defense</i>	Project (Number/Name) 0225 / <i>Surface Ship Torpedo Defense (SSTD)</i>				
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Deliver the initial ATT SALVO capability at the end of FY16.						
FY 2017 Base Plans: Assemble and deliver CAT systems purchased in FY16. Procure long lead material for FY18 Proof of Manufacturing (POM) systems. Continue ATT SALVO Capability testing and follow on software refinement. Conduct one ATT SALVO independent in-water test on a CVN, with an Installed TWS system. Start a phase delivery of the SALVO Software Capability to the fleet.						
FY 2017 OCO Plans: N/A						
Title: Torpedo Warning System (TWS)		28.236	33.000	36.085	0.000	36.085
	Articles:	2	1	1	-	1
FY 2015 Accomplishments: Buy 2 EDM systems to install in FY16 and install 2 systems from FY14. Continue land based and in-water integration testing of TWS and CAT. Follow-on TWS active source software and hardware development and testing. Conduct software development for TWS SALVO capability.						
FY 2016 Plans: Install 2 EDM systems that were purchased in FY 15. Continue land based and in-water integration testing of the TWS and CAT systems. Continue TWS active source software and hardware development and testing. Accelerate TWS SALVO Capability. Conduct 2 independent integrated in-water tests on CVNs with the CAT systems for the development of the TWS initial SALVO capability. Deliver TWS initial SALVO capability at the end of FY16.						
FY 2017 Base Plans: Continue TWS SALVO software refinement. Continue TWS active source software and hardware development and testing. Conduct 1 independent integrated in-water test of TWS initial SALVO capability on a CVN with CAT systems. Conduct first article testing to validate performance and environmental requirements of the TWS Program of Record System Requirements Document. These tests will include qualification planning, testing, analysis, reporting and corrective action for all hardware, software, and integration functions. The first article qualification						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
tests will include anti-tamper verification and validation tests and Environmental Qualification Tests including shock, vibration, temperature cycling, humidity, electromagnetic pulse, and electromagnetic Interference.					
FY 2017 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	56.802	71.300	87.066	0.000	87.066

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

<u>Line Item</u>	<u>FY 2015</u>	<u>FY 2016</u>	<u>FY 2017 Base</u>	<u>FY 2017 OCO</u>	<u>FY 2017 Total</u>	<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• OPN/221300: SSTD	10.653	8.396	7.225	-	7.225	25.417	32.467	43.992	42.057	Continuing	Continuing
• WPN/311300: SSTD	4.573	7.380	6.220	-	6.220	5.311	6.672	37.007	37.747	Continuing	Continuing

Remarks

D. Acquisition Strategy

CAT Program: In FY09 and FY10, the CAT project completed a Systems Requirements Review (SRR) and Preliminary Design Review (PDR) on the second Engineering Development Model (EDM-2) design. Applied Research Lab (ARL) will complete the EDM-2 design and hold a Critical Design Review (CDR) in FY18. ARL will fabricate test articles and 32 total EDM-2 CATS in support of the prototype rapid fielding. Integration testing began in FY13 and will continue through delivery of the prototype CATs. A complete Technical Data Package (TDP) will be prepared. The CAT program will enter Milestone B in FY17, with a milestone C decision in FY19. A competitive fixed price contract will be awarded to build low rate initial production (LRIP) units starting in FY20. These units will support on going developmental testing ending in FY20 with an FY22 IOC.

TWS Program: In FY09 and FY10, a towed sensor system specification was developed and two sea tests were conducted on Navy destroyers that demonstrated the ability of three different passive sonar ranging techniques and demonstrated the benefit of new torpedo detection sonar waveforms. Data from these tests is being applied to the HVU application, and the sensor specification is being modified to meet the increased capability required for HVU ships. Development and production of the new sensors is being conducted by 3Phoenix. A complete sensor set was delivered in 2nd QTR FY12 to support an at sea test in the 3rd QTR FY12. At the same time, a ready-stowage rack, and fire control systems are being developed by Pacific Engineering Incorporated (PEI) and In-Depth Engineering, respectively. All of these components were brought together for integration in FY13. This integration supported fabrication and fielding of the prototype systems. A Milestone C decision is planned for FY18. A contract will be awarded for TWS LRIP systems to support Developmental Testing beginning in FY19, with an FY22 IOC.

