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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Navy **Date:** March 2023

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 6: RDT&E Management Support</i>	R-1 Program Element (Number/Name) PE 0604759N / <i>Major T&E Investment</i>
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	0.000	95.451	141.371	74.221	-	74.221	78.283	75.036	122.168	122.557	Continuing	Continuing
2195: <i>T & E Investment</i>	0.000	83.867	103.371	74.221	-	74.221	78.283	75.036	122.168	122.557	Continuing	Continuing
9999: <i>Congressional Adds</i>	0.000	11.584	38.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	49.584

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 ranges and facilities. The T&E Investment project improves, modernizes and adds new 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, Target Operations, 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, Target Operations, 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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	96.617	95.316	76.954	-	76.954
Current President's Budget	95.451	141.371	74.221	-	74.221
Total Adjustments	-1.166	46.055	-2.733	-	-2.733
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-1.945			
• Congressional Rescissions	-	-			
• Congressional Adds	-	48.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.166	0.000			
• Program Adjustments	0.000	0.000		-2.624	-2.624
• Rate/Misc Adjustments	0.000	0.000		-0.109	-0.109

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

Project: 9999: *Congressional Adds*

FY 2022	FY 2023

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Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Congressional Add: <i>Joint simulation environment</i>	0.000	8.000
Congressional Add: <i>Lab and test range upgrades- targets</i>	11.584	0.000
Congressional Add: <i>Real time pulse level modeling and simulation</i>	0.000	10.000
Congressional Add: <i>Test capabilities accel. - PMRF data management modernization</i>	0.000	20.000
Congressional Add Subtotals for Project: 9999	11.584	38.000
Congressional Add Totals for all Projects	11.584	38.000

Change Summary Explanation

Funding: FY 2024 funding request was reduced by \$2.933 million to fund other priority programs within the department and increased by \$0.200 million for miscellaneous adjustments to MRTFB Modernization Projects for a net decrease of 2.733 million
 Schedule: Not applicable.
 Technical: Not applicable.

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Appropriation/Budget Activity 1319 / 6					R-1 Program Element (Number/Name) PE 0604759N / Major T&E Investment				Project (Number/Name) 2195 / T & E Investment			
COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
2195: T & E Investment	0.000	83.867	103.371	74.221	-	74.221	78.283	75.036	122.168	122.557	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 ranges and facilities. The T&E Investment project improves, modernizes and adds new 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, Target Operations, 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, Target Operations, 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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Title: UNDERSEA RANGE INVESTMENTS	25.498	32.962	18.905	0.000	18.905
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 2023 Plans:					
- Complete upgrade to acoustic acquisition systems and replace the acoustic signal processing systems at Nanoose and Dabob.					
- Complete replacement of the acoustic signal processing system at AUTEC.					
- Complete modernization of acoustic tracking and beamforming capability at Nanoose and Dabob.					
- Complete replacement of radio communication system at Nanoose and Dabob.					
- Continue the minor upgrade and modernization of test capabilities at AUTEC, Nanoose and Dabob.					
- Continue replacement of underwater cables to hydrophone arrays at Nanoose and Dabob.					
- Continue replacement of the array structures at Nanoose and Dabob.					
- Continue replacement of the hydrophone tracking system at AUTEC.					
- Continue replacement of the tracking display system at AUTEC.					
- Continue replacement of universal winch fiber optic at Nanoose and Dabob.					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>- Continue real time tracking software upgrade at Nanoose and Dabob.</p> <p>FY 2024 Base Plans:</p> <ul style="list-style-type: none"> - Complete replacement of universal winch fiber optic at Nanoose and Dabob. - Complete real time tracking software upgrade at Nanoose and Dabob. - Continue the minor upgrade and modernization of test capabilities at AUTEK, Nanoose and Dabob. - Continue replacement of underwater cables to hydrophone arrays at Nanoose and Dabob. - Continue replacement of the array structures at Nanoose and Dabob. - Continue replacement of the hydrophone tracking system at AUTEK. - Continue replacement of the tracking display system at AUTEK. - Initiate and complete modernization of radio communication system at AUTEK. - Initiate upgrade of T&E target emulator at Nanoose and Dabob. - Initiate upgrade of range operational security sensors at Nanoose and Dabob. <p>FY 2024 OCO Plans: N/A</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Funding decrease from FY 2023 to FY 2024 due to the completion of multiple projects including the signal processor replacement at AUTEK and the signal processor replacement, acoustic beamforming capability development and the radio replacement at Nanoose and Dabob.</p>					
<p>Title: OPEN AIR RANGE INVESTMENTS</p> <p align="right">Articles:</p> <p>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.</p> <p>FY 2023 Plans:</p> <ul style="list-style-type: none"> - Complete the imaging radar transmitter modernization at PMRF. - Complete tracking pedestal modernization at NAWCAD. - Complete imaging radar modernization at NAWCAD. - Continue the minor upgrade and modernization of test capabilities at NAWCAD, NAWCWD and PMRF. - Continue procurement of Range Support Aircraft. - Continue the development and integration of Telemetry equipment on the Range Support Aircraft. 	41.104	43.735	40.276	0.000	40.276
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
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<ul style="list-style-type: none"> - Continue optical tracking mount replacement at PMRF. - Continue software modifications to increase air warfare battleshaping capabilities at NAWCWD. - Continue mobile radio replacement at NAWCWD. - Complete telemetry recorder replacement at PMRF. - Continue upgrades to telemetry collection and processing capabilities at NAWCWD. - Continue upgrades to telemetry collection and processing capabilities at PMRF. <p>FY 2024 Base Plans:</p> <ul style="list-style-type: none"> - Complete procurement of Range Support Aircraft. - Complete optical tracking mount replacement at PMRF. - Complete mobile radio replacement at NAWCWD. - Continue the minor upgrade and modernization of test capabilities at NAWCAD, NAWCWD and PMRF. - Continue the development and integration of Telemetry equipment on the Range Support Aircraft. - Continue software modifications to increase air warfare battleshaping capabilities at NAWCWD. - Continue upgrades to telemetry collection and processing capabilities at NAWCWD. - Continue upgrades to telemetry collection and processing capabilities at PMRF. - Initiate and complete purchase of network based telemetry instrumentation at NAWCAD. - Initiate and complete purchase of networked flight test instrumentation at NAWCAD. - Initiate and complete modernization of telemetry data recorders at NAWCAD. - Initiate communication system upgrade on Mobile At Sea Sensor at PMRF. - Initiate replacement of flight termination system at China Lake. - Initiate imaging radar transmitter replacement at PMRF. - Initiate cross-domain solution upgrade at NAWCAD. - Initiate upgrade of the R2508 microwave radar relay system at NAWCWD. <p>FY 2024 OCO Plans: N/A</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: Funding decrease from FY 2023 to FY 2024 due to the completion of multiple projects including radar transmitter and telemetry recorder projects at PMRF and imaging radar modernization at NAWC AD.</p>					
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Title: TEST FACILITIES INVESTMENTS	17.265	26.674	15.040	0.000	15.040
Articles:	-	-	-	-	-

