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Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: (U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT
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COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
Total Program Element	523.133	608.566	856.326	-	856.326	927.814	1,136.403	860.702	823.989	Continuing	Continuing
0223: <i>Sub Combat System Improvement (ADV)</i>	49.250	51.040	40.862	-	40.862	39.277	39.011	40.069	40.879	Continuing	Continuing
2033: <i>Adv Submarine Systems Development</i>	72.544	42.515	33.889	-	33.889	31.040	33.167	33.942	34.262	Continuing	Continuing
3197: <i>Undersea Superiority</i>	30.798	21.983	-	-	-	-	-	-	-	0.000	52.781
3220: <i>SBSD Advanced Submarine System Development</i>	363.371	493.028	781.575	-	781.575	857.497	1,064.225	786.691	748.848	Continuing	Continuing
9999: <i>Congressional Adds</i>	7.170	-	-	-	-	-	-	-	-	0.000	7.170

A. Mission Description and Budget Item Justification

This program element supports innovative research and development in submarine hull and combat systems technologies and the subsequent evaluation, demonstration, and validation for submarine platforms. It will increase the submarine technology base and provide subsystem design options not currently feasible. The program element also supports programs transitioning from Science and Technology (S&T), Defense Advanced Research Projects Agency (DARPA), Independent Research and Development, and Small Business Innovation Research (SBIR) projects.

Project Unit 0223:

The Advanced Submarine Combat Systems Development non-acquisition (NON-ACAT) program supports Navy Submarine Acoustic Superiority and Technology Insertion Initiatives through the application of advanced development and testing of sonar and tactical control systems improvements. This Project transitions technologies developed by Navy Technology bases, the private sector, Office of Naval Research (ONR), Future Naval Capabilities (FNC), and DARPA. The Project addresses technology challenges to improve tactical control in littoral and open ocean environments for a variety of operational missions including peacetime engagement, surveillance, battle space preparation, deterrence, regional sea denial, precision strike, task group support, and ground warfare support. Prototype hardware/software systems are developed to demonstrate technologically promising system concepts in laboratory and at-sea submarine environments. Specifically, the focus of the technology efforts will be Advanced Processing Build - Acoustic (APB-A), Advanced Processing Build - Tactical (APB-T), Advanced Processing Build - Imaging (APB-I) and Advanced Sonar Arrays. APBs develop and demonstrate improvements to current and future sonar/combat control systems. The Advanced Sonar Arrays program develops and tests new sensors and demonstrates large array configuration. This Project is funded under demonstration and validation, as it develops and integrates hardware for experimental tests related to specific platform applications.

Project Unit 2033:

The Advanced Submarine Systems Development (ASSD) Program is a non-acquisition program that develops and matures technologies for successful integration into future and modernized submarine classes, thus lowering acquisition and life cycle program costs while improving mission capability. ASSD transitions Hull,

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<p>Mechanical, and Electrical (HM&E) technologies from Science & Technology (S&T) and Research and Development (R&D) to operational platforms; performs tests and demonstrates submarine design and naval architecture products destined for integration into future submarine classes or backfit into existing fleet assets; and operates unique R&D experimentation, modeling, testing and simulation facilities to enhance submarine stealth, maneuverability, capability, and affordability. The program is structured to support near and mid-term technology insertion to achieve future submarine class total ownership cost reductions and requirements, and influence future submarine concept designs and core technologies.</p> <p>In support of Sea Power 21, Sea Trial experimentation supports the naval enterprises in identifying and prototyping capabilities and technologies that support the warfighter. Focus is on the Undersea Enterprise (USE), the Naval Network/FORCENET (NNFE), Naval Expeditionary Combat Enterprise (NECE), Surface Warfare Enterprise (SWE), and Special Operations Force Enterprise (SOFE). In addition to enterprise support, the fleet experimentation initiative identifies, develops, integrates, and tests Intelligence, Surveillance, and Reconnaissance (ISR) technologies and develops littoral precision strike capabilities supporting the Overseas Contingency Operations (OCO).</p> <p>Experimentation and demonstration is conducted in a joint warfighting context with other services, (i.e. the U.S. Marines, U.S. Army, and the U.S. Air Force), to enable early assessment of warfighting capabilities, and to contribute to smarter technology selection decisions for potential incremental development.</p> <p>This program also supports Information Exchange Programs and joint Project Arrangements (PA) with the United Kingdom, Canada, and Australia.</p> <p>Project 2033 is comprised of four budget categories: Stealth, Payloads & Sensors, Advanced Propulsion/Ship Concept Development and Total Ownership Cost/Affordability.</p> <p>The major developmental efforts include:</p> <ul style="list-style-type: none">Sustainment of Vital Submarine Stealth R&D Capabilities<ul style="list-style-type: none">- Large Scale Vehicle (LSV)- Intermediate Scale Measurement System (ISMS)- Submarine Signature ManagementDevelopment of Technologies to Reduce Submarine Total Ownership Cost:<ul style="list-style-type: none">- Hydraulics Elimination through Electrification- Advanced CO2 Scrubber- Transition of ONR FNC for Affordable Submarine Propulsion and Control Surface Electric ActuatorDevelopment of Advanced Propulsion Systems and Ship Concepts<ul style="list-style-type: none">- DARPA/Navy Tango Bravo Technology Transition- Control Surface Electric Actuation of Retractable Bow PlanesImproved Payload & Sensor Capabilities<ul style="list-style-type: none">- Next Generation Towed Array and Towed Array Reliability- Innovation Technology Transition		

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1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>

Project Unit 3197:
The Undersea Superiority Project supports offboard Anti-Submarine Warfare (ASW) technologies selected by the Chief of Naval Operations (CNO) ASW Cross Functional Team for technologies that hold the potential for deployment and/or use by submarine platforms. Efforts associated with these technologies include design, development, integration and testing of future Undersea Superiority systems.

Project Unit 3220:
The objective of the Sea Based Strategic Deterrent (SBSD) Advanced Submarine System Development project is to design and prepare for construction of the replacement of the OHIO Class SSBN.

B. Program Change Summary (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	549.392	608.566	841.214	-	841.214
Current President's Budget	523.133	608.566	856.326	-	856.326
Total Adjustments	-26.259	-	15.112	-	15.112
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-6.914	-			
• SBIR/STTR Transfer	-17.390	-			
• Program Adjustments	-	-	26.730	-	26.730
• Section 219 Reprogramming	-1.085	-	-	-	-
• Rate/Misc Adjustments	-	-	-11.618	-	-11.618
• Congressional General Reductions	-0.070	-	-	-	-
Adjustments					
• Congressional Add Adjustments	-0.800	-	-	-	-

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 9999: *Congressional Adds*

Congressional Add: *SSBN(X) Systems Development*

Congressional Add: *Underwater Explosion Modeling for Non-Pressure Hull Fairing*

Congressional Add: *High Torque, Low Speed, Direct Drive Electric Motor Technology*

Congressional Add: *Submarine Fatline Vector Sensor Towed Array*

	FY 2010	FY 2011
	1.992	-
	1.992	-
	1.593	-
	1.593	-
	7.170	-

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Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2010	FY 2011
Congressional Add Subtotals for Project: 9999		
Congressional Add Totals for all Projects	7.170	-

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy								DATE: February 2011			
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>				R-1 ITEM NOMENCLATURE PE 0603561N: (U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT				PROJECT 0223: <i>Sub Combat System Improvement (ADV)</i>			
COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
0223: <i>Sub Combat System Improvement (ADV)</i>	49.250	51.040	40.862	-	40.862	39.277	39.011	40.069	40.879	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0		

A. Mission Description and Budget Item Justification

Project Unit 0223: The Advanced Submarine Combat Systems Development Non-ACAT program supports Navy Submarine Acoustic Superiority and Technology Insertion Initiatives by the application of advanced development and testing of sonar and tactical control systems improvements. This Project addresses technology challenges to improve tactical control in littoral and open ocean environments for a variety of operational missions including peacetime engagement, surveillance, battle space preparation, deterrence, regional sea denial, precision strike, task group support, and ground warfare support. These technologies, developed by Navy technology bases, the private sector, ONR, FNC, and DARPA are then transitioned. Prototype hardware / software systems are developed to demonstrate technologically promising system concepts in laboratory and at-sea submarine environments. Specifically, the focus of the technology efforts are APB-A, APB-T, APB-I, tactical control, and Advanced Sonar Arrays. APBs develop and demonstrate improvements to current and future sonar/combat control systems. The Advanced Sonar Arrays program develops and tests new sensors and demonstrates large array configuration.

