Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Navy											Date: April 2022	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602792N *I Innovative Naval Prototypes (INP) Applied Res*							
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	146.926	155.976	120.637	-	120.637	133.828	134.128	132.198	137.056	Continuing	Continuing
0000: *Innovative Naval Prototypes (INP) Applied Res*	0.000	2.341	2.480	3.000	-	3.000	18.837	58.688	77.798	85.606	Continuing	Continuing
2958: *Cyberspace Activities*	0.000	26.867	25.988	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	52.855
3416: *HIJENKS*	0.000	21.033	9.916	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	30.949
3423: *LOCUST*	0.000	20.776	8.031	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	28.807
3450: *AMOS*	0.000	7.918	6.446	8.320	-	8.320	0.000	0.000	0.000	0.000	0.000	22.684
3451: *CLAWS*	0.000	19.943	25.871	2.475	-	2.475	0.000	0.000	0.000	0.000	0.000	48.289
3452: *ELEKTRA*	0.000	5.686	3.967	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.653
3453: *Hypersonic Booster*	0.000	3.740	29.915	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	33.655
3454: *MDUSV*	0.000	4.570	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.570
3455: *MINERVA*	0.000	5.621	3.966	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.587
3456: *Full Spectrum Undersea Warfare*	0.000	14.916	20.940	39.600	-	39.600	42.570	42.570	42.570	43.421	Continuing	Continuing
3461: *MASS*	0.000	0.000	4.487	4.950	-	4.950	7.920	0.000	0.000	0.000	0.000	17.357
3462: *DEALRS*	0.000	0.000	5.983	6.930	-	6.930	10.890	6.930	0.000	0.000	0.000	30.733
3463: *MATes*	0.000	0.000	4.986	6.435	-	6.435	9.900	9.900	4.950	5.049	Continuing	Continuing
5891: *INP Operational Analysis, Support and Experimentation Activity*	0.000	0.000	0.000	4.461	-	4.461	2.000	2.000	2.000	2.000	Continuing	Continuing
5892: *Full Spectrum Information Warfare*	0.000	0.000	0.000	4.000	-	4.000	7.000	0.000	0.000	0.000	0.000	11.000
5893: *Decision Superiority*	0.000	0.000	0.000	1.700	-	1.700	1.200	0.000	0.000	0.000	0.000	2.900
5894: *Direct-X*	0.000	0.000	0.000	2.500	-	2.500	0.000	0.000	0.000	0.000	0.000	2.500
5895: *DMO through IAS*	0.000	0.000	0.000	2.950	-	2.950	4.500	0.000	0.000	0.000	0.000	7.450
5896: *Echidna*	0.000	0.000	0.000	1.777	-	1.777	0.750	0.000	0.000	0.000	0.000	2.527
5897: *Hypersonic Technologies*	0.000	0.000	0.000	8.000	-	8.000	6.000	0.000	0.000	0.000	0.000	14.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Navy												Date: April 2022
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602792N *I Innovative Naval Prototypes (INP) Applied Res*							
5899: *Precision Fire Control*	0.000	0.000	0.000	23.539	-	23.539	22.261	14.040	4.880	0.980	Continuing	Continuing
9999: *Congressional Adds*	0.000	13.515	3.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	16.515

A. Mission Description and Budget Item Justification

The Office of Naval Research (ONR) portfolio includes efforts that solve problems, respond to mission requirements, and perform exploratory research for new and breakthrough capabilities, which will define the future of U.S. Naval forces. Larger in scope, scale, and risk Innovative Naval Prototypes (INP) are selected for their high-payoff and potential to revolutionize operational concepts. Due to high technical risk, INPs typically have long durations with no more than three years between decision points. They mature technologies from a Technology Readiness Level (TRL) of 2 or 3 to a TRL of 6. As such, INPs require both the Applied Research, detailed in this PE; and Advanced Technology Development (ATD) funding, detailed in PE 0603801N. Developing INPs requires a systematic expansion and application of knowledge to develop useful materials, devices, and systems oriented toward the design and development of prototypes applicable to specific mission area requirements. The efforts funded within this PE translate promising basic research into solutions for broadly defined military needs. These efforts include developing breadboard hardware and algorithms that establish the initial feasibility and practicality of proposed solutions to technological challenges, such as concept exploration efforts, studies, investigations, and non-system specific technology efforts. Applied Research INPs do not develop hardware for service use; rather they provide feeder technology that can be demonstrated in prototypes in the ATD portion of the INP program.

