Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Navy											Date: May 2021	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 1: *Basic Research*					R-1 Program Element (Number/Name) PE 0601103N *I University Research Initiatives*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	162.576	144.102	117.448	-	117.448	-	-	-	-	-	-
0000: *University Research Initiatives*	0.000	113.343	116.102	117.448	-	117.448	-	-	-	-	-	-
9999: *Congressional Adds*	0.000	49.233	28.000	0.000	-	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Office of Naval Research's (ONR) mission is to ensure the technological advantage of U.S. Naval forces. ONR fosters scientific research necessary for the discovery, development and delivery of new technologies. Often this research is done in partnership with academia. This program includes support for multidisciplinary basic research in a wide range of naval relevant scientific and engineering disciplines that enables the U.S. Navy to maintain technological superiority and for the university research infrastructure to acquire the research instrumentation needed to maintain and improve the quality of university research important to the Navy. Multidisciplinary University Research Initiative (MURI) efforts involve teams of researchers investigating high priority topics and opportunities that intersect more than one traditional technical discipline. For many military problems, this multidisciplinary approach serves to stimulate innovation, accelerate research progress and lay the foundations for transition of results into Naval applications. The Defense University Research Instrumentation Program (DURIP) supports university research infrastructure essential to high quality, Navy-relevant research. The instrumentation program complements other Navy research programs by supporting the purchase of high cost research instrumentation that is necessary to carry out cutting-edge research. This program supports Presidential Early Career Awards for Scientists and Engineers (PECASE) which are single investigator research efforts performed by outstanding academic scientists and engineers early in their research careers. This program provides the knowledge base, scientific concepts, and technological advances for the maintenance of Naval power and national security. The Minerva Research Initiative is funded in partnership with the Office of the Secretary of Defense to support basic social science and multi-disciplinary research aimed at improving national security and international stability. The goals of this program are to enhance connections between DoD and academia and build cultural and foreign area knowledge on topics ranging from the mechanisms of radicalization to geopolitical power projection strategies in a multi-polar world.

The missions of today's Sailors and Marines are enabled by the results of naval Science and Technology (S&T). Since 1946, the Office of Naval Research (ONR) has fostered scientific research related to the maintenance of maritime superiority and national defense. ONR manages the Department of the Navy's (DON) portfolio of naval Basic and Applied research, and Advanced Technology Development investments to ensure naval forces can effectively deter conflict, but when called upon, fight, win and come home safe. Current investments hedge against uncertainty, providing solutions to commanders today, and options for the future. The Naval S&T budget supports higher guidance defined by the National Defense Strategy, and responds to requirements identified by the Secretary of the Navy through research priorities set by the Chief of Naval Research, coordinated across the Naval Research Enterprise (NRE), and outlined in the Naval R&D Framework.

This Program Element (PE) funds Basic Research, typically defined as systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. The work in this PE can be classified between Technology Readiness Level (TRL) 1 (basic principles observed and reported) and TRL 2 (technology concept and/or application formulation).

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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 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	167.850	116.816	119.141	-	119.141
Current President's Budget	162.576	144.102	117.448	-	117.448
Total Adjustments	-5.274	27.286	-1.693	-	-1.693
• Congressional General Reductions	-	-0.714			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	28.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-5.274	0.000			
• Program Adjustments	0.000	0.000	-1.358	-	-1.358
• Rate/Misc Adjustments	0.000	0.000	-0.335	-	-0.335

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 9999: *Congressional Adds*		
Congressional Add: *Defense University Research Instrumentation Program*	9.654	10.000
Congressional Add: *Aircraft Fleet Readiness and Sustainment*	7.723	8.000
Congressional Add: *University research initiatives*	19.306	10.000
Congressional Add: *Advanced digital radars*	7.723	0.000
Congressional Add: *Multi-disciplinary university research*	4.827	0.000
Congressional Add Subtotals for Project: 9999	49.233	28.000
Congressional Add Totals for all Projects	49.233	28.000