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

	FY 2010	FY 2011	FY 2012
Title: Advanced Processing Build - Acoustic	18.950	18.000	15.200
Articles:	0	0	0
FY 2010 Accomplishments: FY10 focused on the initial development for APB-11. Efforts included improved signal processing to stitch close aboard acoustic coverage to provide 360-degree situational awareness and improved ranging tools, search space reduction tools, active systems, and signal processing for the new fatline towed array. Efforts focused on more seamless integration of acoustic and non-acoustic sensor information for tracking and command information. Conducted a shore test event to inform design decision for future APBs. Tested and delivered updates to bell ringers and contact followers for transition to AN/BQQ-10 in 4Q10.			
FY 2011 Plans: FY11 will focus on completing development, integration and land-based testing for APB-11. Develop Temporary Alterations (TEMPALTs) and test plans/procedures for APB-11 land-based and at-sea testing. Develop concepts and tactical scenarios for APB-13.			
FY 2012 Plans: FY12 will focus on completing at-sea testing and the transition for APB-11. Conduct land-based testing and transition of minor updates for APB-12. Establish content and continue the development of capabilities for APB-13.			
Title: Advanced Processing Build - Tactical	14.625	8.000	8.100

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2010	FY 2011	FY 2012
Articles:		0	0	0
FY 2010 Accomplishments: FY10 focused on initial development for APB-11. Efforts included improving the tactical commander's ability to manage close-in and high density scenarios through advanced target motion analysis, contact management, tactical scene rendering, uncertainty management, and close encounter decision management. Efforts focused on more seamless integration of acoustic and non-acoustic sensor information for tracking and command information. Initiated efforts to establish the APB-Imaging process.				
FY 2011 Plans: FY11 will focus on completing development, integration and land-based testing of APB-11. Develop TEMPALTs and test plans and procedures for APB-11 land-based and at-sea testing. Develop concepts and tactical scenarios for APB-13.				
FY 2012 Plans: FY12 will focus on completing at-sea testing and transition for APB-11. Conduct land-based testing and transition of minor updates for APB-12. Establish content and continue the development of capabilities for APB-13.				
Title: Advanced Processing Build - Imaging		-	10.000	10.200
Articles:			0	0
FY 2011 Plans: Establish groups, charters and infrastructure for commencement of APB-Imaging efforts. APB-11 development efforts begin focus on improving imaging system's signal processing to automate repetitive tasks and develop automated detection, tracking and ranging capabilities. Initiate efforts to baseline system performance. Complete development, integration and land-based testing of APB-11. Develop TEMPALTs and test plans/procedures for APB-11 land-based and at-sea testing. Develop concepts and tactical scenarios for APB-13.				
FY 2012 Plans: FY12 will focus on completing at-sea testing and transition for APB-11. Conduct land-based testing and transition of minor updates for APB-12. Establish content and continue the development of capabilities for APB-13.				
Title: Advanced Sensors		15.675	15.040	7.362
Articles:		0	0	0
FY 2010 Accomplishments: The Conformal Acoustic Velocity Sonar (CAVES) Large Vertical Array (LVA) installation was completed onboard USS DALLAS (SSN700). An at-sea test was completed 4Q10. The Low Cost Conformal Array (LCCA) Advanced Development Model (ADM) dual-array testing on USS CHEYENNE was completed. The LCCA program began transition to PMS401 for production. Initial design for the Light Weight (LW) LCCA ADM was completed. Demonstrated encrypted digital Acoustic Communications				

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)			FY 2010	FY 2011	FY 2012
<p>(ACOMMS). Lake Pend Oreille (LPO) tow tests of connectionless telemetry and 3X Twin-Line Thin-Line (TLTL) partial prototype array were completed.</p> <p>FY 2011 Plans: CAVES LVA will complete at-sea testing and analysis. LW LCCA ADM fabrication is scheduled to be completed by the end of FY11 and tow tests of 3X TLTL and 3X Vector Sensor Towed Array (VSTA) will be completed.</p> <p>FY 2012 Plans: Complete system integration of 9X Twin-Line (TL) towed array. Conduct 9X TL towed array LPO, research vessel sea test, and data analysis. Complete fabrication of 9X VSTA. Finalize TL towed array submarine TEMPALT development and submarine clip-on stream and retrieve procedures.</p> <p>Perform array and telemetry integration testing in-lab and at Lake Travis. Perform all electrical assessments including Electromagnetic Interference (EMI) testing and optical loss baselining. Complete Operational Alteration (OPALT) package for installation and begin physical installation 4Q12.</p>					
Accomplishments/Planned Programs Subtotals			49.250	51.040	40.862
C. Other Program Funding Summary (\$ in Millions)					
N/A					
D. Acquisition Strategy					
Use competitively awarded contracts from Broad Agency Announcement (BAA) solicitations.					
E. Performance Metrics					
<ul style="list-style-type: none"> - Advanced Processing Build (APB): Deliver at-sea tested submarine capability improvements to PEO Submarines as prescribed by the Fleet every two years (minor updates are planned in the 'even' years). Conduct milestone reviews with the Milestone Decision Authority and PEO Submarines prior to delivery. - Conducted Conformal Acoustic Velocity Sonar (CAVES) sea test 3Q10. CAVES provides significant advantages over existing technology; 2/3 of acquisition and installation costs, 10% of life cycle costs, and less impact on hull structure. CAVES/Wide Aperture Array (WAA) replacement of Light Weight WAA provides a cost savings of \$8M - \$13M/ship. - Conducted Low Cost Conformal Array (LCCA) Advanced Development Model (ADM) sea test 1Q10. - Deliver Twin Line Thin Line (TLTL) Short Aperture (3X) Array, Vector Sensor Towed Array (VSTA) Short Aperture (3X) Array, TLTL & VSTA (3X) Lake Pend Oreille Test Reports. 					

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

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Product Development (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/CPFF	Adaptive Methods:VA	0.700	0.225	Feb 2011	-		-		-	0.000	0.925	Continuing
Product Development	C/CPFF	Alion Sciences:VA	3.267	-		-		-		-	0.000	3.267	Continuing
Product Development	C/CPFF	Chesapeake Science:MD	2.799	3.827	Feb 2011	0.750	Dec 2011	-		0.750	Continuing	Continuing	Continuing
Product Development	C/CPFF	Electric Boat:ME	0.375	0.350	Feb 2011	1.040	Dec 2011	-		1.040	Continuing	Continuing	Continuing
Product Development	C/CPFF	General Dynamics:VA	12.647	0.900	Feb 2011	0.300	Dec 2011	-		0.300	Continuing	Continuing	Continuing
Product Development	C/CPFF	GA Tech Research Institute:GA	2.716	0.200	Feb 2011	-		-		-	0.000	2.916	Continuing
Product Development	C/CPFF	In Depth Engineering:VA	2.050	0.600	Dec 2010	0.750	Dec 2011	-		0.750	Continuing	Continuing	Continuing
Product Development	C/CPFF	JHU/APL:MD	47.533	8.880	Dec 2010	8.750	Dec 2011	-		8.750	Continuing	Continuing	Continuing
Product Development	C/CPFF	Lockheed Martin:VA	28.756	4.700	Dec 2010	5.500	Dec 2011	-		5.500	Continuing	Continuing	Continuing
Product Development	C/CPFF	Lockheed Martin:NY	6.514	1.800	Dec 2010	0.400	Dec 2011	-		0.400	Continuing	Continuing	Continuing
Product Development	C/CPFF	METRON:VA	4.158	-		-		-		-	0.000	4.158	Continuing
Product Development	WR	NSWC/Carderock:MD	20.477	2.188	Nov 2010	0.750	Oct 2011	-		0.750	Continuing	Continuing	Continuing
Product Development	WR	NUWC/Newport:RI	56.088	9.740	Nov 2010	7.683	Oct 2011	-		7.683	Continuing	Continuing	Continuing
Product Development	C/CPAF	NSMA:VA	7.394	0.550	Mar 2011	1.250	Nov 2011	-		1.250	Continuing	Continuing	Continuing
Product Development	WR	ONI:DC	0.895	0.650	Feb 2011	0.750	Nov 2011	-		0.750	Continuing	Continuing	Continuing
Product Development	WR	ONR:VA	2.725	-		-		-		-	0.000	2.725	Continuing
Product Development	C/CPFF	Progeny:VA	3.607	0.281	Feb 2011	0.200	Dec 2011	-		0.200	Continuing	Continuing	Continuing
Product Development	C/CPFF	PSU/ARL:PA	3.718	1.340	Jan 2011	1.570	Dec 2011	-		1.570	Continuing	Continuing	Continuing
Product Development	C/CPFF	SAIC:VA	2.550	1.005	Feb 2011	-		-		-	0.000	3.555	Continuing
Product Development	C/CPFF	SEDNA:VA	4.214	1.500	Dec 2010	0.750	Dec 2011	-		0.750	Continuing	Continuing	Continuing
Product Development	WR	SSC/San Diego:CA	1.453	0.060	Dec 2010	-		-		-	0.000	1.513	Continuing
Product Development	MIPR	U.S. Army Research Lab:MD	1.300	0.400	Dec 2010	-		-		-	0.000	1.700	Continuing
Product Development	MIPR	U.S. Army/MITRE:NJ	4.595	-		-		-		-	0.000	4.595	Continuing
Product Development	MIPR	U.S. Hanscom AFB/MIT Lincoln Labs:MA	9.484	1.400	Jan 2011	1.400	Nov 2011	-		1.400	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

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Product Development (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/CPFF	UT/ARL:TX	18.360	2.215	Dec 2010	2.520	Dec 2011	-		2.520	Continuing	Continuing	Continuing
Product Development	C/CPFF	VAR:VAR*	3.261	6.169	Feb 2011	4.424	Dec 2011	-		4.424	Continuing	Continuing	Continuing
Subtotal			251.636	48.980		38.787		-		38.787			

Remarks
*Consists of multiple performing activities with funding for each not greater than \$1M per year.

