Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy	Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603673N *I (U)Future Naval Capabilities Advanced Tech Dev*

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
Total Program Element	0.000	215.946	214.184	231.907	-	231.907	281.953	277.461	273.380	278.874	Continuing	Continuing
3346: *Future Naval Capabilities Adv Tech Dev*	0.000	215.946	206.684	231.907	-	231.907	281.953	277.461	273.380	278.874	Continuing	Continuing
9999: *Congressional Adds*	0.000	0.000	7.500	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	7.500

A. Mission Description and Budget Item Justification

The Future Naval Capabilities (FNC) program represents the requirements-driven, delivery-oriented piece of the Department of the Navy (DON) Science and Technology (S&T) portfolio. The efforts described in this Program Element (PE) address the Advanced Technology Development associated with the FNC Program. The objective of the work in this PE is to develop promising technologies emerging from the FNC Applied Research program that have successfully matured to higher Technology Readiness Levels (TRLs).

The FNC Program was restructured for FY19 to accelerate transition to the Fleet and Force. This restructuring involved a zero based review of all ongoing FNC projects, where each effort was assessed for its technology maturity and transition commitment. Ongoing efforts were categorized as FNCs or Technology Candidates. Some efforts were terminated and others were accelerated to achieve the goals of the restructured program. Funding for FNCs, which have higher Technology Readiness Levels (TRLs of 4/5 to 6) and transition funding commitments, are being resourced in this PE, 0603673N Future Naval Capabilities Advanced Technology Development. ONR is coordinating closely with the resource Sponsors and acquisition stakeholders to develop high priority technological capabilities needed by the operational forces.

Due to the number of efforts in this PE, the programs described herein are representative of the work included in this PE.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	231.772	232.996	230.269	-	230.269
Current President's Budget	215.946	214.184	231.907	-	231.907
Total Adjustments	-15.826	-18.812	1.638	-	1.638
• Congressional General Reductions	-	-0.209			
• Congressional Directed Reductions	-	-26.103			
• Congressional Rescissions	-	-			
• Congressional Adds	-	7.500			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.746	0.000			
• Program Adjustments	0.000	0.000	1.638	-	1.638
• Rate/Misc Adjustments	-0.001	0.000	0.000	-	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Navy					Date: March 2019
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 3: *Advanced Technology Development (ATD)*		R-1 Program Element (Number/Name) PE 0603673N *I (U)Future Naval Capabilities Advanced Tech Dev*			
• Congressional General Reductions Adjustments	-0.144	-	-	-	-
• Congressional Directed Reductions Adjustments	-11.935	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2018	FY 2019
Project: 9999: *Congressional Adds*		
Congressional Add: *Advanced Development of High Yield Conventional Energetics*	0.000	7.500
Congressional Add Subtotals for Project: 9999	0.000	7.500
Congressional Add Totals for all Projects	0.000	7.500

Change Summary Explanation

The program increase in FY 2020 responds to increase demand to develop technologies for transition to Programs of Record.

Technical: Not applicable.

Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603673N / *(U)Future Naval Capabilities Advanced Tech Dev*	Project (Number/Name) 3346 / *Future Naval Capabilities Adv Tech Dev*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
3346: *Future Naval Capabilities Adv Tech Dev*	0.000	215.946	206.684	231.907	-	231.907	281.953	277.461	273.380	278.874	Continuing	Continuing

A. Mission Description and Budget Item Justification

Prior to FY19, Future Naval Capabilities (FNC) Program investments were selected almost two years in advance of execution. It was determined by Navy and Marine Corps leadership that this approach limits Department of the Navy's (DON) ability to exploit technology advances and respond quickly to naval needs. As a result, future Budget Activity (BA) 3 investments supporting the FNC Program are now made less than one year before commencing execution. Because FNCs are now starting at higher Technology Readiness Levels (TRL), the typical duration of an FNC has been shortened to 3-years. The FNC Program has been fully restructured in favor of a more direct and higher level of collaboration. Program Element R-2 Activities were modified for FY19 to align to warfare areas and the corresponding resource sponsors that will integrate FNC technologies into acquisition programs of record. These R-2 Activities have been continued into FY20.

