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Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Navy										Date: February 2018		
Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 6: RDT&E Management Support					R-1 Program Element (Number/Name) PE 0604759N / Major T&E Investment							
COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
Total Program Element	0.000	51.375	52.634	77.014	-	77.014	85.348	83.560	71.548	61.514	Continuing	Continuing
2195: T & E Investment	0.000	41.704	52.634	77.014	-	77.014	85.348	83.560	71.548	61.514	Continuing	Continuing
9999: Congressional Adds	0.000	9.671	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.671

A. Mission Description and Budget Item Justification

This project corrects major deficiencies, improves Test & Evaluation (T&E) capabilities, and increases T&E support effectiveness at Navy Major Range and Test Facility Base. The T&E Investment project provides improved test capabilities at the following test facilities: the Naval Undersea Warfare Center Division Newport Atlantic Undersea Test and Evaluation Center, Andros Island, Bahamas; the Nanoose and Dabob ranges of the Naval Undersea Warfare Center Division Keyport, Keyport, WA; the Sea Range, Land Ranges, Targets, Ordnance T&E Facility, Test Wing Pacific located at the Naval Air Warfare Center Weapons Division, Point Mugu, CA and China Lake, CA; and the Atlantic Test Range, Air Combat Environment T&E Facility, Electromagnetic Environmental Effects, Air Vehicle Modification and Instrumentation facility, Test Wing Atlantic, Targets, and the Propulsion Systems Evaluation Facility located at the Naval Air Warfare Center Aircraft Division, Patuxent River, MD and the test and evaluation capabilities located at the Pacific Missile Range Facility, Kauai, HI.

JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under RESEARCH, DEVELOPMENT, TEST and EVALUATION MANAGEMENT SUPPORT because it supports efforts directed toward sustaining or modernizing installations or operations required for general research, development, test and evaluation.

B. Program Change Summary (\$ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	42.109	52.634	52.694	-	52.694
Current President's Budget	51.375	52.634	77.014	-	77.014
Total Adjustments	9.266	0.000	24.320	-	24.320
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.712	0.000			
• Program Adjustments	0.000	0.000	24.850	-	24.850
• Rate/Misc Adjustments	-0.009	0.000	-0.530	-	-0.530
• Congressional General Reductions	-0.013	-	-	-	-
Adjustments					
• Congressional Add Adjustments	10.000	-	-	-	-

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<u>Congressional Add Details (\$ in Millions, and Includes General Reductions)</u>		FY 2017	FY 2018
Project: 9999: <i>Congressional Adds</i>			
Congressional Add: <i>Modeling and Simulation for Ground Testing Capabilities</i>		9.671	0.000
Congressional Add Subtotals for Project: 9999		9.671	0.000
Congressional Add Totals for all Projects		9.671	0.000
<u>Change Summary Explanation</u>			
The funding increase from FY 2017 to FY 2018 supports material procurements for the replacement of in-water sensors at AUTECH, additional equipment purchases for the Range Support aircraft, and the purchase of Radio Frequency (RF) signal generation and distribution equipment.			
Funding increase from FY18 to FY19 supports the development of a common Navy modeling and Simulation (M&S) environment that is persistent across multiple domains. Current M&S capabilities are not easily integratable or interoperable. An integrated multi domain M&S environment will provide a reusable and persistent ability to perform analysis, engineering, and testing in mixed modeling lab and range environments.			
Technical: Not applicable.			
Schedule: Not applicable.			

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COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
2195: T & E Investment	0.000	41.704	52.634	77.014	-	77.014	85.348	83.560	71.548	61.514	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project corrects major deficiencies, improves Test & Evaluation (T&E) capabilities, and increases T&E support effectiveness at Navy Major Range and Test Facility Base. The T&E Investment project provides improved test capabilities at the following test facilities: the Naval Undersea Warfare Center Division Newport Atlantic Undersea Test and Evaluation Center (AUTEC), Andros Island, Bahamas; the Nanoose and Dabob ranges of the Naval Undersea Warfare Center Division Keyport, Keyport, WA; the Sea Range, Land Ranges, Targets, Ordnance T&E Facility, Test Wing Pacific located at the Naval Air Warfare Center Weapons Division, Point Mugu, CA and China Lake, CA; and the Atlantic Test Range, Air Combat Environment T&E Facility, Electromagnetic Environmental Effects, Air Vehicle Modification and Instrumentation facility, Test Wing Atlantic, Targets, and the Propulsion Systems Evaluation Facility located at the Naval Air Warfare Center Aircraft Division, Patuxent River, MD and the test and evaluation capabilities located at the Pacific Missile Range Facility, Kauai, HI.