Information security concerns preclude full disclosure of project efforts, research activities, and technology development plans within this exhibit. Detailed information will be provided to the Congressional oversight committees.

B. Program Change Summary ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	161.028	152.976	0.000	-	0.000
Current President's Budget	146.926	155.976	120.637	-	120.637
Total Adjustments	-14.102	3.000	120.637	-	120.637
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	3.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-7.746	0.000			
• SBIR/STTR Transfer	-6.356	0.000			
• Program Adjustments	0.000	0.000	0.000	-	0.000
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Adjustments to Budget Year	-	-	120.637	-	120.637

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: 9999: *Congressional Adds*		

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Navy	Date: April 2022
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602792N *I Innovative Naval Prototypes (INP) Applied Res*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Congressional Add: *Thermoplastic tailorable universal feedstock composites*	9.654	0.000
Congressional Add: *Thermoplastic Composities for Lightweight Naval Applications*	3.861	0.000
Congressional Add: *Accelerate proliferated LEO narrowband capability*	0.000	3.000
Congressional Add Subtotals for Project: 9999	13.515	3.000
Congressional Add Totals for all Projects	13.515	3.000

Change Summary Explanation

Funding: Not applicable.

Technical: Not applicable.

Schedule: Not applicable.

FY 2023 funding increase reflects the fact that the FY 2022 President’s Budget request did not include out-year funding.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 0000 / *Innovative Naval Prototypes (INP) Applied Res*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
0000: *Innovative Naval Prototypes (INP) Applied Res*	0.000	2.341	2.480	3.000	-	3.000	18.837	58.688	77.798	85.606	Continuing	Continuing

A. Mission Description and Budget Item Justification

The efforts described in this Project address the Applied Research associated with the Innovative Naval Prototypes (INP) Program. These investments represent game-changing technologies with the potential to revolutionize operational concepts. They are disruptive in nature, as they would dramatically change the way naval forces fight. Due to high technical risk, INPs typically have long duration but have no more than three years between decision points. They mature technologies from a Technology Readiness Level (TRL) of 2 or 3 to a TRL of 6. As such, INPs require both Budget Activity (BA) 2 and BA3 funding. The BA3 INP funds are specified in a separate Program Element (PE), 0603801N Innovative Naval Prototypes (INP) Adv Tec Dev. INPs do not develop hardware for service use; rather they provide feeder technology that can be demonstrated in prototypes in the 6.3 portion of the INP program. Developing INPs requires a systematic expansion and application of knowledge to develop useful materials, devices, and systems oriented toward the design and development of prototypes applicable to specific mission area requirements. The efforts funded within this PE translate promising basic research into solutions for broadly defined military needs. These efforts include developing breadboard hardware and algorithms that establish the initial feasibility and practicality of proposed solutions to technological challenges, such as concept exploration efforts, studies, investigations, and non-system specific technology efforts. The Department of the Navy would have to make significant acquisition decisions to integrate the new technological capabilities into naval warfighting systems. INPs are selected by a process that involves senior leadership in the Department of the Navy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Directed Energy / Electric Weapons	2.341	2.480	0.000	0.000	0.000
Description: Effective in FY 2023, the Directed Energy/Electric Weapons Activity was discontinued and its funding was realigned to the new stand-alone Proj:5891 Operational Analysis, Support and Experimentation Activity to broaden the spectrum of promising applied research efforts investigated within this Project.					
FY 2022 Plans: Continue operational analysis and support to inform INP investment decisions in this activity to include identifying technologies that will provide scalable lethality through enabling multi-domain, integrated, scalable kinetic and non-kinetic systems for offensive of defensive purposes.					
FY 2023 Base Plans: NA					
FY 2023 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 0000 / *Innovative Naval Prototypes (INP) Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The funding decrease from FY 2022 to FY 2023 is due to the re-alignment of funding to initiate stand-alone Proj: 5891 Operational Analysis, Support and Experimentation Activity within this PE.					
Title: INP Applied Research ***Description:*** The efforts described in this Project address the Applied Research associated with the Innovative Naval Prototypes (INP) Program. These investments represent game-changing technologies with the potential to revolutionize operational concepts. They are disruptive in nature, as they would dramatically change the way naval forces fight. Due to high technical risk, INPs typically have long duration but have no more than three years between decision points. They mature technologies from a Technology Readiness Level (TRL) of 2 or 3 to a TRL of 6. As such, INPs require both Budget Activity (BA) 2 and BA3 funding. The BA3 INP funds are specified in a separate Program Element (PE), 0603801N Innovative Naval Prototypes (INP) Adv Tec Dev. INPs do not develop hardware for service use; rather they provide feeder technology that can be demonstrated in prototypes in the 6.3 portion of the INP program. Developing INPs requires a systematic expansion and application of knowledge to develop useful materials, devices, and systems oriented toward the design and development of prototypes applicable to specific mission area requirements. The efforts funded within this PE translate promising basic research into solutions for broadly defined military needs. These efforts include developing breadboard hardware and algorithms that establish the initial feasibility and practicality of proposed solutions to technological challenges, such as concept exploration efforts, studies, investigations, and non-system specific technology efforts. The Department of the Navy would have to make significant acquisition decisions to integrate the new technological capabilities into naval warfighting systems. INPs are selected by a process that involves senior leadership in the Department of the Navy. ***FY 2022 Plans:*** N/A ***FY 2023 Base Plans:*** Initiate applied research in support of the development of the INP Applied Research INP. Specific efforts include the following: - Investigate investments which may represent game-changing technologies with the potential to revolutionize operational concepts.	0.000	0.000	3.000	0.000	3.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 0000 / *Innovative Naval Prototypes (INP) Applied Res*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
- Explore concepts that are disruptive in nature and would dramatically change the way naval forces fight. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 0000 INP Applied Research is due to the desire to investigate a broader spectrum of technology efforts within this Project and identify the most promising applied research technologies to fund.					
Accomplishments/Planned Programs Subtotals	2.341	2.480	3.000	0.000	3.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 2958 / *Cyberspace Activities*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
2958: *Cyberspace Activities*	0.000	26.867	25.988	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	52.855