A complete accounting of the technologies being developed and a full disposition of each technology development effort will be provided separately to the Congressional oversight committees.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Title: CAPABLE MANPOWER (CMP)	17.624	7.514	10.640	0.000	10.640
Description: The Capable Manpower R-2 Activity, modified for FY19, focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record principally under the purview of Deputy Chief of Naval Operations (CNO) for Manpower, Personnel, Training and Education and Marine Corps Training and Education Command (TECOM). ***FY 2019 Plans:*** The advanced technologies being developed under this R-2 Activity include efforts that focus on the future integrated training environment for integrated air and ground operations of the marine air-ground task force, learning continuum and performance aids, manpower, personnel and training strategic planning, simulation tailored training and assessments, decision making and learning management systems, an assessment process for the selection of unmanned aerial systems personnel, simulation toolsets for analysis of mission, personnel and systems that includes techniques to optimize manpower planning, next generation perceptual training systems and tools, augmented immersive team training, behavioral and performance analysis for intelligent					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *(U)Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
training, advanced technologies for automated performance assessment in games and tools for game-based training and assessment of human performance. ***FY 2020 Base Plans:*** The advanced technologies being developed under this R-2 Activity in FY20 include technologies supporting the future integrated training environment and ready relevant learning. Training simulator software and hardware to support the rapid integration and interoperability of air and ground legacy and future simulation-based training is being developed to address the shortfall in sorties needed to maintain readiness for integrated air and ground operations of the marine air-ground task force. This technology will allow pilots and aircrews to train effectively in a common, simulated operating environment. Flexible and interoperable learning continuum and performance aids will be developed, providing individual career management, skill classification, selection, automatic training content re-engineering, supervisor evaluations, and Fleet readiness tracking. New machine learning algorithms will input training data from the lifelong learning record, and output a training model that is usable for adaptive training. The focus on ready relevant training will accelerate learning, reduce the decay of acquired skills, and provide readiness tracking of performance at an individual level. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 was due to an increased investment in technologies supporting the future integrated training environment and ready, relevant training. A complete accounting of the technologies being developed and a full disposition of each technology development effort will be provided separately to the Congressional oversight committees.					
Title: ENTERPRISE AND PLATFORM ENABLERS (EPE) ***Description:*** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructured Future Naval Capabilities (FNC) Program. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:***	14.301	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603673N / *(U)Future Naval Capabilities Advanced Tech Dev*	**Project (Number/Name)** 3346 / *Future Naval Capabilities Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** N/A					
Title: EXPEDITIONARY MANEUVER WARFARE (EMW) ***Description:*** The Expeditionary Maneuver Warfare R-2 Activity, modified for FY19, focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in PE 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record principally under the purview of the Deputy Commandant for Combat Development and Integration (CD&I) and the Director of Expeditionary Warfare. ***FY 2019 Plans:*** The advanced technologies being developed under this R-2 Activity include those efforts that focus on autonomous unmanned surface vehicles for mine warfare, off-board refueling and data transfer for unmanned surface vehicles, automated data analysis for expeditionary Mine Countermeasures (MCM), advanced undersea weapon systems for mine warfare, ground based air defense on-the-move high energy laser systems, advanced sonar technology for high clearance rate MCM, defense of harbor and near-shore naval infrastructure against asymmetric threats, fuel efficient tactical vehicles, renewable and sustainable expeditionary power, exchange of actionable information at the tactical edge, actionable intelligence enabled by persistent surveillance, densified propellants for fire from enclosed/confined spaces, spectral and reconnaissance imagery, azimuth and inertial navigation systems, counter radio-controlled improvised explosive device electronic warfare, and precision universal mortars. ***FY 2020 Base Plans:*** The advanced technologies being developed under this R-2 Activity in FY20 include those efforts that focus on Mine Countermeasures (MCM) task force planning, multi-mission airborne mine detection, and mine neutralization without collateral damage. Mission management tools will be developed for the Mine Countermeasures Commander to assist in the planning and re-planning, scheduling, and allocation of MCM task force assets using an extremely modular, open systems approach. This will provide MCM Commanders with the ability to rapidly re-plan and schedule emerging LCS/MCM Mission Package assets and maintain situational awareness of heterogeneous groups of systems. The investment in single-system, day/night, multi-mission airborne mine detection technologies usable at all water depths will be increased in order to reduce the MCM timeline and facilitate our capability to counter surface/near surface mines in the Surf Zone or Beach	0.000	5.840	22.399	0.000	22.399

