Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Navy											DATE: April 2013	
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 7: *Operational Systems Development*					R-1 ITEM NOMENCLATURE PE 0204228N: *Surface Support*							
COST ($ in Millions)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	3.292	4.171	2.374	-	2.374	3.099	2.582	2.398	2.440	Continuing	Continuing
3311: *Navigation Systems*	0.000	3.292	4.171	2.374	-	2.374	3.099	2.582	2.398	2.440	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

The Surface Support RDT&E funding will be used for the research, design, development, integration testing, and documentation of a new Inertial Navigation System (INS) to support the Ballistic Missile Defense (BMD) mission. The program will implement systems engineering processes to identify specific BMD performance requirements, investigate major navigation system error sources, define new functions, research new technologies, algorithms, and techniques to improve system performance, conduct analyses of alternatives, create preliminary and final design concepts, develop new hardware components and associated software, and conduct land based and shipboard testing.

The Navy's current INS is the AN/WSN-7(V) Ring Laser Gyro Navigator (RLGN), a legacy 1980's design that was first installed in 1998 and is now obsolete. This is a proprietary design. Estimates to redesign obsolete components for new production systems for SCN platforms exceed current budgets. The RLGN is reaching its limit with respect to providing the high-accuracy navigation solution required to meet known and emerging mission requirements. Navigator of the Navy's Vision 2025 identifies emergent requirements with respect to improved navigation in a GPS denied environment, littoral warfare, mine countermeasures, and manned and unmanned vehicle operations that cannot be met with existing systems. The RLGN employs an Inertial Measuring Unit (IMU) with three single-axis ring laser gyros that allow the system to provide continuous and automatic data outputs of the ship's geographic position (latitude, longitude), horizontal and vertical linear velocity (Ve, Vn, Vv), attitude (heading, roll, and pitch) and attitude rates. The INS provides mission critical ship's position and attitude data to shipboard sensors (such as radars), combat systems, gun and missile systems. The INS uses data from the Global Positioning System (GPS) to periodically update (i.e., reset) its position and internal clock. The INS is the ship's primary position source in absence of GPS.

Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Navy					DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 7: *Operational Systems Development*			R-1 ITEM NOMENCLATURE PE 0204228N: *Surface Support*		
B. Program Change Summary ($ in Millions)	**FY 2012**	**FY 2013**	**FY 2014 Base**	**FY 2014 OCO**	**FY 2014 Total**
Previous President's Budget	3.377	4.171	2.963	-	2.963
Current President's Budget	3.292	4.171	2.374	-	2.374
Total Adjustments	-0.085	0.000	-0.589	-	-0.589
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.085	0.000			
• Rate/Misc Adjustments	0.000	0.000	-0.589	-	-0.589

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 7: *Operational Systems Development*	R-1 ITEM NOMENCLATURE PE 0204228N: *Surface Support*	PROJECT 3311: *Navigation Systems*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
3311: *Navigation Systems*	0.000	3.292	4.171	2.374	-	2.374	3.099	2.582	2.398	2.440	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0		0	0	0	0	0		

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

The Surface Support RDT&E funding will be used for the research, design, development, integration testing, and documentation of a new Inertial Navigation System (INS) to support the Ballistic Missile Defense (BMD) mission. The program will implement systems engineering processes to identify specific BMD performance requirements, investigate major navigation system error sources, define new functions, research new technologies, algorithms, and techniques to improve system performance, conduct analyses of alternatives, create preliminary and final design concepts, develop new hardware components and associated software, and conduct land based and shipboard testing.