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

	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Title: UNDERSEA RANGE INVESTMENTS	3.724	8.624	6.611	0.000	6.611
Articles:	-	-	-	-	-
Description: This effort funds the modernization, upgrades, and new test and evaluation capabilities required at the Navy's Major Range Test Facility Base undersea ranges, to include AUTEC, Andros Island, Bahamas and the Nanoose and Dabob ranges of the Naval Undersea Warfare Center Division Keyport, Keyport, WA.					
FY 2018 Plans: - Continue the minor upgrade and modernization of test capabilities at AUTEC, Nanoose and Dabob. - Continue replacement of in-water sensors at AUTEC. - Continue replace of range tracking radar at AUTEC. - Continue range radar obsolescence project at Nanoose and Dabob. - Continue tracking system modernization at Nanoose and Dabob. - Continue recovery system improvement at Nanoose and Dabob. - Continue operating system upgrade at Nanoose and Dabob. - Complete range craft service life extension at Nanoose and Dabob. - Complete launch system modernization at Nanoose and Dabob.					
FY 2019 Base Plans: - Continue the minor upgrade and modernization of test capabilities at AUTEC, Nanoose and Dabob. - Continue tracking system modernization at Nanoose and Dabob.					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<div>- Complete replacement of in-water sensors at AUTC.</div> <div>- Complete replace of range tracking radar at AUTC.</div> <div>- Complete range radar obsolescence project at Nanoose and Dabob.</div> <div>- Complete recovery system improvement at Nanoose and Dabob.</div> <div>- Complete operating system upgrade at Nanoose and Dabob.</div> <div>- Initiate torpedo control panel modernization at Nanoose and Dabob.</div> <div>FY 2019 OCO Plans:</div> <div>N/A</div> <div>FY 2018 to FY 2019 Increase/Decrease Statement:</div> <div>The funding decrease from FY 2018 to FY 2019 due to the completion of material purchases for in-water sensors at AUTC, range tracking radar at AUTC, and the range radar obsolescence project at Nanoose and Dabob.</div>						
Title: OPEN AIR RANGE INVESTMENTS		35.930	38.610	40.167	0.000	40.167
Articles:		-	-	-	-	-
Description: This effort funds the modernization and upgrades of existing capabilities and the development of new T&E capabilities required at the Navy's Major Range Test Facility Base open air ranges at the Naval Air Warfare Center Aircraft Division (NAWCAD), Patuxent River, MD, Naval Air Warfare Center Weapons Division (NAWCWD), Point Mugu, CA and China Lake, CA and Pacific Missile Range Facility (PMRF), Kauai, HI.						
FY 2018 Plans:						
<div>- Continue the minor upgrade and modernization of test capabilities at NAWCAD, NAWCWD and PMRF.</div> <div>- Continue procurement of Range Support Aircraft.</div> <div>- Continue the modernization of the telemetry antenna controllers and data processors at PMRF.</div> <div>- Continue the modernization of the imaging radar at PMRF.</div> <div>- Complete procurement of new aircraft position tracking system.</div> <div>- Complete target vessel modernization at NAWCWD.</div> <div>- Complete the upgrade of the telemetry processing system at NAWCAD.</div> <div>- Complete the modernization of the InfraRed measurement capability at NAWCAD.</div> <div>- Complete the modernization of the video tracking mounts at PMRF.</div> <div>- Complete the modernization of the Land Range timing and instrumentation control system at NAWCWD.</div> <div>- Complete the modernization of the Land Range and Sea Range voice switch at NAWCWD.</div> <div>- Initiate the acquisition of tactical data link capability at NAWCAD.</div>						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<div><div>- Initiate the upgrade of the avionic data processing and display system at NAWCAD.</div><div>- Initiate modernization of the imaging radar mechanical assemblies at PMRF.</div><div>- Initiate the acquisition of new Infrared and Ultraviolet measurement capability at NAWCAD.</div><div>- Initiate the development of Environmental Impact Statements at NAWCAD and NAWCWD.</div><div>- Initiate the replacement of the FOCUS cable at NAWCWD.</div><div>- Initiate the development and integration of Telemetry and optics equipment on the Range Support Aircraft.</div><div>- Initiate the site preparation and integration of radars and emitters at NAWCWD.</div></div> <div><div>FY 2019 Base Plans:</div><div>- Continue the minor upgrade and modernization of test capabilities at NAWCAD, NAWCWD and PMRF.</div><div>- Continue procurement of Range Support Aircraft.</div><div>- Continue the modernization of the telemetry antenna controllers and data processors at PMRF.</div><div>- Continue the modernization of the imaging radar at PMRF.</div><div>- Complete the modernization of the InfraRed measurement capability at NAWCAD.</div><div>- Continue the upgrade of the avionic data processing and display system at NAWCAD.</div><div>- Continue modernization of the imaging radar mechanical assemblies at PMRF.</div><div>- Continue the development of Environmental Impact Statements at NAWCAD and NAWCWD.</div><div>- Complete the acquisition of tactical data link capability at NAWCAD.</div><div>- Complete the acquisition of new Infrared and Ultraviolet measurement capability at NAWCAD.</div><div>- Complete the replacement of the FOCUS cable at NAWCWD.</div><div>- Complete the development and integration of Telemetry and optics equipment on the Range Support Aircraft.</div><div>- Complete the site preparation and integration of radars and emitters at NAWCWD.</div><div>- Initiate and complete modernization of air traffic control radar at NAWCWD.</div><div>- Initiate upgrade for ground based testing against a 5th generation aerial threat. This effort will upgrade an existing track test facility at NAWC WD with the ability to suspend a 5th generation aircraft for use in testing sensors.</div></div> <div><div>FY 2019 OCO Plans:</div><div>N/A</div></div> <div><div>FY 2018 to FY 2019 Increase/Decrease Statement:</div><div>The funding increase from FY 2018 to FY 2019 supports to the procurement of an FAA compliant Air Traffic Control Radar for R2508 Joint Use airspace at China Lake and upgrade of the Supersonic Navy Ordnance Research Track (SNORT) to support weapons testing against 5th Generation aerial threats.</div></div>						
Title: TEST FACILITIES INVESTMENTS		2.050	5.400	30.236	0.000	30.236