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Zone (BZ) at night. The viability of the preliminary design and schedule to support Fire Scout integration will be thoroughly explored. New mine neutralization technologies will enhance the effectiveness and efficiency of Navy expeditionary force capabilities in their assigned response mission to counter naval mine and maritime improvised explosive device threats. This technology will enhance the capability of the Maritime Expeditionary Standoff Response (MESR) System of Systems. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 reflects an increased investment in multi-mission airborne mine detection technologies that offer the potential for a significant reduction in the MCM timeline, and an investment in new mine neutralization technologies countering naval mine and maritime improvised explosive device threats. This increase includes specific and substantial ramp-up in FY 2020 for the Single-system Multi-mission Airborne Mine Detection (SMAMD) effort and initiating the Low Observable No Collateral Damage - Neutralization (LONCD-N) System development. A complete accounting of the technologies being developed and a full disposition of each technology development effort will be provided separately to the Congressional oversight committees.					
Title: FORCE HEALTH PROTECTION (FHP)	10.717	0.802	0.000	0.000	0.000
Description: The Force Health Protection R-2 Activity focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to programs under the purview of the Surgeon General of the Navy and the Defense Health Agency. ***FY 2019 Plans:*** The advanced technologies being developed under this R-2 Activity include those efforts that focus on enabling new practices, procedures, medical devices and pharmaceuticals for the improvement of personnel performance, casualty prevention and combat casualty care. These technologies aim to decrease the logistical burden of forward medical operations, mitigate and prevent combat-related illness and injury, and provide cutting-edge medical applications for Navy and Marine Corps warfighters on land, at sea, and in the air. ***FY 2020 Base Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The decrease from FY19 to FY20 was due to the completion of an FNC system that predicts, detects, and warns warfighters of hypoxia in a way that accounts for individual tolerance differences. A complete accounting of the technologies being developed and a full disposition of each technology development effort will be provided separately to the Congressional oversight committees.					
Title: FORCENET (FNT) ***Description:*** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructured Future Naval Capabilities (FNC) Program. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** N/A	60.565	0.000	0.000	0.000	0.000
Title: POWER AND ENERGY (P&E) ***Description:*** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructured Future Naval Capabilities (FNC) Program. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:***	12.590	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** N/A					
Title: SEA SHIELD (SHD) ***Description:*** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructured Future Naval Capabilities (FNC) Program. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** N/A	55.745	0.000	0.000	0.000	0.000
Title: SEA STRIKE (STK) ***Description:*** The investments that would have continued in this R-2 Activity have been moved into the activities of the restructured Future Naval Capabilities (FNC) Program. ***FY 2019 Plans:*** N/A ***FY 2020 Base Plans:*** N/A ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** N/A	44.404	0.000	0.000	0.000	0.000
Title: AIR WARFARE (AW)	0.000	35.214	38.871	0.000	38.871

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total

Description: The Air Warfare R-2 Activity, focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record principally under the purview of the Director of Air Warfare.