The Navy's current INS is the AN/WSN-7(V) Ring Laser Gyro Navigator (RLGN), a legacy 1980's design that was first installed in 1998 and is now obsolete. This is a proprietary design. Estimates to redesign obsolete components for new production systems for SCN platforms exceed current budgets. The RLGN is reaching its limit with respect to providing the high-accuracy navigation solution required to meet known and emerging mission requirements. Navigator of the Navy's Vision 2025 identifies emergent requirements with respect to improved navigation in a GPS denied environment, littoral warfare, mine countermeasures, and manned and unmanned vehicle operations that cannot be met with existing systems. The RLGN employs an Inertial Measuring Unit (IMU) with three single-axis ring laser gyros that allow the system to provide continuous and automatic data outputs of the ship's geographic position (latitude, longitude), horizontal and vertical linear velocity (Ve, Vn, Vv), attitude (heading, roll, and pitch) and attitude rates. The INS provides mission critical ship's position and attitude data to shipboard sensors (such as radars), combat systems, gun and missile systems. The INS uses data from the Global Positioning System (GPS) to periodically update (i.e., reset) its position and internal clock. The INS is the ship's primary position source in absence of GPS.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
Title: Systems Engineering	3.292	4.171	2.374
Articles:	0	0	0
FY 2012 Accomplishments:			
- Assessed current AN/WSN-7 design, performance, and support gaps.			
- Completed draft INS-R sensor, processing hardware/software, and interface specification documents.			
- Generated acquisition documentation.			
- Issued draft Request for Proposal (RFP) for INS-R sensor development.			
FY 2013 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 7: *Operational Systems Development*	R-1 ITEM NOMENCLATURE PE 0204228N: *Surface Support*	PROJECT 3311: *Navigation Systems*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2012	FY 2013	FY 2014
- Award competitive contract for INS-R sensor development. - Develop INS-R processing hardware/software design. - Develop INS-R Modeling and Simulation capability. ***FY 2014 Plans:*** - Integrate INS-R sensor with processing hardware/software.			
Accomplishments/Planned Programs Subtotals	3.292	4.171	2.374

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
• OPN/0670: *Other Navigation*	20.582	23.392	39.509		39.509	41.392	40.974	32.298	42.378	0.000	302.147

Remarks

D. Acquisition Strategy

Procurement of the Inertial Navigation System (INS) planned to begin in FY14.

E. Performance Metrics

FY12:
- Completed Design, performance, and support gap analysis.
- Drafted Request for Proposal (RFP) issued for INS-R sensor development.
- Completed INS-R Single Acquisition Management Plan (SAMP).

FY13:
- Initial INS-R processing hardware/software development.
- Initial INS-R Modeling and Simulation capability.
- Complete INS-R CDD.

FY14:
- INS-R sensor integration with processing hardware/software.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2014 Navy			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 7: *Operational Systems Development*	R-1 ITEM NOMENCLATURE PE 0204228N: *Surface Support*	PROJECT 3311: *Navigation Systems*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Systems Engineering/ Design	WR	SPAWAR Atlantic:Little Creek, VA	0.000	0.777	Jul 2012	0.761	Oct 2012	0.448	Oct 2013	-		0.448	Continuing	Continuing	Continuing
Systems Engineering/ Design	C/CPFF	WR Systems:Norfolk, VA	0.000	1.019	Feb 2012	0.545	Oct 2012	0.278	Oct 2013	-		0.278	0.000	1.842	
Systems Engineering/ Design	C/CPFF	Penn State/ ARL:Warminster, PA	0.000	0.891	Feb 2012	0.500	Oct 2012	0.266	Oct 2013	-		0.266	0.000	1.657	
Systems Engineering/ Design	WR	NSWC Dahlgren:Dahlgren, VA	0.000	0.154	Feb 2012	0.117	Oct 2012	0.025	Oct 2013	-		0.025	0.000	0.296	
Systems Engineering/ Design	C/CPFF	Old Dominion University:Suffolk, VA	0.000	0.250	Feb 2012	0.200	Oct 2012	0.000		-		0.000	0.000	0.450	
Systems Engineering/ Design	C/CPFF	Contractor TBD:TBD	0.000	0.000		1.672	Jul 2013	1.000	Jan 2014	-		1.000	0.000	2.672	
		Subtotal	0.000	3.091		3.795		2.017		0.000		2.017			