E. Performance Metrics

Torpedo Effectiveness for the CAT
 Torpedo Detection Classification and Localization (TDCL) False Alert Rate

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TDCL probability of correct classification TWS System Availability		

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy												Date: February 2016			
Appropriation/Budget Activity				R-1 Program Element (Number/Name)				Project (Number/Name)							
1319 / 4				PE 0603506N / Surface Ship Torpedo Defense				0225 / Surface Ship Torpedo Defense (SSTD)							
Product Development (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering	WR	NUWC : Newport, RI	39.770	2.400	Nov 2014	2.141	Nov 2015	2.411	Nov 2016	-		2.411	Continuing	Continuing	Continuing
Systems Engineering ATT Dev.	C/CPFF	PSU/ARL : State College, PA	234.018	25.851	Dec 2014	21.895	Dec 2015	14.670	Dec 2016	-		14.670	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	JHU/APL : Baltimore , MD	1.740	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering Warhead Dev.	WR	NSWC : Indian Head, MD	64.955	3.200	Nov 2014	5.545	Nov 2015	8.207	Nov 2016	-		8.207	Continuing	Continuing	Continuing
Systems Engineering	WR	NUWC : Keyport, WA	42.982	2.300	Nov 2014	8.700	Nov 2015	11.161	Nov 2016	-		11.161	Continuing	Continuing	Continuing
Systems Engineering TDCL	C/CPFF	Ultra : Braintree, MA	11.640	0.000		0.000		0.000		-		0.000	0.000	11.640	Continuing
Systems Engineering ATT	WR	ONR : Arlington, VA	1.680	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Systems Engineering TDCL	C/CPFF	AAC : Hauppauge, NY	4.480	0.000		0.000		0.000		-		0.000	0.000	4.480	Continuing
Systems Engineering	WR	OPTEVFOR : Norfolk, VA	1.613	0.100	Feb 2015	0.377	Feb 2016	0.481	Feb 2017	-		0.481	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	ArgonST : Manassas, VA	0.800	0.000		0.000		0.000		-		0.000	0.000	0.800	Continuing
Systems Engineering TDCL	WR	NSWC : Dahlgren, VA	9.547	0.141	Nov 2014	0.177	Nov 2015	0.380	Nov 2016	-		0.380	0.000	10.245	Continuing
Systems Engineering TDCL	WR	SPAWAR : San Diego, CA	8.387	0.600	Dec 2014	1.161	Dec 2015	1.076	Dec 2016	-		1.076	0.000	11.224	Continuing
Systems Engineering	C/CPFF	UT/ARL : Arlington, TX	0.600	0.000		0.000		0.000		-		0.000	0.000	0.600	Continuing
Systems Engineering	C/CPFF	Alion : Bridgeport, CT	12.141	1.600	Feb 2015	1.117	Dec 2015	2.860	Dec 2016	-		2.860	0.000	17.718	Continuing
Systems Engineering	WR	NUWC DET : Norfolk, VA	21.863	4.160	Dec 2014	7.158	Dec 2015	8.935	Dec 2016	-		8.935	0.000	42.116	-
Systems Development	C/CPFF	3 Phoenix : Fairfax, VA	72.194	13.100	Dec 2014	19.000	Dec 2015	16.344	Dec 2016	-		16.344	0.000	120.638	Continuing
Integrated Logistic Spt	WR	NSWC Crane : Crane, IN	0.834	0.100	Mar 2015	0.130	Dec 2015	0.260	Dec 2016	-		0.260	0.000	1.324	Continuing
Systems Engineering	C/CPFF	PEI : Roca, NE	2.594	0.300	Dec 2014	0.851	Dec 2015	1.395	Dec 2016	-		1.395	0.000	5.140	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2017 Navy											Date: February 2016				
Appropriation/Budget Activity 1319 / 4				R-1 Program Element (Number/Name) PE 0603506N / Surface Ship Torpedo Defense				Project (Number/Name) 0225 / Surface Ship Torpedo Defense (SSTD)							

Product Development (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Systems Engineering	WR	CARDEROCK : Bethesda, MD	0.977	0.100	Dec 2014	0.258	Dec 2015	0.263	Dec 2016	-		0.263	0.000	1.598	-
Systems Engineering	C/CPFF	CGI : Washington, DC	0.200	0.000		0.000		0.000		-		0.000	0.000	0.200	-
Systems Engineering	C/BA	Dam Neck : Virginia Beach, VA	0.022	0.000		0.000		0.000		-		0.000	0.000	0.022	-
Systems Engineering	C/BA	NSWC Panama City : Panama City, FL	0.255	0.000		0.000		0.000		-		0.000	0.000	0.255	-
Systems Engineering	C/BA	Devron 26 : Not Specified	0.139	0.000		0.000		0.000		-		0.000	0.000	0.139	-
CAT Proof of Manufacturing	C/CPFF	TBD : TBD	0.000	0.000		0.000		15.513	Mar 2017	-		15.513	0.000	15.513	-
Systems Engineering	WR	Puget Sounds : Norfolk, VA	0.000	0.200	Oct 2015	0.000		0.000		-		0.000	0.000	0.200	-
Subtotal			533.431	54.152		68.510		83.956		-		83.956	-	-	-

Remarks
 The key events driving the funding request in FY17 are: start of the Manufacturing Risk Reduction efforts with the purchase of the CAT Proof of Manufacturing (POM) units, conducts 1 independent integrated in-water test of TWS SALVO capability on a CVN with CAT systems, and the First Article Testing on the first TWS system to validate performance and environmental requirements of the TWS Program of Record System Requirements Document. The first article qualification tests will include anti-tamper verification and validation tests and Environmental Qualification Tests including shock, vibration, temperature cycling, humidity, electromagnetic pulse, and electromagnetic Interference.