FY 2019 Plans:
The advanced technologies being developed under this R-2 Activity include those efforts that focus on extended range targeting, advanced protection from infrared and electro-optic threats, radar electronic attack protection, intelligent collaborative engagements, multifunction capabilities for missile warning sensors, advanced threat aircraft countermeasures, technologies that discriminate and provide terminal guidance for weapons that engage moving targets, numerous advanced weapons technologies, high altitude Anti-Submarine Warfare (ASW), placement and operation of active ASW distributed systems, data exfiltration and networked platform interaction, advanced topcoat systems for air vehicles, air platforms safety and affordability technologies, virtual-constructive representations on live avionics displays for training, and dynamic adaptive and modular training for unmanned aerial systems.

FY 2020 Base Plans:
The advanced technologies being developed under this R-2 Activity in FY20 include those efforts that focus on enhanced corrosion protection for aircraft surfaces and galvanic interfaces in order to improve durability and reduce toxicity/exposures, advanced radio enhancements for long range anti-ship missiles and other weapons, human machine interface and vehicle controller command and control technologies that implement full and partial UxV transfer of control and discovery, software performance assessment tools to automatically collect, fuse, display, analyze, and archive live virtual constructive training data from disparate systems, and multi-platform technologies for collaborative airborne manned and unmanned tactical electronic warfare operations at all jamming ranges.

FY 2020 OCO Plans:
N/A

FY 2019 to FY 2020 Increase/Decrease Statement:
The increase from FY 2019 to FY 2020 reflects the initiation of new FNCs involving unmanned vehicle control software, live virtual constructive training, and collaborative electronic warfare technologies. A complete

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
accounting of the technologies being developed and a full disposition of each technology development effort will be provided separately to the Congressional oversight committees.					
Title: INFORMATION WARFARE (IW) ***Description:*** The Information Warfare R-2 Activity, focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record principally under the purview of the Deputy Chief of Naval Operations for Information Warfare. ***FY 2019 Plans:*** The advanced technologies being developed under this R-2 Activity cover rapidly evolving technological areas and include those that focus on next-generation command, control and decision support services, cyber security, cyber operations, real-time engagement coordination and performance estimation, next generation countermeasure technologies for ship missile defense, extended distributed weapons coordination, cross field processing and smart use of distributed systems, network collaborative precision navigation and timekeeping, communications and interoperability for integrated fires, shipboard panoramic infrared and electro-optic cueing and surveillance systems, a tactical cloud that exploits cross warfare area data sources, electronic warfare battle management for surface defense, autonomous persistent tactical surveillance, mission-based waveform controls and networking, satellite vulnerability mitigation, comprehensive maritime operational and navigational planning via decision support services, collaborative algorithms for non-Global Positioning System (GPS)-based navigation, technologies that enable real-time situational awareness of tactic-edge Internet Protocol (IP) networks operating in contested environments, technologies enabling coordination between shipboard and expendable Electro-Optical/Infrared (EO/IR) countermeasures, automation technologies that improve theater level anti-submarine warfare operations and multi-domain battle management capabilities. ***FY 2020 Base Plans:*** The advanced technologies being developed under this R-2 Activity in FY20 cover rapidly evolving technological areas and include those that: a)enable distributed and networked sensor and weapon control by providing a communications interface for combat systems applications, b) deliver data and information via any combination of available tactical data links, c) enhance security, d) provide an improved capability to detect and track the newest generation of ultra-quiet submarines in the deep ocean, e) provide the surface fleet with a position fixing capability in a Global Positioning System (GPS) denied environment, f) correlate multi-sensor, multi-platform, radio-frequency, geo-location data to create a passive common operating picture and enable coordinated	0.000	74.446	61.814	0.000	61.814