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<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 2023 Plans:</p> <ul style="list-style-type: none"> - Continue the minor upgrade and modernization of test capabilities at NAWCAD and NAWCWD and the upgrade to general instrumentation and equipment. - Continue the modernization of the insensitive munitions test arena at NAWCWD. Tasks include renovating and modernizing the control room, refurbishing the test pads and cable paths to the test arena and replacing associated cabling between the test pad and control room at the Ordnance test facility. - Continue the modernization of the ordnance test arena at NAWCWD by replacing conduits, cabling, firing control system and data collection system. - Continue helicopter drive system upgrade by aligning test stand and replacing loading and instrumentation at NAWCAD. - Continue modernization of environmental test chambers at NAWCWD. - Continue modernization of the electromagnetic radiation test area at NAWCAD. - Continue development of direct drive electromagnetic pulse test capability at NAWCAD. - Continue development of an integrated fire control test environment at NAWCAD. <p>Modeling and Simulation:</p> <ul style="list-style-type: none"> - Complete development of high fidelity blue-on-red and red-on-blue jamming technique models and simulations including blue-on-blue EMI that are realistic and observed across all systems. Provide a means to test and train in degraded and denied environments for Communications, Global Positioning System (GPS), Link, and Radar modes. - Complete integration of multi-domain reference interoperability emulators, low fidelity capability assessment tools and battlespace suites in labs and testbeds designed to allow platforms to assess performance early in system development. - Complete developing scalable and reusable M&S environments for experimenting and testing with new concepts and warfighting capabilities across Doctrine, Organization, Training, Materiel, Leadership, Personnel and Facilities (DOTMLPF) spectrum. Task includes development of M&S capabilities in order to support T&E requirements associated with subsurface environment capabilities, undersea sensors, data fusion capabilities, 					

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>and measuring the effectiveness of Counter-Intelligence Surveillance, Reconnaissance and Targeting (C-ISRT), Cyber and Electronic Warfare effects in near real time supporting Electromagnetic Maneuver Warfare (EMW) and Integrated Fires (IF) (e.g., Military Deception/Operational Deception (MILDEC/OPDEC), Computer Network Attack (CNA), Computer Network Exploitation (CNE), and active / passive Electronic Attack (EA).</p> <ul style="list-style-type: none"> - Complete development of Next Generation M&S Space capability for users across the Test and Evaluation labs, facilities and ranges including LVC, Analysis, Tactics, Techniques and Procedures (TTP) planning, Testing, Training, and Fleet Design activities. - Complete enhancement of modeling behaviors (e.g. evasion rules and environment data from blue and red torpedoes) to support assessment of autonomous behaviors in a warfighting environment, improve decision making via mining of simulation / LVC big datasets, uncover hidden patterns, reveal trends, and understand SoS interactions. - Complete advanced improvements of intelligent models to realistically represent the Battlespace as well as analyze and assess Modeling and Simulation (M&S) environments. Simulate intelligent enemy agent tactics to provide realistic OPFOR for T&E. - Complete multi-domain testbed improvements and integration using best practices, open interfaces and ensure persistent connectivity to enhance integrated Live Virtual Constructive (LVC) capability across Department of the Navy test and evaluation labs, facilities and ranges. - Continue update of Naval modeling and simulation environment to implement improved electronic warfare modeling effects, propagation and interactions. Improve fidelity and accuracy of the Electronic Warfare (EW) interactions and environmental effects (including Radio Frequency, Electro-Optical and Infrared (RF/EO/IR). Testing will include virtual and hardware-in-the-loop facilities and ranges to create coherent Live, Virtual, and Constructive (LVC) EW evaluation environments. - Continue to develop architecture to integrate emerging threat intelligence products for both classified software, virtual and low-cost hardware representations. Task will improve and integrate Integrated Threat Analysis Simulation Environment (ITASE) to meet Navy requirements. Task will integrate classified mixed hardware / software threat emulations into a real-time LVC environment. Threat will be available through innovative repository/cloud solutions. 					