Management Services (\$ in Millions)				FY 2015		FY 2016		FY 2017 Base		FY 2017 OCO		FY 2017 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Earned Value Mgmt Spt	C/CPAF	Pioneer : Virigina	0.050	0.000		0.000		0.000		-		0.000	0.000	0.050	-
Program Management Support	C/FFP	EG&G : Gaithersburg, Md.	2.846	0.000		0.000		0.000		-		0.000	0.000	2.846	Continuing
DAWDF	Various	Not Specified : Not Specified	0.237	0.000		0.000		0.000		-		0.000	0.000	0.237	Continuing

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Exhibit R-4, RDT&E Schedule Profile: PB 2017 Navy **Date:** February 2016

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603506N / <i>Surface Ship Torpedo Defense</i>	Project (Number/Name) 0225 / <i>Surface Ship Torpedo Defense (SSTD)</i>
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	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019				FY 2020				FY 2021			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
TWS - SALVO At Sea Integration Test	██████████																											
TWS - Engineering Design Model (EDM) 6									████																			
TWS - Critical Design Review (CDR)									████																			
TWS - First Article Test (FAT)									████																			
TWS - Milestone C													████															
TWS - Production Readiness Review (PRR)													████															
TWS -Low Rate Initial Production (LRIP) 1													██████████															
TWS - LRIP 2																	██████████											
TWS - Developmental Testing (DT) 1																	████											
TWS - DT2																	██████████											
TWS - LRIP 3																					██████████							
TWS - Full Rate Production (FRP)																					████							
TWS - Initial Operational Capability (IOC)																									████			

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy		Date: February 2016
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603506N / <i>Surface Ship Torpedo Defense</i>	Project (Number/Name) 0225 / <i>Surface Ship Torpedo Defense (SSTD)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 0225				
Countermeasure Anti-Torpedo (CAT) - In Water Test	4	2015	4	2016
CAT - SALVO At-Sea Integration Test	3	2015	2	2016
CAT - Milestone B	2	2017	2	2017
CAT)- Engineering Design Model (EDM) Contract Award	4	2017	4	2017
CAT - Environmental Quality Test (EQT)	3	2018	2	2019
CAT - Live Fire 1	4	2018	4	2018
CAT - Critical Design Review (CDR)	1	2018	1	2018
CAT - Milestone C	4	2019	4	2019
CAT - Production Readiness Review (PRR)	4	2019	4	2019
CAT - Developmental Testing (DT)	2	2019	3	2019
CAT - DT2	3	2019	2	2020
CAT - Integrated Logistics Assessment (ILA)	2	2019	2	2019
CAT - Low Rate Initial Production (LRIP) 1	1	2020	4	2020
CAT - Live Fire 2	4	2020	4	2020
CAT - Competitive RFP	1	2021	1	2021
CAT - LRIP 2	1	2021	1	2021
CAT - Full Rate Production (FRP) Design Review	1	2021	1	2021
CAT / TWS - Integrated Testing (IT)	1	2021	4	2021
CAT / TWS - Operation Test Readiness Review (OTRR)	4	2021	4	2021
Torpedo Warning System (TWS) - (EDM) 5	2	2016	2	2016
TWS - SALVO At Sea Integration Test	3	2015	4	2016

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Exhibit R-4A, RDT&E Schedule Details: PB 2017 Navy **Date:** February 2016

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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
TWS - Engineering Design Model (EDM) 6	1	2017	1	2017
TWS - Critical Design Review (CDR)	2	2017	2	2017
TWS - First Article Test (FAT)	3	2017	3	2017
TWS - Milestone C	3	2018	3	2018
TWS - Production Readiness Review (PRR)	2	2018	2	2018
TWS -Low Rate Initial Production (LRIP) 1	3	2018	2	2019
TWS - LRIP 2	1	2019	1	2020
TWS - Developmental Testing (DT) 1	2	2019	2	2019
TWS - DT2	3	2019	1	2020
TWS - LRIP 3	1	2020	4	2021
TWS - Full Rate Production (FRP)	2	2020	2	2020
TWS - Initial Operational Capability (IOC)	4	2021	4	2021

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