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
engagements of multi-mode, multi-aspect, threat sensors using networked tactical electronic warfare and information operations systems, g) build on networked electronic warfare infrastructures to provide new user interfaces for multi-platform, coordinated electronic support and electronic attack techniques, h) sense and assess real-time environmental conditions to improve sensor performance forecasting and automate the detection of very quiet targets within undersea surveillance barriers, and i) develop technologies that can be demonstrated in an 'A'-size sonobuoy capable of delivering the array gain required to localize and collect passive acoustic intelligence of ultra-quiet submarines at tactically relevant ranges through exploitation of a unique feature of the sound channel. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The decrease from FY 2019 to FY 2020 was due to the completion and delivery to acquisition programs of record of several Future Naval Capabilities (FNC) that successfully demonstrated a Technology Readiness Level (TRL) of 6, including the FNCs providing a tactical cloud capability that exploit cross warfare area data sources and a means to detect and measure incoming threats. A complete accounting of the technologies being developed and a full disposition of each technology development effort will be provided separately to the Congressional oversight committees.					
Title: SURFACE WARFARE (SW) ***Description:*** The Surface Warfare R-2 Activity, focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record principally under the purview of the Director of Surface Warfare. ***FY 2019 Plans:*** The advanced technologies being developed under this R-2 Activity include those efforts that focus on hyper velocity projectiles, full sector torpedo defense, cooperative networked radars, sonar automation, radar resource management for integrated air and missile defense, periscope detection and discrimination, high fidelity active sonar training, anti-ship missile defense, long range detection and tracking, naval interceptor improvements, unmanned systems common control, digital array radars, multifunction shipboard energy storage and power distribution, high power solid state circuit protection, compact power conversion for advanced surface machinery systems, resilient hull and infrastructure mechanical and electrical security, phased array antennas, human injury	0.000	32.656	46.824	0.000	46.824

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
and treatment models, aluminum alloy corrosion control and prevention, affordable common radar architectures, total ship survivability damage tolerance and recoverability, adaptive training to enhance individual and team learning, and platform design and acquisition tools that reduce manpower. ***FY 2020 Base Plans:*** The advanced technologies being developed under this R-2 Activity in FY20 include those efforts that focus on: a) high density, modular and configurable, high cycle rate, megawatt-scale multifunction energy storage systems for electric weapons and sensor loads that are necessary to provide continuous operational availability, b) the integration testing necessary to implement attack resilient architectures and toolsets that can be retrofitted to both legacy and modern shipboard control systems, c) the incorporation of high density reactive materials into warheads such as the ALaMO 57mm round so as to significantly increase lethality without requiring changes to flight dynamics, guidance, and/or interaction with the respective weapon system, d) advanced alloys and airfoil coatings for Gas Turbine hot section components that will realize a 3X improvement in engine life at higher operating temperatures and pressures, improving the mean time between failure of these expensive ship engines, e) technologies that counter unmanned aerial surveillance drones, f) a new in-situ electrodeposition repair process to coat heat exchanger tubing surfaces with materials and alloys that restore and improve the integrity of damaged Cu-Ni tubing, g) training for staffs and operators required to conduct command and control against peer threats in degraded and denied environments, h) a new electronic initiation safety device for energetic initiation for both SM-6 and SM-2 upgrades, i) a receive-only capability on SPY-6V1 for improved situational awareness during EMCON and improved radar timelines with advanced waveforms for communications and radar operation, and j) modular virtual-constructive simulation technologies, realistic phenomenology and behavior models for synthetic entities in support of warfighter command Ttam and platform operator staff multi-mission training, assessment and certification. ***FY 2020 OCO Plans:*** N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 enables the initiation of new FNCs for in-situ repair of heat exchanger tubing, training for operations in command and control denied or degraded environments, a new electronic initiation safety device for the SM-2 and SM-6, and receive-only SPY-6V1 improvements. A complete accounting of the technologies being developed and a full disposition of each technology development effort will be provided separately to the Congressional oversight committees.					
Title: UNDERSEA WARFARE (UW)	0.000	50.212	51.359	0.000	51.359