A. Mission Description and Budget Item Justification

This Project contains all Applied Research Innovative Naval Prototype (INP) investments that are developing new technologies for cyber warfare. Potential adversaries are investing in advanced technologies that will challenge our advantages in the critical information domain. Nation states and non-state actors seek to degrade our command and control capabilities, networks and computer systems. Cyber threats continue to grow and rapidly proliferate. Technologies developed in this R-2 Activity will enable the warfighter to take immediate, appropriate action at any time, against any desired adversary, target or network by assuring that autonomous, continuous analyses of intelligence, persistent surveillance and open information sources have, at all times, optimized the possible courses of action based on commander's guidance. Technologies within this activity will foster operational endurance and enable sustained operations and resiliency for warfighters and platforms through enhanced cyber security/protection.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Cyber	26.867	25.988	0.000	0.000	0.000
Description: This Project contains all Applied Research Innovative Naval Prototype (INP) investments that are developing new technologies for cyber warfare. Potential adversaries are investing in advanced technologies that will challenge our advantages in the critical information domain. Nation states and non-state actors seek to degrade our command and control capabilities, networks and computer systems. Cyber threats continue to grow and rapidly proliferate. Technologies developed in this R-2 Activity will enable the warfighter to take immediate, appropriate action at any time, against any desired adversary, target or network by assuring that autonomous, continuous analyses of intelligence, persistent surveillance and open information sources have, at all times, optimized the possible courses of action based on commander's guidance. Technologies within this activity will foster operational endurance and enable sustained operations and resiliency for warfighters and platforms through enhanced cyber security/protection.					
FY 2022 Plans: Complete Applied Research studying the unique technical challenges required to achieve a systematic reduction and dynamic reshaping of any computing system's attack surface across all its layers of computing by development of automated tools and techniques to remove bloat and unused features from both new and existing applications and communications protocols.					
FY 2023 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 2958 / *Cyberspace Activities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding is due to program completion.					
Accomplishments/Planned Programs Subtotals	26.867	25.988	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N /2958: *Cyberspace Activities*	15.537	15.893	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	45.273

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3416 / *HIJENKS*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3416: *HIJENKS*	0.000	21.033	9.916	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	30.949