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management	C/CPFF	TBD:TBD	0.000	0.201	Feb 2012	0.376	Dec 2012	0.357	Dec 2013	-		0.357	0.000	0.934	
		Subtotal	0.000	0.201		0.376		0.357		0.000		0.357	0.000	0.934	

	All Prior Years	FY 2012 Cost	FY 2012 Award Date	FY 2013 Cost	FY 2013 Award Date	FY 2014 Base Cost	FY 2014 Base Award Date	FY 2014 OCO Cost	FY 2014 OCO Award Date	FY 2014 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	3.292		4.171		2.374		0.000		2.374			

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 7: *Operational Systems Development*	R-1 ITEM NOMENCLATURE PE 0204228N: *Surface Support*	PROJECT 3311: *Navigation Systems*

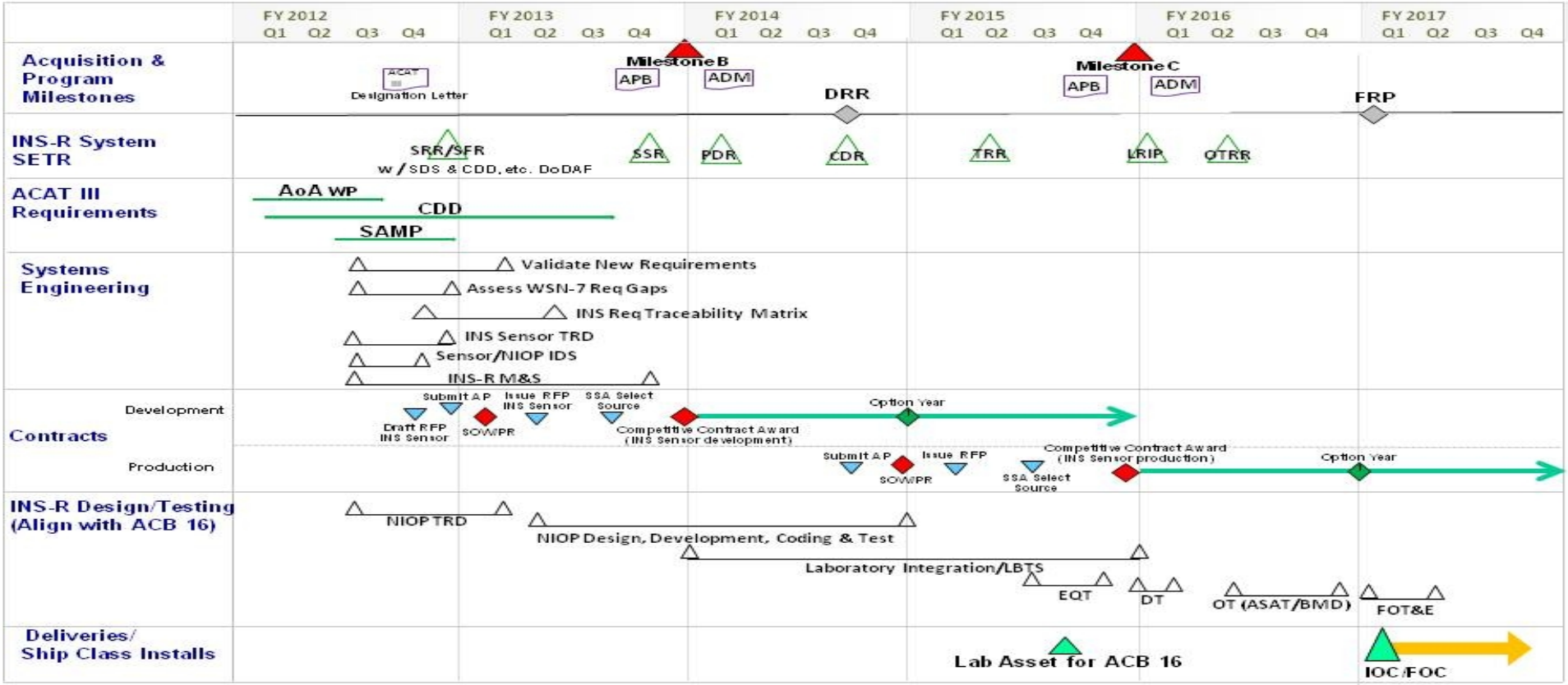

Exhibit R-4A, RDT&E Schedule Details: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 7: *Operational Systems Development*	R-1 ITEM NOMENCLATURE PE 0204228N: *Surface Support*	PROJECT 3311: *Navigation Systems*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 3311				
Analysis of Alternatives (AoA) White Paper	1	2012	3	2012
Capability Development Document (CDD)	1	2012	3	2013
Single Acquisition Management Plan (SAMP)	2	2012	4	2012
Designation Letter	3	2012	4	2012
Validate New Requirements	3	2012	1	2013
Assess WSN-7 Req Gaps	3	2012	4	2012
Inertial Navigation System (INS) Requirement Traceability Matrix	4	2012	2	2013
INS Sensor Tech Requirements Document (TRD)	3	2012	4	2012
Navigation Input Ouput Processor (NIOP) TRD	3	2012	1	2013
Sensor/NIOP Interface Design Specification (IDS)	3	2012	4	2012
INS-Replacement (INS-R) Modeling & Simulation (M&S)	3	2012	4	2013
System Requirement Review (SRR)/System Function Review (SFR)	4	2012	4	2012
Draft Request For Proposal (RFP) INS Sensor	4	2012	4	2012
Submit Acquisition Plan (AP)	4	2012	4	2012