Management Services (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	C/CPAF	Stanley and Associates:VA	1.000	-		-		-		-	0.000	1.000	Continuing
Program Management Support	C/CPAF	BAE Systems:MD	7.349	1.050	Feb 2011	1.050	Dec 2011	-		1.050	Continuing	Continuing	Continuing
Program Management Support	C/CPFF	EG&G:VA	0.950	0.950	Feb 2011	0.950	Dec 2011	-		0.950	Continuing	Continuing	Continuing
Travel	Allot	NAVSEA PEO IWS5:DC	0.375	0.060	Jan 2011	0.075	Oct 2011	-		0.075	Continuing	Continuing	Continuing
Subtotal			9.674	2.060		2.075		-		2.075			

	Total Prior Years Cost	FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals		261.310	51.040		40.862		-	40.862			

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2012 Navy		DATE: February 2011
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Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy		DATE: February 2011
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 0223				
APB-10 Shore Test	3	2010	3	2010
Transition APB-10 to ARCI/BYG-1	4	2010	4	2010
APB-11 Sea Test	2	2012	2	2012
Transition APB-11 to ARCI/BYG-1	2	2012	3	2012
APB-12 Shore Test	4	2012	4	2012
Transition APB-12 to ARCI/BYG-1	1	2013	1	2013
APB-13 Sea Test	3	2013	3	2013
Transition APB-13 to ARCI/BYG-1	4	2013	4	2013
APB-14 Shore Test	3	2014	3	2014
Transition APB-14 to ARCI/BYG-1	4	2014	4	2014
APB-15 Sea Test	3	2015	3	2015
Transition APB-15 to ARCI/BYG-1	4	2015	4	2015
APB-16 Shore Test	3	2016	3	2016
Transition APB-16 to ARCI/BYG-1	4	2016	4	2016
Test ADM array	4	2010	4	2010
Transition to VA Class SSNs (CAVES/LVA)	1	2010	4	2011
LW LCCA ADM Development	1	2010	4	2011
LW LCCA Integration/Installation	1	2012	4	2012
LW LCCA ADM Sea Test	1	2013	1	2013
Transition to VA Class SSNs	2	2013	4	2013
Develop Array Technologies	1	2010	4	2014

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Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Build & Test Prototype Arrays	1	2010	4	2014
Conduct Ohio Class Replacement Array Studies	1	2012	4	2016

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy								DATE: February 2011			
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>				R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>				PROJECT 2033: <i>Adv Submarine Systems Development</i>			
COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
2033: <i>Adv Submarine Systems Development</i>	72.544	42.515	33.889	-	33.889	31.040	33.167	33.942	34.262	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0		

A. Mission Description and Budget Item Justification

The Advanced Submarine Systems Development (ASSD) Program is a non-acquisition program that develops and matures technologies for successful integration into future and modernized submarine classes, thus lowering acquisition and life cycle program costs while improving mission capability. ASSD transitions Hull, Mechanical, and Electrical (HM&E) technologies from Science & Technology (S&T) and Research and Development (R&D) to operational platforms; performs tests and demonstrates submarine design and naval architecture products destined for integration into future submarine classes or backfit into existing fleet assets; and operates unique R&D experimentation, modeling, testing and simulation facilities to enhance submarine stealth, maneuverability, capability, and affordability. The program is structured to support near and mid-term technology insertion to achieve future submarine class total ownership cost reductions and requirements, and influence future submarine concept designs and core technologies.

Experimentation is a critical component in technology maturity assessment. The ASSD program works within the Sea Trials process to identify and exploit test opportunities that can provide assessment and maturation for appropriate technologies. Sea Trials experiments provide joint test opportunities in relevant environments at significantly less cost.

This program also supports joint Project Arrangements (PAs) with the United Kingdom, and Information Exchange Programs with Canada, Australia, Japan, South Korea, Malaysia, Norway, Sweden, Germany, Netherlands and Italy.

Project 2033 is comprised of four budget categories: Stealth, Payloads & Sensors, Advanced Propulsion/Ship Concept Development and Total Ownership Cost (TOC)/Affordability.

The major developmental efforts include:

Sustainment of Vital Submarine Stealth R&D Capabilities

- Large Scale Vehicle (LSV)
- Intermediate Scale Measurement System (ISMS)
- Submarine Signature Management

Development of Technologies to Reduce Submarine Total Ownership Cost:

- Hydraulic Elimination through Electrification
- Advanced CO2 Scrubber
- Transition of ONR FNC for Affordable Submarine Propulsion and Control Surface Electric Actuator

Development of Advanced Propulsion System and Ship Concepts

- DARPA/Navy Tango Bravo Technology Transition

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<ul style="list-style-type: none"> - Control Surface Electric Actuation of Retractable Bow Planes Improved Payload & Sensor Capabilities - Next Generation Towed Array Handling System and Towed Array Reliability - Innovation Technology Transition - Irregular Warfare 				
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2010	FY 2011	FY 2012
Title: Payloads and Sensors/Subtotal Cost		19.684	8.406	3.393
Articles:		0	0	0
<p>Description: Develop promising advanced technologies and/or concepts capable of revolutionizing submarine design, reducing cost, improving payload flexibility, increasing capability, reducing weight and space requirements, exploring alternative payload launch mechanisms, increasing reliability with accompanying decreases in required maintenance, and improving material strength. Develop payload demonstrations targeted at improving flexible ocean interfaces, Intelligence, Surveillance, Reconnaissance (ISR) requirements, and payload and launch retrieval methods from undersea platforms. Conduct Navy and joint SEA TRIALS that take demonstrations to the Fleet in order to assess the operational value of the technologies and systems under consideration. The SEA TRIALS/experiments support examination and assessment of potential new Fleet capabilities based on Sea Power 21. Focus is on the Undersea Enterprise (USE), the Naval Network/FORCENET (NNFE), Naval Expeditionary Combat Enterprise (NECE), Surface Warfare Enterprise (SWE), and Special Operations Force Enterprise (SOFE).</p> <p>FY 2010 Accomplishments: The Small Missile Encapsulation (SME) project completed the design work necessary for testing a translating Vertical Launch System (VLS) shock tube with a Littoral Warfare Weapon (LWW) capsule at up to seven knots at a depth equivalent of an SSN at periscope depth. The actual testing was not accomplished as the funding was required for other higher priority projects. The LWW team then proceeded to conduct a "Smart Shutdown" of the SME technology development work and will document the results as the effort is "put on the shelf". Similarly, the system engineering and safety tasks for a Water Piercing Missile Launcher (WPML) unique launcher design and technology feasibility demonstration effort was curtailed due to funding constraints, and a "Smart Shutdown" process was executed to document the accomplishments and identify future technical challenges of the project. Developed, tested, and transitioned ISR technologies to support Irregular Warfare (IW). IW efforts involved technology risk evaluation of unmanned vehicle autonomous systems and submarine interfaces for experimentation on SSGN to include the integration of the Sensor Hosting Autonomous Remote Craft (SHARC) Unmanned Vehicle. Integration efforts also focused on host ship interfaces to incorporate the Universal Launch and Recovery Module (ULRM), as well as exterior platform nodes and non-organic sensors. Small Business Innovative Research efforts included transition of developed technologies including efforts on the hull-mounted Non Traditional Sensor System (NTSS). Funding stream for SME and WPML ends in FY10.</p> <p>FY 2011 Plans:</p>				

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)				
				FY 2010
				FY 2011
				FY 2012
<p>Complete final documentation and reports for the SME/LWW capsule technology development efforts. Complete final documentation and reports for the WPML technology demonstration effort. Develop, test, and transition ISR technologies to support Irregular Warfare. Conduct SSGN exercises as part of Talisman Sabre 2011 (TS21) to demonstrate an integrated Joint ISR architecture, persistent ISR, and advanced networking capability to Joint Force and local commanders in real time. Experimentation as part of Talisman Sabre 2011 (TS21) will include SSGN integration with autonomous vehicles to support Theater Commander's requirements. Conduct operational testing of the SHARC Unmanned Vehicle and integrate those operations into the Naval Oceanographic Office (NAVOCEANO) Glider Operation Center (GOC).</p> <p>FY 2012 Plans: Conduct initial studies on low-cost Towed Array Handling System concepts and begin definition and development of physics-based modeling tools. Perform preliminary requirements definition for technology transfer initiatives based on small business research studies. Execute evaluation demonstration for the Universal Launch and Recovery Module (ULRM) from an SSGN. The initiative focuses on unmanned systems integration and deployment, procedure development and refinement, and risk reduction activities to transition to a Theatre Commander.</p>				
Title: Stealth/Subtotal Cost				22.203
				0
				23.912
				0
				23.378
				0
<p>Description: Develop technologies and tools to increase the survivability of submarines by recognizing and mitigating sources of noise and non-acoustic vulnerabilities to ensure submarines can penetrate contested waters and remain undetected in the littorals. Develop technologies, Tactics, Techniques, and Procedures (TTPs) that facilitate new or enhanced existing warfighting concepts. Operate the Large Scale Vehicle (LSV 2) and the Intermediate Scale Measurement System (ISMS) to conduct large model experiments for submarines focusing on stealth, maneuvering and control, affordability, and operational effectiveness.</p> <p>FY 2010 Accomplishments: Conducted LSV maintenance, support, and operations and maintained LSV and ISMS test ranges. Continue qualification testing associated with a new material for use in future conformal arrays. Obtained full-scale data to support validation of modeling techniques related to Electromagnetic (EM) Signature propagation. Conducted full-scale submarine acoustic and underwater electromagnetic signature trials to baseline submarine signature evaluations. Executed R&D related to flow-noise, future sonar concepts, and structural acoustics for ONR, VA Class Program Office, and OHIO Class Replacement Program Office. Performed studies to define cost-effective degaussing signature control technologies. Conducted initial physical scale model experiments to evaluate degaussing control systems. Developed numeric and analytic models to predict stress magnetization and validate results</p>				