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Articles:		-	-	-	-	-
<p>Description: This effort funds the modernization and upgrades of existing capabilities and the development of new Test & Evaluation capabilities required at the Navy's Major Range Test Facility Base ground test facilities at NAWCAD, Patuxent River, MD, and NAWCWD, Point Mugu, CA and China Lake, CA.</p> <p>FY 2018 Plans:</p> <ul style="list-style-type: none">- Continue the minor upgrade and modernization of test capabilities at NAWCAD and NAWCWD.- Continue the upgrade to general instrumentation and equipment.- Continue the modernization of the helicopter propulsion data acquisition system.- Initiate the procurement of time precision RF signal generation and distribution equipment. <p>FY 2019 Base Plans:</p> <p>-Initiate the test cell performance improvement at NAWCAD. This effort will upgrade Propulsion Systems Evaluation Facility turbine engine test cell to provide uniform temperature and pressure intake airflow and improve dynamometer performance. FY19 work includes establishing requirements, analyzing solution alternatives, and preliminary and critical design reviews.</p> <p>- Initiate the modernization of the data acquisition and processing system at NAWCAD. This effort will modernize the Electro Magnetic Pulse (EMP) instrumentation by replacing analog fiber links and obsolete oscilloscopes and control triggers with modern supportable equipment. In FY19, the prototype instrumentation package will be developed.</p> <p>- Initiate the procurement of the direct drive electromagnetic test system at NAWCAD. This effort will evaluate potential amplifier solutions to replace amplifiers at the Electromagnetic/Environmental/Effects (E3)facility that are no longer supported by the manufacturer. The replacement amplifiers will provide less distortion/better representation responses and be maintainable.</p> <p>- Initiate the modernization of the insensitive munitions test arena at NAWCWD. Tasks include developing requirements for modernizing the control room, test pads and cable paths to the test arena and developing a contract package to implement the modernization of the Ordnance test facility.</p> <p>Modeling and Simulation:</p>						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<p>- Initiate and complete a study to evaluate past and current modeling and simulation environments in government and industry. Effort will confirm requirements of advanced modeling and simulation detailed requirements, analyze solution alternatives, and conduct design reviews for technical products.</p> <p>-Initiate multi-site and multi-domain modeling and simulation test bed design. Develop virtualized representations of high-priority Navy systems to integrate into complex digital battle space and into National Cyber Range. Innovate and standardize virtualization and integration process for use in DON Modeling & Simulation/Live Virtual Constructive (LVC) Environment. Evaluate architecture of major modeling and simulation environments and integrate major multi-domain test beds using best practices, open interfaces and ensure standing persistent connectability. Task will promulgate Enterprise models across Air, Surface, Subsurface and Cyber domains. Collaborate on improvements required for multi-Domain modeling and complex security environments to facilitate "Capability" Analysis/RDT&E/Training and fund enabling technologies.</p> <p>-Initiate common modeling and simulation tool design effort. Enhance Model Based Systems Engineering tools and integrate tools with T&E capabilities, allowing improved planning for agile software testing and cyber evaluations. Develop state-of-the-art data analysis and mining tools to integrate and present cohesive results in complex LVC environments. Develop architecture to integrate emerging Threat Intelligence products for both classified software, virtual and low-cost hardware representations. Improve and integrate Integrated Threat Analysis Simulation Environment to meet Navy requirements. Update immersive visualization model suite to add complex Electronic Warfare (EW) effects and improve ability to evaluate and