Statement of Work (SOW)/Procurement Request (PR)	1	2013	1	2013
Issue RFP INS Sensor	2	2013	2	2013
NIOP Design, Development, Coding & Test	2	2013	4	2014
Sensor Sub Assembly (SSA) Source Selection	4	2013	4	2013
Milestone B Acquisition Program Baseline (APB)	4	2013	4	2013
Software Specification Review (SSR)	4	2013	4	2013
Competitive Contract Award (INS Sensor Development)	4	2013	4	2013

Exhibit R-4A, RDT&E Schedule Details: PB 2014 Navy		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 7: *Operational Systems Development*	R-1 ITEM NOMENCLATURE PE 0204228N: *Surface Support*	PROJECT 3311: *Navigation Systems*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Laboratory Integration/Land Based Test Site (LBTS)	1	2014	1	2016
Preliminary Design Review (PDR)	1	2014	1	2014
Milestone B Acquisition Decision Memo (ADM)	1	2014	1	2014
Design Readiness Review (DRR)	4	2014	4	2014
Critical Design Review (CDR)	4	2014	4	2014
Submit AP 2	4	2014	4	2014
Competitive Contract Option Award (INS Sensor Development)	1	2015	1	2015
SOW/PR 2	1	2015	1	2015
Test Readiness Review (TRR)	2	2015	2	2015
SSA Source Selection 2	3	2015	3	2015
Environmental Qualification Test (EQT)	3	2015	4	2015
Milestone C APB	4	2015	4	2015
Lab Asset for Wallops	4	2015	4	2015
Competitive Contract Award (INS Sensor Production)	1	2016	1	2016
Low Rate Initial Production (LRIP)	1	2016	1	2016
Development Test (DT)	1	2016	1	2016
Milestone C ADM	1	2016	1	2016
Operational Test Readiness Review (OTRR)	2	2016	2	2016
Operational Test (OT) At Sea Alignment Testing/Ballistic Missile Defense (ASAT/BMD)	2	2016	4	2016
Competitive Contract Option Award (INS Sensor Production)	1	2017	1	2017
Full Rate Production (FRP)	1	2017	1	2017
Follow on Test & Evaluation (FOT&E)	1	2017	2	2017
Initial Operational Capability (IOC)	1	2017	1	2017