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2010	FY 2011	FY 2012
<p>by comparing to physical scale model and available full-scale data. Initiated Electromagnetic Silencing Project Agreement (PA) with the United Kingdom (UK) to develop technologies for OHIO Replacement and Successor programs.</p> <p>FY 2011 Plans: Conduct LSV operations and maintain LSV and ISMS test ranges. Support OHIO Class SSBN replacement and future VA Class design development. Support VA Class Cost Reduction Sail Trials. Continue conducting full-scale baseline signature measurement trials. Complete qualification testing associated with a new material for use in future conformal arrays. Continue Electromagnetic Silencing PA with the UK to develop technologies for OHIO Replacement and UK Successor programs. Conduct joint scale model stress magnetization and electric signature measurements with the UK to support future platform designs. Execute 1/4-scale LSV test to measure flow noise resulting from surface roughness to validate numerical prediction capabilities.</p> <p>FY 2012 Plans: Conduct LSV maintenance, support, and operations and maintain LSV and ISMS test ranges. Support OHIO Class SSBN replacement design development and support VA Class Cost Reduction Sail Trials. Continue Electromagnetic Silencing PA with the UK to develop technologies for OHIO Replacement and Successor programs. Develop and validate performance of control algorithms for both magnetic and electric signatures.</p>				
<p>Title: Total Ownership Cost/Affordability/Subtotal Cost</p> <p align="right">Articles:</p> <p>Description: Demonstrate technologies with potential to reduce total ownership costs of submarine systems by lowering construction costs, improving commonality of interfaces, extending the life of parts, and lowering life cycle maintenance requirements.</p> <p>FY 2010 Accomplishments: Developed TEMPALT Technical Data Package (TDP) for an at-sea demonstration of a ball valve rotary Electric Actuation System (EAS) and Universal Modular Mast (UMM) linear EAS. Completed Concept Design Report for the elimination of the External Hydraulic System on VA Class Submarines. Built and lab tested advanced CO2 scrubber sorbent test cubes and installed OPALTs on an SSN (USS Scranton) and SSBN (USS Nevada) for at-sea testing. Transition agreement signed with VA Class Program (PMS-450) for incorporation of system as a Reduced Total Ownership Cost (RTOC) initiative on VA Block IV. Initiated design of a full capacity Technical Readiness Level (TRL)-6 CO2 lab unit to assess the technology of solid sorbent material. Completed full-scale trials on SSN-688 and SSN-688I platforms to obtain data to support final recommendations relating to the maintenance associated with Main Ballast Tank (MBT) treatments with final recommendations to allow only partial replacement of some treatments during availabilities underway.</p> <p>FY 2011 Plans:</p>		13.115 0	3.118 0	2.584 0

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)				
				FY 2010
				FY 2011
				FY 2012
<p>Finalize updates to maintenance documentation for MBT damping configurations. Perform Navy land-based test and evaluation of the UMM linear EAS. Install UMM linear EAS and ball valve rotary EAS TEMPALTs on USS Missouri to demonstrate electrically-actuated systems at-sea. Continue at-sea evaluation of advanced carbon dioxide (CO2) test cubes. Develop the system procurement specification, and design and build a full capacity CO2 scrubber prototype TRL-6 for further technical evaluation of solid sorbent technology. Continue assessment of total ownership cost reduction opportunities for in-service submarines to reduce current and future submarine maintenance cost.</p> <p>FY 2012 Plans: Design and build a full-capacity advanced CO2 scrubber TRL-9 prototype and perform vendor test and evaluation. The TRL-9 prototype is the VA Class Block IV qualified version. Monitor and record data on ball valve rotary EAS and UMM linear EAS TEMPALTs during at-sea demonstrations.</p>				
<p>Title: Advanced Propulsion/Ship Concept Developments/Subtotal Cost</p> <p align="right">Articles:</p>				17.542
				7.079
				4.534
<p>Description: Overcome technological barriers that have significant impact on submarine HM&E systems so as to enable design options for a submarine with VIRGINIA Class capability in two technical areas: Shaftless Propulsion and Radical Ship HM&E Infrastructure Reduction. Develop submarine alternative propulsion and stern configurations with potential to significantly reduce submarine acquisition costs. Demonstrate critical performance parameters through appropriate scale demonstrators in realistic environmental conditions. Evaluate integration of technologies and approaches for cost reduction in future submarines. Develop understanding of ship concept studies and submarine cost drivers and model analysis. Develop and demonstrate technologies for future submarines in areas of hull and platform technologies, propulsors, ship control, electric actuation, sensors, and self defense. This work will apply to future submarine designs including the long-lead concept work on the OHIO Replacement Program. Evaluate current platforms via full scale signature measurement trials to guide future R&D investments.</p> <p>FY 2010 Accomplishments: Continued partnership with DARPA on Tango Bravo (TB) projects. Continued demonstration and performance testing of TB Shaftless Propulsion prototype and direct drive motor for X-Planes control surface electric actuation. For TB, performed motor structural acoustic design and testing. For the Bow Plane effort, completed specifications, arrangement drawings, safety assessment reports, fabricated the design, performed test and evaluation, and completed OPALT TDP for bow plane control surface electric actuator demonstration on a VA Class submarine. Initiated preliminary multi-material characterization/construction and demonstration of multi-material beams, and propulsor design tool for Hybrid Multi-Material Rotor (HMMR).</p> <p>FY 2011 Plans:</p>				0
				0
				0

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
<p>Continued partnership with DARPA on TB Shaftless Propulsion projects. Continue demonstration and performance testing of TB Shaftless Propulsion prototype. Complete fabrication of Retractable Bow Planes (RBP) OPALT to demonstrate bow plane control surface Electric Actuation System (EAS) on a VA Class submarine. Execute full scale electromagnetic signature trials on in-service submarines to guide R&D investments. Continue preliminary multi-material characterization/construction and demonstration of multi-material beams, and propulsor design tool for HMMR.</p> <p><i>FY 2012 Plans:</i> Install OPALT to demonstrate bow plane control surface EAS on a VA Class Submarine. Continue demonstration and performance testing of TB Shaftless Propulsion prototype and perform motor structural acoustic analysis. Continue partnership with DARPA on HMMR program to include delivery of coupled design software tool sets and multi-material characterization.</p>			
Accomplishments/Planned Programs Subtotals	72.544	42.515	33.889

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

N/A

D. Acquisition Strategy

F2033: Sole source Concept Formulation (CONFORM) contracts with the only two submarine design/construction shipyards, General Dynamics Electric Boat (GDEB) and Northrop Grumman Shipbuilding Newport News (NGNN). Engagement with industry to build vendor base and support development of R&D products for enhanced submarine capability via competitively awarded Small Business Innovation Research (SBIR) contracts to support Hull Mechanical & Electrical systems.

E. Performance Metrics

- To enable transition of a minimum of three technology challenge solutions supporting emergent war fighter needs.
- Sustain critical one of a kind national R&D hydroacoustic infrastructure enabling the design and assessment of VIRGINIA Class cost reduction and the OHIO Replacement designs for affordability.
- Refine the design of the Advanced Carbon Dioxide Removal System (ACRU) CO2 Scrubber System based on at-sea testing of new solid sorbent materials and the removal of liquid amine system from future submarines.
- Install and perform three at-sea demonstrations for electric actuation of critical ship control and ship system operational components in support of the OHIO Replacement and follow-on VIRGINIA Class Block Upgrades.
- Assess as-built VIRGINIA and OHIO Class SSBN/SSGN submarine for design drivers/design tools and model validation to define R&D needs for OHIO Class Replacement component development and technical design maturity.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 2033: <i>Adv Submarine Systems Development</i>
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Product Development (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	MIPR	DARPA:Arlington, VA	-	1.084	Apr 2011	-		-		-	Continuing	Continuing	Continuing
Product Development	SS/CPFF	NGSB:Newport News, VA	3.082	0.250	Apr 2011	0.394	Dec 2011	-		0.394	Continuing	Continuing	Continuing
Product Development	WR	NSWC:Dahlgren, VA	5.241	-		-		-		-	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Kollmorgen:N. Hampton, MA	1.100	-		-		-		-	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Oceaneering:Chesapeake, VA	1.900	-		-		-		-	0.000	1.900	1.900
Product Development	SS/CPFF	Boeing:St. Louis, MO	0.925	-		-		-		-	0.000	0.925	0.925
Product Development	SS/CPFF	EB:Groton, CT	29.472	6.809	Jun 2011	3.429	Mar 2012	-		3.429	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Raytheon:Portsmouth, RI	16.034	-		-		-		-	Continuing	Continuing	Continuing
Product Development	WR	NSWC:Carderock, MD	60.613	8.570	Jun 2011	5.007	Mar 2012	-		5.007	Continuing	Continuing	Continuing
Product Development	SS/CPFF	ARL/PSU:State College, PA	4.387	0.400	Mar 2011	0.700	Jan 2012	-		0.700	Continuing	Continuing	Continuing
Product Development	SS/CPFF	UT/ARL:Austin, TX	6.050	-		-		-		-	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JHU/APL:Laurel, MD	15.594	0.200	May 2011	-		-		-	Continuing	Continuing	Continuing
Product Development	Various	Various:Various	29.489	2.435	Jun 2011	1.168	Mar 2012	-		1.168	Continuing	Continuing	Continuing
Product Development	WR	NUWC:Newport, RI	46.034	6.755	Jun 2011	5.671	Mar 2012	-		5.671	Continuing	Continuing	Continuing
Product Development	WR	ONR:Arlington, VA	8.066	-		-		-		-	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Lockheed Martin:Bethesda, MD	8.934	-		-		-		-	0.000	8.934	8.934
Product Development	WR	SPAWAR:San Diego, CA	5.850	-		-		-		-	Continuing	Continuing	Continuing
Subtotal			242.771	26.503		16.369		-		16.369			