Change Summary Explanation

Funding changes in FY22 are reflective of realignments within S&T to support Navy Priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy											Date: May 2021	
Appropriation/Budget Activity 1319 / 1					R-1 Program Element (Number/Name) PE 0601103N / *University Research Initiatives*				Project (Number/Name) 0000 / *University Research Initiatives*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
0000: *University Research Initiatives*	0.000	113.343	116.102	117.448	-	117.448	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Office of Naval Research's (ONR) mission is to ensure the technological advantage of U.S. Naval forces. ONR fosters scientific research necessary for the discovery, development and delivery of new technologies. Often this research is done in partnership with academia. This program includes support for multidisciplinary basic research in a wide range of naval relevant scientific and engineering disciplines that enables the U.S. Navy to maintain technological superiority and for the university research infrastructure to acquire the research instrumentation needed to maintain and improve the quality of university research important to the Navy. Multidisciplinary University Research Initiative (MURI) efforts involve teams of researchers investigating high priority topics and opportunities that intersect more than one traditional technical discipline. For many military problems, this multidisciplinary approach serves to stimulate innovation, accelerate research progress, and lay the foundation for transition of results into Naval applications. The DURIP project supports university research infrastructure essential to high quality, Navy-relevant research. The instrumentation project complements other Navy research programs by supporting the purchase of high cost research instrumentation that is necessary to carry out cutting-edge research. The PECASE project supports single-investigator research efforts performed by outstanding academic scientists and engineers early in their research careers. This project provides the knowledge base, scientific concepts, and technological advances for the maintenance of Naval power and national security.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Defense University Research Instrumentation Program (DURIP)	22.989	23.124	23.672	0.000	23.672
Description: DURIP funds are awarded to universities to purchase relatively high cost research instrumentation that is normally not included in single-investigator research grants. Individual grants range from $50K to $1.5M. Funding for DURIP efforts is awarded after the Office of the Secretary of Defense (OSD) selects and announces the awardees, which typically takes place towards the second half of the fiscal year. In turn, universities need to purchase the instrumentation and take delivery before any billing occurs. It frequently takes several months for delivery and billing to be completed. DURIP is a one-year program. ***FY 2021 Plans:*** - Research Instrumentation: Funding for instrumentation to enhance basic research through numerous focus areas including photonic diagnostics for the development of advanced materials, high fidelity laser profiling of biologically active sediments for seabed models, instrumentation for studies of high Reynolds Number non-					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 1	**R-1 Program Element (Number/Name)** PE 0601103N / *University Research Initiatives*	**Project (Number/Name)** 0000 / *University Research Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
equilibrium flows, a dynamic material testing system for characterizing, investigating and designing artificial muscle, and instrumentation for the development and characterization of solid propulsion, among many others. ***FY 2022 Base Plans:*** Funds will be awarded to support purchase or development of instrumentation to enhance Basic Research in various areas such as A Turboshaft Engine Test Stand for Particle Ingestion Research, Monitoring Decompression Illness during Undersea Missions, Sub Linear Machine learning, Acoustically equipped Gliders for Marine Mammal, Metal Organic Chemical Vapor Deposition of Group III - Nitrides Oceanography Research Environment ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant changes from FY21 to FY22.					
Title: Multidisciplinary University Research Intiiative (MURI) ***Description:*** Research efforts include high priority topics that intersect more than one traditional discipline. MURI topics are selected to address Naval Science and Technology (S&T) Framework Priorities as described in the Naval Research and Development Framework. Funding for MURI efforts is awarded after Office of the Secretary of Defense (OSD) announces the awardees, which typically takes place towards the second half of the fiscal year. Since the MURI program funds academic researchers, execution of the efforts typically ramp up during the summer months. MURI projects make significant contributions to Navy and Department of Defense (DOD) objectives by speeding up scientific programs, by cross-fertilization of ideas, by hastening the transition of basic research to practical applications, and by training students in cross-disciplinary approaches to science and engineering research of importance to DoD. MURI projects are five-year programs. ***FY 2021 Plans:*** - Multidisciplinary Research: Initiate multidisciplinary basic research efforts on the fundamental limits on information latency, advanced analytical and computational modeling of arctic sea ice, molecularly programmable graphene, identifying invariances for improved modeling and prediction of oceanographic phenomena, high performance organic electronics, bio-inspired models of distributed information processing, active perception and knowledge exploitation in navigation and spatial awareness, the advanced dynamics of coupled human/machine systems.	81.593	81.312	82.156	0.000	82.156

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 1	**R-1 Program Element (Number/Name)** PE 0601103N / *University Research Initiatives*	**Project (Number/Name)** 0000 / *University Research Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
- Fund previous years basic research efforts in other high priority topics for the Navy and DoD. ***FY 2022 Base Plans:*** Support multidisciplinary research in areas such as molecular qubits, computer vision, ocean dynamics off rocky coasts, thermal transport, super-hard materials, social cyber-attack in social media, control theory of safe, cognitive, and learning systems. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant changes from FY21 to FY22					
Title: Presidential Early Career Awards (PECASE) ***Description:*** PECASE awards are made to academic scientists early in their research careers for extremely prestigious, single-investigator research in areas of vital importance to the Navy. Awards provide national recognition and research grants of up to $200K per year for five years. OSD, with policy and oversight responsibility for the PECASE program, awards a minimum of four new awards per year. PECASE is a five year program. ***FY 2021 Plans:*** - Fund new basic research projects in Naval priority areas including efficient information processing, layered chalcogenide heterointerfaces, information retrieval by exploiting the unique geometry of sparse arrays, and the prediction, design and control the assembly of hierarchically mesostructured materials. - Support previous year ongoing basic research projects performed by early career investigators. ***FY 2022 Base Plans:*** Fund new basic research projects in Naval priority areas including statistical machine learning procedures that quantify sources of uncertainty in data analysis, nanophotonics and optical materials, deep learning for dexterous robotic manipulation, wireless communication and sensing systems. Support previous year ongoing basic research projects performed by early career investigators. ***FY 2022 OCO Plans:***	8.761	8.726	8.916	0.000	8.916