A. Mission Description and Budget Item Justification

HIJENKS is a non-kinetic High Power Microwave (HPM) payload integrated on an airborne platform will enable the prosecution of multiple targets with area coverage across each target and open targets previously restricted due to collateral damage. HIJENKS increases operational access by disrupting land-based infrastructure facilities tied to adversary systems, decreases cost exchange ratios through non-kinetic engagement, and addresses targets previously restricted due to collateral damage concerns/moral hardening. It expands the competitive space in the electromagnetic spectrum to disrupt, degrade, and destroy critical electronic targets. The Activity identified in Project Unit 3416 specifically addresses Applied Research in support of the HIJENKS INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: HIJENKS	21.033	9.916	0.000	0.000	0.000
Description: The High Power Joint Electromagnetic Non-Kinetic Strike (HIJENKS) program is a proof-of-concept demonstration of a multi-target, advanced airborne High Power Microwave (HPM) payload capable of disrupting electronic targets non-kinetically. HIJENKS is capable of disrupting land-based electronic system infrastructure and engaging multiple targets with a single airborne weapon, increasing operational access/ decreasing cost exchange ratios, providing area lethality with increased pulse rate, providing options to address limitations on collateral damage, increasing standoff range and expanding magazine depth. HIJENKS will advance the current state-of-the-art in HPM technology and demonstrate the near-term operational benefits of integrating HPM-based Electronic Warfare/Electronic Attack (EW/EA) into the current force structure.					
FY 2022 Plans: Continue applied research to further the State-of-the-Art Advancement for HPM technology areas including source, antenna, pulsed power, and high voltage power supplies to support prototype development. Perform Additional platform-agnostic Science and technology (S&T) efforts to advance transition of HPM. Transition Risk Reduction for future HPM systems due to S&T investments in reliability, shelf life, maintainability. Complete HPM Lethality Predictions via effects testing focused on reducing uncertainties and enhancing weaponeering tools and catalog of target models. Continue to pursue investments in manufacturing of critical payload systems; development of materials for storage shelf life & other environmental requirements; and range extension.					
FY 2023 Base Plans: N/A					
FY 2023 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3416 / *HIJENKS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding from FY 2022 to FY 2023 in Proj: 3416 HIJENKS is due to program completion.					
Accomplishments/Planned Programs Subtotals	21.033	9.916	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3416: *HIJENKS*	13.630	7.621	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	21.251

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3423 / *LOCUST*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3423: *LOCUST*	0.000	20.776	8.031	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	28.807

A. Mission Description and Budget Item Justification

Adversary military modernization and increasing contested domains require a shift in approach "...to strike diverse targets inside adversary air and missile defense networks to destroy mobile power-projection platforms. This will include capabilities to enhance close combat lethality in complex terrain." The Low-Cost UAV Swarming Technology (LOCUST) effort will develop and deliver autonomy, C2 architecture, and a series of modular payloads on a robust, scalable, flexible, multifunctional UAV system; employable from surface, sub-surface, airborne, and ground manned and un-manned systems to provide a dispersed, resilient, and adaptive capability to gain a competitive military advantage. LOCUST will provide ISR and precision loitering munitions capable of being launched from air, surface, ground, and sub-surface platforms to conduct both singular and swarm operations across battlespace in conjunction with Joint and manned operations. It will demonstrate multi-domain launch and strike operations, heterogeneous air platform payloads, unmanned from unmanned operations, distributed control of the strike mission, and refined cost elements for critical technologies that have supply chain assurance addressed. The Activity identified in Project Unit 3423 specifically addresses Applied Research in support of the LOCUST INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: LOCUST	20.776	8.031	0.000	0.000	0.000
Description: Adversary military modernization and increasing contested domains require a shift in approach "...to strike diverse targets inside adversary air and missile defense networks to destroy mobile power-projection platforms. This will include capabilities to enhance close combat lethality in complex terrain." The Low-Cost UAV Swarming Technology (LOCUST) effort will develop and deliver autonomy, C2 architecture, and a series of modular payloads on a robust, scalable, flexible, multifunctional UAV system; employable from surface, sub-surface, airborne, and ground manned and un-manned systems to provide a dispersed, resilient, and adaptive capability to gain a competitive military advantage. LOCUST will provide ISR and precision loitering munitions capable of being launched from air, surface, ground, and sub-surface platforms to conduct both singular and swarm operations across battlespace in conjunction with Joint and manned operations. It will demonstrate multi-domain launch and strike operations, heterogeneous air platform payloads, unmanned from unmanned operations, distributed control of the strike mission, and refined cost elements for critical technologies that have supply chain assurance addressed.					
FY 2022 Plans: Applied research in the areas of Collaborative, Coordinated, & Cognitive Autonomy (C3A) and largescale Command and Control (C2) of unmanned swarm air vehicle systems engaging in complex behaviors in degraded environments will complete. In FY22, the primary focus will be on methods for rapid swarm behavior					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3423 / *LOCUST*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
generation and optimization in multi-target threat scenarios, non-GPS reliant swarm coordination and secure comms architectures that can support operationally relevant environments. ***FY 2023 Base Plans:*** N/A ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding in FY 2022 to FY 2023 is due to the planned completion of applied research efforts.					
Accomplishments/Planned Programs Subtotals	20.776	8.031	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3423: *LOCUST*	12.184	3.373	6.000	-	6.000	0.000	0.000	0.000	0.000	0.000	21.557
• RDTEN/0603382N/3423: *LOCUST*	2.123	3.371	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	10.257