Remarks

Various/VAR is used to group multiple activities with small funding levels. Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 2033: <i>Adv Submarine Systems Development</i>
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Support (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	SS/CPFF	Various:Various	7.512	0.885	Jun 2011	0.885	Dec 2011	-		0.885	Continuing	Continuing	Continuing
Government Engineering Support	WR	Various:Various	4.018	0.335	Jun 2011	0.780	Dec 2011	-		0.780	Continuing	Continuing	Continuing
Travel	WR	NAVSEA HQ:Not Specified	0.409	0.100	Jun 2011	0.100	Nov 2011	-		0.100	Continuing	Continuing	Continuing
Acquisition Workforce	Various	Not Specified:Not Specified	0.293	-		-		-		-	0.000	0.293	0.293
Subtotal			12.232	1.320		1.765		-		1.765			

Remarks

Various/VAR is used to group multiple activities with small funding levels.
Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

Test and Evaluation (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	SS/CPFF	EB:Groton, CT	4.627	0.219	Jun 2011	3.141	Mar 2012	-		3.141	Continuing	Continuing	Continuing
Developmental Test & Evaluation	SS/CPFF	Raytheon:Portsmouth, VA	9.104	-		-		-		-	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NAVAIR:Patuxent, MD	2.593	-		-		-		-	Continuing	Continuing	Continuing
Developmental Test & Evaluation	Various	Various:Various	5.236	1.136	Jun 2011	-		-		-	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NUWC:Newport, RI	2.372	7.749	Jun 2011	6.523	Mar 2012	-		6.523	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NSWC:Carderock, MD	7.667	5.588	Jun 2011	6.091	Mar 2012	-		6.091	Continuing	Continuing	Continuing
Developmental Test & Evaluation	SS/CPFF	NGSB:Newport News, VA	0.783	-		-		-		-	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

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Test and Evaluation (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	
Developmental Test & Evaluation	SS/CPFF	JHU/ARL:Laurel, MD	0.305	-		-		-		-	Continuing	Continuing	Continuing
Developmental Test & Evaluation	SS/CPFF	ARL/PSU:State College, PA	0.720	-		-		-		-	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NSWC:Dahlgren, VA	1.320	-		-		-		-	Continuing	Continuing	Continuing
Subtotal			34.727	14.692		15.755		-		15.755			

Remarks
 Various/VAR is used to group multiple activities with small funding levels.
 Activities will be incrementally funded. The award dates reflect the latest incremental portion funds will obligate.

	Total Prior Years Cost	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	289.730	42.515	33.889	-	33.889			

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2012 Navy		DATE: February 2011
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Exhibit R-4, RDT&E Schedule Profile: PB 2012 Navy		DATE: February 2011
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Exhibit R-4, RDT&E Schedule Profile: PB 2012 Navy		DATE: February 2011
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Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy		DATE: February 2011
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 2033				
P&S Small Missile Encapsulation Demonstration Full-Scale Testing	2	2010	4	2010
P&S Water Piercing Missile Launch Demo Prototype Launcher Critical Design Review, Fly-out test and final report	2	2010	4	2010
P&S Innovation Technology Transition SBIR/IRAD projects	1	2010	4	2016
P&S Irregular Warfare Technology Development/Test/Transition	1	2010	4	2011
P&S Towed Array Handling System Concept Development	1	2012	2	2013
P&S Towed Array Handling System Requirements Definition	3	2013	2	2014
P&S Towed Array Handling System Modeling & Simulation	3	2014	2	2015
P&S Towed Array Handling System ADM Development	2	2015	4	2016
AP Tango Bravo Shaftless Propulsion Prototype Demo	1	2010	4	2012
AP Electric Control Surface Actuation Demo (Bow Plane OPALT) Fabricate/Design/T&E/Dev TDP	1	2010	4	2011
AP Electric Control Surface Actuation Demo (Bow Plane OPALT) Install OPALT	1	2012	3	2012
AP Electric Control Surface Actuation Demo (Bow Plane OPALT) Monitor At-Sea	1	2013	4	2016
AP Hybrid Multi-Material Rotor Development , Coupled Tool Architecture/Build Full Thickness Beams	1	2010	2	2011
AP Hybrid Multi-Material Rotor Development , Mat'l Characteristics/ Coupled Design Tools	3	2011	4	2012
AP ONR FNC AMP Advanced Material Propeller Development	1	2014	4	2016
STEALTH Coupled Wake Signature Model Validation	1	2010	4	2011
STEALTH CAVES Outer-Layer Material Qualification	1	2010	4	2013
STEALTH Conformal Array Signature Assessment	1	2010	4	2010

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Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 2033: <i>Adv Submarine Systems Development</i>

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
STEALTH Stone Mason	1	2010	4	2012
STEALTH ISMS Large Aperture Bow Array Target Strength and Structural Testing	1	2010	4	2012
STEALTH LSV/ISMS Next Gen Pwr Sys Assmt Range Testing - LSV Surf Roughness	4	2010	1	2011
STEALTH LSV/ISMS Next Gen Pwr Sys Assmt Range Testing - NGPS Blue Demo	1	2013	2	2013
STEALTH LSV/ISMS Next Gen Pwr Sys Assmt Range Testing - NGPS Gold Demo	4	2013	1	2014
STEALTH LSV/ISMS Next Gen Pwr Sys Assmt Range Testing - Fuel Cell	3	2014	4	2014
STEALTH ISMS Continuous Active Sonar Range	1	2010	4	2013
STEALTH ISMS Maint & Repair	1	2010	4	2016
STEALTH ISMS VA Class Testing	1	2010	2	2013
STEALTH ISMS Ohio Replacement Acoustics	3	2012	4	2012
STEALTH ISMS Ohio Replacement Acoustics phase 2	3	2013	4	2014
STEALTH LSV2 Maintenance RAV	2	2010	2	2010
STEALTH LSV2 Maintenance RAV phase 2	2	2012	3	2012
STEALTH LSV2 Ohio Replacement Acoustics	4	2012	4	2013
STEALTH LSV2 Maintenance RAV phase 3	1	2014	2	2014
STEALTH LSV2 Advanced Material Propeller	3	2014	4	2014
STEALTH LSV2 & ISMS Technology Refresh	1	2011	4	2011
STEALTH Sail Treatment Characterization	1	2010	1	2011
STEALTH Future Sail Trial VA Class	2	2011	2	2013
STEALTH Electromagnetic Signatures Project Arrangement (PA) w/UK	1	2010	4	2014
STEALTH Full-Scale Baseline Acoustic Trails	1	2010	4	2010
TOC SSN-688I Class Main Ballast Tank Damping Treatment Configuration Test	1	2010	4	2010
TOC SSN-688I Class Main Ballast Tank Damping Treatment Finalize Maint. Documentation	1	2011	4	2011

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Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 2033: <i>Adv Submarine Systems Development</i>

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
TOC Hydraulic Elimination (Internal EA Systems) Develop Ball Valve TEMPALT Package	1	2010	4	2010
TOC Hydraulic Elimination (Internal EA Systems) Install Ball Valve TEMPALT	1	2011	2	2011
TOC Hydraulic Elimination (Internal EA Systems) Monitor Ball Valve TEMPALT At-Sea	3	2011	4	2012
TOC Hydraulic Elimination (Internal EA Systems) Develop Flood Control/SUBSAFE Spec	1	2014	4	2014
TOC Hydraulic Elimination (Internal EA Systems) Develop Flood Control/SUBSAFE Prototypes	1	2015	4	2015
TOC Hydraulic Elimination (Internal EA Systems) Develop Flood Control/SUBSAFE TEMPALT Plan	1	2016	4	2016
TOC Hydraulic Elimination (External EAS (UMM Only) Develop UMM Spec; TEMPALT and Navy T&E	1	2010	2	2011
TOC Hydraulic Elimination (External EAS (UMM Only) Install UMM TEMPALT	2	2011	4	2011
TOC Hydraulic Elimination (External EAS (UMM Only) Monitor UMM TEMPALT At-Sea	1	2012	4	2012
TOC Advanced CO2 Removal System Develop Spec and Breadboard, Build and Install Test Cubes	1	2010	4	2010
TOC Advanced CO2 Removal System Develop Perf Spec/ Manufacture and Test Material, Award Prototype Contract	1	2011	4	2011
TOC Advanced CO2 Removal System Design and Build Prototype, Vendor Test & Evaluation (T&E)	1	2012	4	2012
TOC Advanced CO2 Removal System Install & Test Prototype in Navy Lab, T&E	1	2013	4	2013
TOC Advanced CO2 Removal System Evaluate Prototype in Navy Lab, T&E	1	2014	4	2014
TOC Life Cycle Maintenance Cost Reduction Corrosion Analysis	1	2010	4	2010
TOC Life Cycle Maintenance Cost Reduction Technical Demonstration	1	2011	4	2012
TOC ONR FNC Electric Actuation Fabricate and Conduct Land Based Test/Dev TDP	1	2013	4	2014
TOC ONR FNC Electric Actuation Install OPALT	2	2015	4	2015