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Description: The Undersea Warfare R-2 Activity, focuses on the advanced technology development of new capabilities that leverage the underlying applied research investments in Program Element (PE) 0602750N, Future Naval Capabilities (FNC) Applied Research. These advanced technology investments align to acquisition programs of record principally under the purview of the Director of Undersea Warfare. ***FY 2019 Plans:*** The advanced technologies being developed under this R-2 Activity include those efforts that focus on extended range modular undersea heavyweight vehicle technology for submarine-launched torpedoes, coherent electronic attack capabilities for submarines, vector sensors and signal processing for acoustic arrays, panoramic infrared sensors, technologies for rapid and covert surveillance, electronic sensors for detection of low probability of intercept periscope detection radars, torpedo advanced propulsion systems, simultaneous transmit and receive capabilities for submarines, scalable integrated radio frequency systems for undersea platforms, electronic warfare tactical decision aids, tools for predicting array operational loading and distribution, acoustic damping systems, corrosion mitigation technologies that increase operational availability, panoramic photonics mast technologies, hyper-spectral scanning imagery, low light level video cameras, new material development and lab characterization, unmanned aerial system control technologies, adaptive training for submarine navigation and piloting, signature management technologies, and information architectures for improved decision making. ***FY 2020 Base Plans:*** The advanced technologies being developed under this R-2 Activity in FY20 include those efforts that focus on a) simultaneous transmit and receive capabilities for radio frequency antenna apertures as well as the backend processing that enable stealthy submarine information operation missions, b) an integrated combat capability to the Submarine Payload Control System that supports collaborative planning, payload coordination, briefing, and enhanced mission execution through seamless integration with the unmanned vehicle controller, c) reducing the signature of current and future submarines in order to enhance their military effectiveness, d) automated data analysis for expeditionary mine countermeasures, e) a modular and adaptive electronic warfare trainer, scenario generator and digital stimulator that's applicable to multiple training facilities and air, surface, and undersea platforms, f) high performance submersible radar absorbing structures that use advanced manufacturing techniques to improve affordability, durability, scalability, and the performance of submarine mast materials, and g) technologies offering a covert broadband acoustic signal structure with advanced processing algorithms that will increase an SSBN's ability to conduct bathymetric fixes in a wider range of operational environments. ***FY 2020 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy		Date: March 2019
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
N/A ***FY 2019 to FY 2020 Increase/Decrease Statement:*** The increase from FY 2019 to FY 2020 supports completion and delivery to acquisition programs of record of several Future Naval Capabilities (FNC) including tools for predicting array operational loading/distribution and heavyweight torpedo improvements. A complete accounting of the technologies being developed and a full disposition of each technology development effort will be provided separately to the Congressional oversight committees.					
Accomplishments/Planned Programs Subtotals	215.946	206.684	231.907	0.000	231.907

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

The performance metric for this Program Element (PE) is measured by the number of FNCs that transition through an acquisition POR to deploy new capabilities into the Fleet or Force.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Navy			Date: March 2019
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603673N / *(U)Future Naval Capabilities Advanced Tech Dev*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	0.000	7.500	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	7.500

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other projects

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019
Congressional Add: Advanced Development of High Yield Conventional Energetics	0.000	7.500
FY 2018 Accomplishments: N/A		
FY 2019 Plans: FY19 funds will be used towards the advanced demonstration of energetic materials in a variety of weapon system applications to include: high performance solid rocket and air breathing propulsion, reactive materials demonstrations and effects in advanced lethality and effectiveness models,advanced warhead concepts to include novel reactive shaped charge configurations, hybrid reactive material warhead demonstrations, and the development and demonstration of any necessary modeling and simulation capabilities for quantification of damage effects on adversary weapon systems,and other potential energetic technologies.		
Congressional Adds Subtotals	0.000	7.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Congressional Interest Items not included in other projects