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 1	**R-1 Program Element (Number/Name)** PE 0601103N / *University Research Initiatives*	**Project (Number/Name)** 0000 / *University Research Initiatives*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant changes from FY21 to FY22					
Title: Minerva Research Initiative (MRI) (Social Science Networking) ***Description:*** The Minerva Research Initiative is funded in partnership with the Office of the Secretary of Defense to support basic social science and multi-disciplinary research aimed at improving national security and international stability. The goals of this program are to enhance connections between DoD and academia and build cultural and foreign area knowledge on topics ranging from the mechanisms of radicalization to geopolitical power projection strategies in a multi-polar world. ***FY 2021 Plans:*** - Create and implement a theoretical framework to automate cyber vulnerability assessment and remediation for information operations in social contexts, for example, the injection of disinformation into social networks to influence the political attitudes or those exposed to it. Investigate models and methods for understanding online influence. ***FY 2022 Base Plans:*** -Create novel techniques (e.g. social network analysis, social computational models, and, artificial Intelligence) that will enable the detection and source attribution of cyber malware incursions on large networked computer systems more quickly and accurately than is possible based on current manual approaches. -Discover large-data analytic techniques to detect and mitigate the occurrence of disinformation in social network systems more quickly and effectively than is currently possible. Techniques are sought that scale up to very large social networks and have the robustness to quickly adapt to emerging disinformation techniques. -Discover mechanisms of crowd manipulation, social hysteria, rumor and propaganda. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** No significant changes from FY21 to FY22	0.000	2.940	2.704	0.000	2.704
Accomplishments/Planned Programs Subtotals	113.343	116.102	117.448	0.000	117.448

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 1	**R-1 Program Element (Number/Name)** PE 0601103N / *University Research Initiatives*	**Project (Number/Name)** 0000 / *University Research Initiatives*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy											Date: May 2021	
Appropriation/Budget Activity 1319 / 1					R-1 Program Element (Number/Name) PE 0601103N / *University Research Initiatives*				Project (Number/Name) 9999 / *Congressional Adds*			
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
9999: *Congressional Adds*	0.000	49.233	28.000	0.000	-	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other Projects.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
Congressional Add: Defense University Research Instrumentation Program ***FY 2020 Accomplishments:*** N/A ***FY 2021 Plans:*** Purchased instrumentation and equipment used to enhance university research in the areas of photonics; materials included high-temperature materials, soft multi-material structures, and photomechanical materials; autonomous and robotic systems; optical quantum information; oceanography; electronics; atmospheric turbulence; and distributed energy.	9.654	10.000
Congressional Add: Aircraft Fleet Readiness and Sustainment ***FY 2020 Accomplishments:*** N/A ***FY 2021 Plans:*** Purchase equipment through DURIP to develop capabilities in the following areas (1) Understand Effects of Process Parameters on the Performance of Thermoplastics in Airframe Structural Applications (2) Cold Spray Additive Manufacturing for Rapid Sustainment Initiatives (3) Advanced Thermoplastic Integrated Structures produced by Automated Tool-less Manufacturing (4) Fiber Patch Placement for Aircraft Applications with Complex Contours and (5) Autonomous Repair Verifications and Inspections.	7.723	8.000
Congressional Add: University research initiatives ***FY 2020 Accomplishments:*** N/A ***FY 2021 Plans:*** Supported collaborative university research into the understanding, detection, and prevention of Traumatic Brain Injuries. Also, supported grants to purchase instrumentation and equipment to enhance university basic research.	19.306	10.000
Congressional Add: Advanced digital radars ***FY 2020 Accomplishments:*** N/A ***FY 2021 Plans:*** N/A	7.723	0.000
Congressional Add: Multi-disciplinary university research	4.827	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Navy		Date: May 2021
Appropriation/Budget Activity 1319 / 1	**R-1 Program Element (Number/Name)** PE 0601103N / *University Research Initiatives*	**Project (Number/Name)** 9999 / *Congressional Adds*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
FY 2020 Accomplishments: N/A ***FY 2021 Plans:*** N/A		
Congressional Adds Subtotals	49.233	28.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A