understand complex interactions tied to warfighting outcomes. Continue to integrate and transition best-of-breed innovations coming from research centers, DIUX and the gaming industry into use at RDT&E facilities for program and prototyping support. Incorporate improved EW effects/interactions into constructive modeling and integrate with virtual/hardware in the loop labs/ranges to create a coherent LVC EW/Electromagnetic Spectrum Maneuver Warfare evaluation environment. Analyze future state and develop plan to assess new capabilities for fusion and predictive systems. Integrate ONR modeling tools into test beds to allow assessment of human performance when assisted by improved machine-learning technologies. Focus on integration with Next Generation Threat System as core enterprise simulation and allow assessment in both test/training environments. Design, develop and integrate reference Interoperability emulators, low fidelity capability assessment tools and battlespace suite design to allow platforms to assess performance early in system development</p> <p>- Continue the minor upgrade and modernization of test capabilities at NAWCAD and NAWCWD and the upgrade to general instrumentation and equipment.</p>						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)						
		FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
<p>- Complete the modernization of the helicopter propulsion data acquisition system</p> <p>- Complete the procurement of time precision RF signal generation and distribution equipment.</p> <p>-Initiate upgrade for model and simulation testing against a 5th generation aerial threat. This effort will develop the capability to synchronize radio frequency output of different electronic warfare environment generators for a coherent presentation."</p> <p><i>FY 2019 OCO Plans:</i> N/A</p> <p><i>FY 2018 to FY 2019 Increase/Decrease Statement:</i> Funding increase from FY 2018 to FY 2019 supports the development of a common Navy Modeling and Simulation (M&S) environment that is persistent across multiple domains and for the upgrade of electronic warfare (EW) environment generator output capabilities. Current M&S capabilities are not easily integratable or interoperable. An integrated multi domain M&S environment will provide a reusable and persistent ability to perform analysis, engineering, and testing in mixed modeling lab and range environments. This funding increase also supports an upgrade to the Air Combat Environment Test and Evaluation Facility to support platform and sensor testing against 5th generation aerial threats</p>						
Accomplishments/Planned Programs Subtotals		41.704	52.634	77.014	0.000	77.014
C. Other Program Funding Summary (\$ in Millions) N/A						
Remarks						
D. Acquisition Strategy Not Applicable.						
E. Performance Metrics Successfully achieve Initial Operational Capability of 8-15 Improvement and Modernization projects per year and have 90% of test capabilities scheduled in support of Navy acquisition test programs within 180 days.						

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COST (\$ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
9999: Congressional Adds	0.000	9.671	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.671
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification
Congressional Add

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2017	FY 2018
Congressional Add: Modeling and Simulation for Ground Testing Capabilities	9.671	0.000
FY 2017 Accomplishments: Develop/integrate models for jammer simulator and open loop stimulator; procure magic wall transporter; upgrade lightning test capability; develop wet/dry aircraft instrumentation prototype; develop electronic warfare common open-air and ground test instrumentation; develop interface standards for real time ground test environments; upgrade ground test target presentation capability; upgrade network storage capability.		
FY 2018 Plans: N/A		
Congressional Adds Subtotals	9.671	0.000

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

Remarks

D. Acquisition Strategy
Not required for Congressional Adds

E. Performance Metrics
Not required for Congressional Adds