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Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 2033: <i>Adv Submarine Systems Development</i>

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
TOC ONR FNC Electric Actuation Monitor At-Sea	1	2016	4	2016

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3197: <i>Undersea Superiority</i>
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COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
3197: <i>Undersea Superiority</i>	30.798	21.983	-	-	-	-	-	-	-	0.000	52.781
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0		

A. Mission Description and Budget Item Justification

Project Unit 3197: This Project supports Navy Undersea Superiority through the application of advanced development and testing of organic and offboard sonar and tactical control systems. This Project transitions technologies developed by Navy technology bases, the private sector, ONR, Future Naval Capabilities, and DARPA. This non-acquisition Project addresses technology challenges to improve Anti-Submarine Warfare (ASW) in littoral and open ocean environments for a variety of operational missions by relevant tactical ASW capabilities. Prototype hardware/software systems are developed to demonstrate technologically promising system concepts in laboratory and at-sea submarine environments. Technologies are selected by the CNO's ASW Initiative which was established to support the CNO's vision to "fundamentally change the way ASW is currently conducted to render the enemy submarine irrelevant against US and coalition forces". This Project matures promising Undersea Warfare (USW) technologies via an incremental development methodology, establishes military utility through sea testing and self assessment, and supports transition to production as merited by results.

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

	FY 2010	FY 2011	FY 2012
Title: Undersea Superiority	30.798	21.983	-
Articles:	0	0	
FY 2010 Accomplishments: Continued development of Deep Water Active Detection System (DWADS) to include integration, prototyping, land-based and at-sea testing of Advanced Development Models (ADM) and conduct of Military Utility Assessments (MUAs). Continued development of Distributed Netted Sensors (DNS) Control and Communications capabilities and Reliable Acoustic Path Vertical Line Array (RAP VLA), fabricated and tested prototype, and conducted at-sea acoustic test. Continued studies, analysis and assessments of potential transformational ASW technologies.			
FY 2011 Plans: Fabricate and test upgraded version of DWADS design based on initial at-sea and MUA test results. Conduct at-sea demonstration of updated DWADS. Continue development of RAP VLA and conduct at-sea demonstration of a fully functioning prototype. Continue studies, analysis and assessments of potential transformational ASW technologies.			
Accomplishments/Planned Programs Subtotals	30.798	21.983	-

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3197: <i>Undersea Superiority</i>

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

N/A

D. Acquisition Strategy

Use competitively awarded contracts from Broad Agency Announcement (BAA) solicitations.

E. Performance Metrics

- Reliable Acoustic Path Vertical Line Array (RAP VLA) provides detection of quiet diesel submarines at ranges 3 to 7 times water depth. Continued RAP VLA development and conduct a Deep Digital Array sea test and an Engineering Integration test in FY10.
- Deep Water Active Detection System (DWADS) - participate in Distributed Netted System (DNS) 10-1 Prototype testing in Convergence Zone and Valiant Shield 10 with Integrated Units in FY10.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3197: <i>Undersea Superiority</i>
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Product Development (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/CPFF	In Depth Engineering:VA	0.900	-		-		-		-	0.000	0.900	0.900
Product Development	C/CPFF	JHU/APL:MD	7.266	5.250	Dec 2010	-		-		-	0.000	12.516	12.516
Product Development	C/CPFF	Lockheed Martin:VA	9.975	9.700	Dec 2010	-		-		-	0.000	19.675	19.675
Product Development	C/CPFF	Lockheed Martin:CA	23.365	-		-		-		-	0.000	23.365	23.365
Product Development	WR	Marine Acoustics Inc.:NC	0.363	-		-		-		-	0.000	0.363	0.363
Product Development	WR	Naval Research Lab:DC	0.885	-		-		-		-	0.000	0.885	0.885
Product Development	WR	NUWC/Newport:RI	1.220	2.646	Oct 2010	-		-		-	0.000	3.866	3.866
Product Development	C/CPFF	Scientific Solutions Inc:NH	0.500	-		-		-		-	0.000	0.500	0.500
Product Development	MIPR	U.S. AFB/MIT Lincoln Labs:MA	1.200	-		-		-		-	0.000	1.200	1.200
Subtotal			45.674	17.596		-		-		-	0.000	63.270	63.270

Test and Evaluation (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	C/CPFF	JHU/APL:MD	5.580	2.200	Dec 2010	-		-		-	0.000	7.780	7.780
Test and Evaluation	WR	NUWC/Newport:RI	5.657	1.000	Oct 2010	-		-		-	0.000	6.657	6.657
Test and Evaluation	WR	SPAWAR, San Diego:CA	1.600	-		-		-		-	0.000	1.600	1.600
Test and Evaluation	MIPR	US AFB/MIT Lincoln Labs:MA	0.150	-		-		-		-	0.000	0.150	0.150
Test and Evaluation	C/CPFF	UT/ARL:TX	2.400	-		-		-		-	0.000	2.400	2.400
Test and Evaluation	WR	VAR:VAR*	4.591	0.727	Dec 2010	-		-		-	0.000	5.318	5.318
Subtotal			19.978	3.927		-		-		-	0.000	23.905	23.905

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3197: <i>Undersea Superiority</i>
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Test and Evaluation (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete			

Remarks
* Consists of multiple performing activities with funding for each not greater than \$1M per year.

Management Services (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total		Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete			
Program Management Support	C/CPAF	BAE SYSTEMS:MD	0.800	0.400	Dec 2010	-		-		-	0.000	1.200	1.200	
Travel	WR	NAVSEA PEO IWS5:DC	0.070	0.060	Oct 2010	-		-		-	0.000	0.130	0.130	
Subtotal			0.870	0.460		-		-		-	0.000	1.330	1.330	

			Total Prior Years Cost	FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			66.522	21.983		-		-		-	0.000	88.505	88.505

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3197: <i>Undersea Superiority</i>

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Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3197: <i>Undersea Superiority</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Proj 3197</i>				
DWADS Design/Development	1	2010	3	2011
DWADS Fully Functional Prototype Sea Test/MUA	3	2010	4	2011
RAP/VLA Design Development	1	2010	3	2011
RAP/VLA Fully Functional Prototype Sea Test/MUA	3	2010	4	2011

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy									DATE: February 2011		
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>				R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>				PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>			
COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
3220: <i>SBSD Advanced Submarine System Development</i>	363.371	493.028	781.575	-	781.575	857.497	1,064.225	786.691	748.848	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0		

A. Mission Description and Budget Item Justification

The Sea Based Strategic Deterrent (SBSD) Advanced Submarine System Development program funding request supports the necessary design, systems engineering, prototyping, and vendor qualification activities needed to execute the schedule for Common Missile Compartment (CMC) design, whole ship design, and component technologies development for the next generation US ballistic missile submarine. This RDT&E program supports cooperation with the United Kingdom (UK) to maintain strategic deterrence, based on a single effort to develop a common missile compartment as agreed by the UK Secretary of State for Defense and the US Secretary of Defense in 2009.

The OHIO Replacement program strategy is to maximize the re-use of existing OHIO systems and new designs from VIRGINIA Class (as applicable), focus on Life Cycle Total Ownership Cost (TOC) affordability and meet the higher standards required for this SSBN to achieve mission success in a challenging environment.

The following key activities support a ship acquisition program to replace the OHIO Class SSBNs:

1. Design and development of a missile compartment, launch system and strategic support systems to meet US strategic requirements while cooperating with the UK on modernizing its strategic deterrent in accordance with Presidential direction (December 2006).
2. Analysis of Alternatives (AOA) completed with final brief to the Office of the Secretary of Defense (OSD) on May 20, 2009. The final AOA Report was completed in September 2009. AOA Sufficiency Review Letter was signed by OSD Director, Cost Assessment & Program Evaluation on December 8, 2009. The program completed a Milestone A (MSA) Defense Acquisition Board (DAB) review on December 9, 2010. The Acquisition Decision Memorandum (ADM) is expected to be signed in February 2011, approving MSA, and authorizing the program to enter the Technology Development phase.
3. Concept and System Definition for remaining portions of the ship will maintain synchronization with the CMC design efforts. This effort will be accomplished by the design/ build/ sustain approach modeled after the VIRGINIA Class program.
4. Development of advanced submarine platform technologies to provide capabilities needed to enhance platform operational effectiveness and minimize life cycle cost.