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

	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
<p>- Complete updates to Family of Simulation models to account for offensive and defensive cyber effects in the battlespace. Integrate automated intelligence and machine learning models with the Next Generation Threat System (NGTS) environment then assess the improvements available to both test and training.</p> <p>FY 2024 Base Plans:</p> <ul style="list-style-type: none"> - Complete modernization of environmental test chambers at NAWCWD. - Complete development of direct drive electromagnetic pulse test capability at NAWCAD. - Complete development of an integrated fire control test environment at NAWCAD. - Continue the minor upgrade and modernization of test capabilities at NAWCAD and NAWCWD and the upgrade to general instrumentation and equipment. - Continue the modernization of the insensitive munitions test arena at NAWCWD. Tasks include renovating and modernizing the control room, refurbishing the test pads and cable paths to the test arena and replacing associated cabling between the test pad and control room at the Ordnance test facility. - Continue the modernization of the ordnance test arena at NAWCWD by replacing conduits, cabling, firing control system and data collection system. - Continue helicopter drive system upgrade by aligning test stand and replacing loading and instrumentation at NAWCAD. - Continue modernization of the electromagnetic radiation test area at NAWCAD. - Initiate and complete upgrade of the high horse power drive load system at NAWCAD. - Initiate and complete upgrade of the electromagnetic interference drive stand at NAWCAD. - Initiate and complete replacement of the electromagnetic pulse suspension towers at NAWCAD. <p>Modeling and Simulation:</p> <ul style="list-style-type: none"> - Complete update of Naval modeling and simulation environment to implement improved electronic warfare modeling effects, propagation and interactions. Improve fidelity and accuracy of the Electronic Warfare (EW) interactions and environmental effects (including Radio Frequency, Electro-Optical and Infrared (RF/EO/IR). Testing will include virtual and hardware-in-the-loop facilities and ranges to create coherent Live, Virtual, and Constructive (LVC) EW evaluation environments. - Complete to develop architecture to integrate emerging threat intelligence products for both classified software, virtual and low-cost hardware representations. Task will improve and integrate Integrated Threat Analysis Simulation Environment (ITASE) to meet Navy requirements. Task will integrate classified mixed hardware / software threat emulations into a realtime LVC environment. Threat will be available through innovative repository/cloud solutions. <p>FY 2024 OCO Plans:</p>					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
N/A					
<i>FY 2023 to FY 2024 Increase/Decrease Statement:</i> Funding decrease from FY 2023 to FY 2024 due to the completion of most modeling and simulation tasks.					
Accomplishments/Planned Programs Subtotals	83.867	103.371	74.221	0.000	74.221

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

N/A

Remarks

D. Acquisition Strategy

Not Applicable.

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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
9999: Congressional Adds	0.000	11.584	38.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	49.584
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Congressional Add

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

	FY 2022	FY 2023
Congressional Add: Joint simulation environment <i>FY 2022 Accomplishments:</i> N/A <i>FY 2023 Plans:</i> Initiate and complete improvements to red air threat realism, develop a cyber warfare effects environment and develop a large force cross domain scenario in the Joint Simulation Environment.	0.000	8.000
Congressional Add: Lab and test range upgrades- targets <i>FY 2022 Accomplishments:</i> Initiate replacement of the hydrophone tracking system at AUTEK. <i>FY 2023 Plans:</i> N/A	11.584	0.000
Congressional Add: Real time pulse level modeling and simulation <i>FY 2022 Accomplishments:</i> N/A <i>FY 2023 Plans:</i> Initiate and complete the integration of electronic warfare integrated reprogramming database models into the next generation threat system.	0.000	10.000
Congressional Add: Test capabilities accel. - PMRF data management modernization <i>FY 2022 Accomplishments:</i> N/A <i>FY 2023 Plans:</i> Initiate and complete the modernization of the Pacific Missile Range Facility and Mobile At-Sea Sensor unclassified and classified networks.	0.000	20.000
Congressional Adds Subtotals	11.584	38.000

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

N/A

Remarks

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D. Acquisition Strategy

Not required for Congressional Adds