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

	FY 2010	FY 2011	FY 2012
Title: SBSD Advanced Submarine System Development	363.371	493.028	781.575
Articles:	0	0	0
Description: SBSD Concept and System Definition Prototyping, and Technology Development Efforts.			

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy	DATE: February 2011
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APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
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<p>The SBSB program supports design, systems engineering, prototyping, and vendor qualification activities needed to develop CMC design, the OHIO Replacement whole ship design, and component development. OHIO Replacement design efforts support decisions on missile tube hull insert manufacturing in FY 2010 and missile compartment construction strategy down-select in FY 2011. The SBSB design timelines are based on the approach proven on VIRGINIA Class Program, adjusted for the additional complexity of a missile compartment and Strategic Weapons Systems (SWS). Planned technical studies and prototyping are necessary to reduce risks associated with updating SSBN system designs for current technical standards and demonstrating design feasibility of technical options to inform the establishment of detailed requirements.</p> <p>The Navy is investing \$150M (\$50M/year in FY 2012-2014) in Design for Affordability (DFA) initiatives similar to those employed successfully for VIRGINIA Class, but will be further tailored to the uniqueness of OHIO Replacement to drive down overall program costs. Efforts will focus on reducing ship construction costs through implementing more effective design features to produce a more affordable/producible class. As part of this effort, alternative contracting strategies will be examined.</p> <p>Activities planned for FY 2010, FY 2011 and FY 2012 include the design of a common missile compartment to satisfy the requirements of both the US and the UK, to mature required technologies, and to re-host the TRIDENT II D5 Strategic Weapon System (Launcher, Fire Control and Navigation) while ensuring no degradation to D5 security, safety, and performance. In addition, whole ship design efforts are focused on technologies requiring significant development times and those technologies with early design impacts. These include propulsor development, ship control (e.g., control surfaces), and ship signatures. These technologies are critical to understand stealth capabilities for a ship class that will be in service until the 2080s. Ship concept design efforts include important pre-construction activities such as trade studies of ship requirements, risk characterization of technology options, improvement and validation of performance prediction tools, and improvement of design tools. Technology development will address maturation of technologies that must be mature to support ship design and construction schedules such as the propulsor, maneuvering/ship control, and signatures.</p> <p>FY 2010 Accomplishments: Common Missile Compartment (CMC) Design and Prototyping (\$116.2M) - Initiated efforts for the design and development of the CMC to include: related sections of the ship specification, concept system design, prototype missile tube concept design and prototype missile tube/barrel quad pack design, and CMC system diagrams. Completed efforts related to full scale welding feasibility demonstration of four representative missile tube barrel quarter crown assemblies. Initiated casting vendor qualification and manufacturing fixture prototyping for validation of missile tube to missile tube quad production techniques. Fixture design and prototype efforts of the E Fixture (missile tube crown assembly; prototype), F Fixture (missile tube/hull cylinder integration; concept design), H Fixture (automated frame fabrication; concepts) and I Fixture (pressure hull shell fabrication; concepts). Initiated system engineering efforts to define the required CMC build strategy. Commence planning activities for CMC test facilities.</p>			
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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2010	FY 2011
<p>Performed facility concept studies and facility outfit planning work. Initial exploration of robotic welding capabilities and techniques to support missile tube to keel weld butt.</p> <p>Ship Studies and Design (\$48.0M) - Initiated efforts for Rest of Ship concept development, Systems Integration, component design, system definition documents, system diagrams, ship arrangements, construction drawings, and studies to support CMC interfaces with the shipbuilder.</p> <p>NAVSEA R&D and Prototyping (\$25.0M) - Initiated Technology Development efforts for corrosion control, undersea sensor suite, propulsor, shafting system, hydrodynamics, maneuvering, ship control, composites, component development, and ship signatures.</p> <p>Test and Evaluation (T&E) (\$1.2M) - Initiated efforts to identify T&E requirements for the program and interfaced with OSD oversight organizations for T&E.</p> <p>Strategic Weapons System (SWS) Integration (\$98.6M) - Initiated system engineering efforts for the development of SWS system diagrams as they interface with the CMC. Initiated concept and design work to develop a missile launch tube test facility, test stand and refurbishment of a test vehicle to support launch system prototype effort and qualification.</p> <p>Systems Engineering / Program Management (\$74.4M) - Provided technical oversight including Program Office management and technical support from government laboratories for review, analysis and modeling.</p> <p>FY 2011 Plans: CMC Design and Prototyping (\$209.4M) - Continue efforts for the design and development of the CMC to include; related sections of the ship specification, commence prototype missile tube detailed design and prototype missile quad pack design, and CMC system diagrams. On-site installation of the missile tube integration fixture and execution of the missile tube quarter crown and barrel prototype quad. Fixture design and prototype efforts. E Fixture (missile tube crown assembly), F Fixture (missile tube/hull cylinder integration; preliminary design), H Fixture (automated frame fabrication; concepts continued) and I Fixture (pressure hull shell fabrication; concepts continued). Continue casting vendor qualification and concept design of missile tube quad to hull manufacturing prototypes to validate planned missile compartment production techniques. Continue system engineering efforts to refine the required CMC build strategy. Conduct missile tube requirements review and commence missile tube detailed design. Continue planning activities for CMC test facilities. Perform facility development studies and facility outfit planning activities. Initial planning, development and testing of missile tube to keel robotic welding.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2010	FY 2011
<p>Ship Studies and Design (\$47.6M) - Continue Rest of Ship concept development, system integration, component design, system definition documents, system diagrams, ship arrangements, construction drawings, and studies to support CMC interfaces with the shipbuilder.</p> <p>NAVSEA R&D and Prototyping (\$35.1M) - Continue Technology Development efforts for corrosion control, undersea sensor suite, propulsor, shafting system, hydrodynamics, maneuvering, ship control, composites, component development, and ship signatures.</p> <p>T&E (\$2.9M) - Continue efforts to identify T&E requirements for the program and interface with OSD oversight organizations for T&E.</p> <p>SWS Integration (\$102.6M) - Continue system engineering efforts for the development of SWS system diagrams as they interface with the CMC. Continue concept and design work to develop a missile launch tube test facility and test stand including refurbishment of a test vehicle to support launch system prototype effort and qualification. Conduct evaluation of Missile gas temperature test data acquired during Demonstration and Shakedown Operations (DASO) to verify missile performance in re-hosted environment. Continue system engineering design efforts associated with the physical arrangement drawings of missile tubes and SWS hardware within the CMC and Missile Control Center (MCC).</p> <p>Systems Engineering / Program Management (\$95.4M) - Continue to provided technical oversight including Program Office management and technical support from government laboratories for review, analysis and modeling. Commence Design for Affordability (DFA) planning activities.</p> <p>FY 2012 Plans: CMC Design and Prototyping (\$297.1M) - Continue efforts for the design and development of the CMC to include; completion of sections of the CMC ship specification, drawings of the first article missile tube quad pack, and CMC system diagrams. Approve missile tube drawings and finalize CMC arrangements. Continue validation of missile tube to missile tube quad pack production techniques. Continue validation and verification of the casting design and preliminary design of the missile tube quad to hull manufacturing fixture prototypes to validate planned missile compartment production techniques. E Fixture (missile tube crown refit for 87 inch tube). F Fixture (missile tube/hull cylinder integration; detailed design), H Fixture (automated frame fabrication; preliminary design) and I Fixture (pressure hull shell fabrication; preliminary design). Continue system engineering efforts to define the required CMC testing during the build cycle. Commence detailed planning activities for CMC test facilities. Perform facility arrangements, test items and facility outfit detailed planning activities. Issue facility design award. Continue development and testing of missile tube to keel robotic welding techniques to support process certification.</p>			

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy	DATE: February 2011
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APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2010	FY 2011	FY 2012
Ship Studies and Design (\$41.3M) - Continue Rest of Ship concept development, system integration, component design, system definition documents, system diagrams, ship arrangements, construction drawings, and studies to support CMC interfaces with the shipbuilder.			
NAVSEA R&D and Prototyping (\$128.5M) - Continue Technology Development efforts for corrosion control, undersea sensor suite, propulsor, shafting system, hydrodynamics, maneuvering, ship control, composites, component development, and ship signatures.			
T&E (\$3.6M) - Continue efforts to identify T&E requirements for the program and interface with OSD oversight organizations for T&E.			
SWS Integration (\$151.7M) - Continue system engineering efforts required for the technical repackaging of the TRIDENT D5 SWS on the OHIO Replacement submarine; including review and modification of system interface drawings. Continue concept and design work to develop a missile launch tube test facility and test stand including refurbishment of a test vehicle to support launch system prototype effort and qualification. Initiation of system engineering efforts related to development of flight Test Instrumentation hardware, Special Test Vehicles, shore based and shipset mechanical and electrical support equipment, and flight test hardware. Complete system engineering design efforts associated with the physical arrangement drawings for SWS equipment within the CMC and MCC.			
Systems Engineering / Program Management (\$159.4M) - Continue to provided technical oversight including Program Office management and technical support from government laboratories for review, analysis and modeling. Commence execution of DFA program and design initiatives.			
Accomplishments/Planned Programs Subtotals	363.371	493.028	781.575

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

N/A

D. Acquisition Strategy

The missile compartment will be designed and developed to support the US and UK in development of the OHIO Replacement and Successor SSBN programs. It also enables the potential for a common US-UK CMC production, which would maximize the benefit of the ongoing US-UK partnership in strategic deterrence. Whole ship concepts and System Definition efforts will be performed primarily by the US submarine shipyards. R&D efforts will be performed by Navy laboratories, shipyards, private industry, and University Affiliated Research Centers.

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>

E. Performance Metrics

Updated Integrated Master Schedule, and CMC build strategy down-select. Development of Signature Management efforts to address knowledge gap, Concepts for Propulsor and Shafting, and Design Guidance and Interface Control Requirements.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>
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Product Development (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	
Product Development	SS/CPFF	Ship Design Contractor:EB	97.452	47.600	Mar 2011	43.617	Oct 2011	-		43.617	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Ship Design Contractor DFA Support:TBD	-	-		37.500	Jan 2012	-		37.500	Continuing	Continuing	Continuing
Product Development	WR	NSWC:Carderock, MD	28.791	76.940	Mar 2011	152.157	Oct 2011	-		152.157	Continuing	Continuing	Continuing
Product Development	WR	NSWC DFA Support:Carderock, MD	-	-		2.500	Jan 2012	-		2.500	Continuing	Continuing	Continuing
Product Development	SS/CPFF	ARL Penn State University:State College, PA	0.738	1.921	Mar 2011	0.356	Jan 2012	-		0.356	0.000	3.015	2.310
Product Development	SS/CPFF	EB:Groton, CT	4.887	7.439	Mar 2011	36.703	Oct 2011	-		36.703	Continuing	Continuing	Continuing
Product Development	SS/CPFF	NGMS:Sunnyvale, CA	30.935	15.742	Mar 2011	33.430	Oct 2011	-		33.430	Continuing	Continuing	Continuing
Product Development	WR	NUWC:Newport, RI	6.174	18.275	Mar 2011	18.711	Oct 2011	-		18.711	Continuing	Continuing	Continuing
Product Development	WR	NUWC DFA Support:Newport, RI	-	-		10.000	Jan 2012	-		10.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Missile Comp Design Contractor-EB:Groton, CT	116.159	209.359	Mar 2011	297.113	Oct 2011	-		297.113	Continuing	Continuing	Continuing
Product Development	SS/CPFF	JHU/APL:Laurel, MD	5.865	4.200	Mar 2011	6.097	Oct 2011	-		6.097	Continuing	Continuing	Continuing
Product Development	SS/CPFF	Draper Labs:Cambridge, MA	-	2.760	Mar 2011	3.500	Oct 2011	-		3.500	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMFS:NY	3.550	5.022	Mar 2011	5.254	Oct 2011	-		5.254	Continuing	Continuing	Continuing
Product Development	Various	NAVSEA:Various	1.216	0.654	Mar 2011	4.328	Oct 2011	-		4.328	Continuing	Continuing	Continuing
Product Development	WR	NOTU:FL	-	4.400	Mar 2011	5.000	Oct 2011	-		5.000	Continuing	Continuing	Continuing
Product Development	SS/CPFF	LMMSC:CA	21.749	14.132	Mar 2011	29.500	Oct 2011	-		29.500	Continuing	Continuing	Continuing
Product Development	C/CPFF	GDAIS:MA	11.318	23.475	Mar 2011	26.050	Jan 2012	-		26.050	Continuing	Continuing	Continuing
Product Development	SS/CPFF	IEC:VA	3.522	1.200	Mar 2011	1.700	Oct 2011	-		1.700	Continuing	Continuing	Continuing
Product Development	WR	NSWC:VA	0.910	2.100	Mar 2011	4.720	Oct 2011	-		4.720	Continuing	Continuing	Continuing
Product Development	SS/CPFF	BAE:MD	2.098	6.826	Mar 2011	6.577	Oct 2011	-		6.577	Continuing	Continuing	Continuing
Product Development	SS/CPFF	BNA:CA	1.248	2.239	Mar 2011	3.140	Oct 2011	-		3.140	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>
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Product Development (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	WR	NSWC Crane:IN	6.853	4.269	Mar 2011	6.100	Oct 2011	-		6.100	Continuing	Continuing	Continuing
Product Development	WR	NWC CL:CA	2.500	-		-		-		-	0.000	2.500	2.500
Product Development	SS/CPFF	SPA:VA	1.200	-		-		-		-	0.000	1.200	1.200
Product Development	Various	SSP:Various	6.569	16.212	Mar 2011	20.540	Oct 2011	-		20.540	Continuing	Continuing	Continuing
Subtotal			353.734	464.765		754.593		-		754.593			

Remarks
 Note: Various is used for multiple activities with different award dates

Test and Evaluation (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Test and Evaluation Support	C/CPFF	T&E Support:Various	0.454	1.100	Mar 2011	1.442	Oct 2011	-		1.442	Continuing	Continuing	Continuing
Government Test and Evaluation Support	WR	T&E Support:Various	0.771	1.810	Mar 2011	2.153	Oct 2011	-		2.153	Continuing	Continuing	Continuing
Travel	WR	NAVSEA HQ:Washington, D.C.	0.100	0.150	Mar 2011	0.083	Oct 2011	-		0.083	Continuing	Continuing	Continuing
Subtotal			1.325	3.060		3.678		-		3.678			

Remarks
 Note: Various is used for multiple activities with different award dates. Contractor Test & Evaluation Support cost category item funds will be sent to Shipbuilder and Support Contractors to be determined. Government Test and Evaluation Support cost category item funds will be sent to several Navy activities to be determined.

Management Services (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Management Support	C/CPFF	Various:Multiple Awards	5.727	14.115	Mar 2011	11.917	Oct 2011	-		11.917	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>
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Management Services (\$ in Millions)				FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Government Management Support	WR	Various: NSWC Carderock, MD	2.285	10.838	Mar 2011	11.052	Oct 2011	-		11.052	Continuing	Continuing	Continuing
Travel	WR	NAVSEA HQ: Washington, D.C.	0.300	0.250	Mar 2011	0.335	Oct 2011	-		0.335	Continuing	Continuing	Continuing
Subtotal			8.312	25.203		23.304		-		23.304			

Remarks
Note: Various is used for multiple activities with different award dates

	Total Prior Years Cost	FY 2011		FY 2012 Base		FY 2012 OCO		FY 2012 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	363.371	493.028		781.575		-		781.575			

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>

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Exhibit R-4A, RDT&E Schedule Details: PB 2012 Navy		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 3220: <i>SBSD Advanced Submarine System Development</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
Proj 3220				
Concept Studies	1	2010	4	2012
Platform Technology Demonstrations	1	2010	4	2016
Strategic Systems Technology Demonstrations	1	2010	4	2016
Missile Compartment Design	1	2010	4	2016
Whole Boat Concept and System Definition	1	2010	4	2016
Prototyping Effort	2	2010	4	2016
Design for Affordability	2	2012	4	2014

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy **DATE:** February 2011

APPROPRIATION/BUDGET ACTIVITY 1319: <i>Research, Development, Test & Evaluation, Navy</i> BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 ITEM NOMENCLATURE PE 0603561N: <i>(U)ADVANCED SUBMARINE SYSTEM DEVELOPMENT</i>	PROJECT 9999: <i>Congressional Adds</i>
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COST (\$ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
9999: <i>Congressional Adds</i>	7.170	-	-	-	-	-	-	-	-	0.000	7.170
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0		

A. Mission Description and Budget Item Justification

Congressional Add Projects.

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

	FY 2010	FY 2011
Congressional Add: SSBN(X) Systems Development	1.992	-
FY 2010 Accomplishments: The FY10 Congressional plus-up for SSBN(X) Systems Development will execute concept studies to narrow the design space, execute technology trade-off studies, and execute research and development for selected submarine technologies. This plus-up will be executed by the submarine design industrial base for the timely development of technology options and will reduce the risk of their successful insertion into the OHIO Replacement design.		
Congressional Add: Underwater Explosion Modeling for Non-Pressure Hull Fairing	1.992	-
FY 2010 Accomplishments: The FY10 Congressional plus-up for Underwater Explosion Modeling for Non-Pressure Hull Fairing will allow execution of underwater shock (UNDEX) modeling & simulation of composite non-pressure hull (NPH) structures, to enhance UNDEX survivability of lightweight/low cost composite fairing structures for application to US Navy Ohio Class Replacement.		
Congressional Add: High Torque, Low Speed, Direct Drive Electric Motor Technology	1.593	-
FY 2010 Accomplishments: FY10 Congressional Add: Completed design changes and lab testing on the Moog Flo-tork Electric Actuation System (EAS).		
Congressional Add: Submarine Fatline Vector Sensor Towed Array	1.593	-
FY 2010 Accomplishments: FY10 Congressional Add: Funds were used to support the Navy's Sea Power 21 Anti-Submarine Warfare (ASW) mission objectives via the development and demonstration of a Vector Sensor Towed Array (VSTA) which provides improved gain and better Target Motion Analysis (TMA). Improvements included steering in the direction of interfering sources, and instantaneously resolving right-left ambiguity of a single line array without the need for ship maneuvering.		
Congressional Adds Subtotals	7.170	-

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Exhibit R-2A, RDT&E Project Justification: PB 2012 Navy		DATE: February 2011
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C. Other Program Funding Summary (\$ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Congressional Add Projects.