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3450 / *AMOS*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3450: *AMOS*	0.000	7.918	6.446	8.320	-	8.320	0.000	0.000	0.000	0.000	0.000	22.684

A. Mission Description and Budget Item Justification

The Arctic Mobile Observing System (AMOS) effort will develop a prototype mobile sensing system that can be deployed anywhere in the Arctic via the development of a sea ice-based buoy node that will enable the critical infrastructure (power, communication, environmental intelligence) to provide the Navy with a persistent Arctic presence at lower cost than manned platforms. AMOS is a mobile observing system of systems node that enables 2-way communications, under-ice vehicle navigation, and extended-duration autonomy in the complex Arctic environment. AMOS will provide a persistent, mobile, autonomous capability to monitor the operational environment and maritime operations of potential adversaries in the Arctic Ocean. The Activity identified in Project Unit 3450 specifically addresses Applied Research in support of the AMOS INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: AMOS	7.918	6.446	8.320	0.000	8.320
Description: The Arctic Mobile Observing System (AMOS) effort will develop a prototype mobile sensing system that can be deployed anywhere in the Arctic via the development of a sea ice-based buoy node that will enable the critical infrastructure (power, communication, environmental intelligence) to provide the Navy with a persistent Arctic presence at lower cost than manned platforms. AMOS is a mobile observing system of systems node that enables 2-way communications, under-ice vehicle navigation, and extended-duration autonomy in the complex Arctic environment. AMOS will provide a persistent, mobile, autonomous capability to monitor the operational environment and maritime operations of potential adversaries in the Arctic Ocean.					
FY 2022 Plans: Continue applied research in support of the development of the Arctic Mobile Observing System (AMOS). Specific efforts include the following: - Conduct at-sea experimentation to understand spatial and temporal limits of low/medium frequency communications on navigation of platforms in the Arctic. - Model under ice communications to enable sustained and persistent communications in the Arctic. - Evaluate sensor and platform power consumption over an annual deployment cycle. - Assess network command & control strategies for AMOS subsystems such as major buoy nodes, floats, gliders and vehicles.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3450 / *AMOS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
This applied research is critical to achieving the persistence required for sustained presence in the Arctic. ***FY 2023 Base Plans:*** Continue applied research in support of the development of the Arctic Mobile Observing System (AMOS). Specific efforts include: - Continue at-sea experimentation to determine sensing and communications limits from gliders, floats & UUVs to navigation and communications buoys. - Continue evaluation of platform sensor and power consumption including UUV docking and data transmission studies during at-sea experimentation. - Continue float dispersement studies during at-sea experimentation. Complete the following modeling, evaluation, and assessment activities prior to final prototype deployment: - Complete sensor/platform design & establish power budget for the final prototype. - Complete 2-way communications evaluation & final system design for prototype build. Initiate final Arctic deployment of full AMOS prototype for test and evaluation ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY2022 to FY2023 in Proj: 3450 AMOS is due to the ramp up of at-sea experimentation to understand spatial and temporal limits of low/medium frequency communications on navigation of platforms in the Arctic.					
Accomplishments/Planned Programs Subtotals	7.918	6.446	8.320	0.000	8.320

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3450: *AMOS*	4.264	3.457	4.480	-	4.480	0.000	0.000	0.000	0.000	0.000	12.201

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3451 / *CLAWS*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3451: *CLAWS*	0.000	19.943	25.871	2.475	-	2.475	0.000	0.000	0.000	0.000	0.000	48.289

A. Mission Description and Budget Item Justification

The CLAWS INP effort will develop an autonomous unmanned undersea weapon system capable of providing offensive effects to the Combatant Commanders beyond Phase 0 inside the first island chain. It will clandestinely extend the reach of large UUVs and increase the mission areas into kinetic effects. CLAWS will deliver algorithms to enable all families of UUVs to operate in complex, dynamic and degraded environments. CLAWS will demonstrate autonomous missions in denied waters, develop and demonstrate autonomous technologies for survivability of large UUVs, and develop autonomy and launch capabilities for special mission payloads. CLAWS will be able to complete missions 1&2 against near peer adversary defenses, maintain critical communication with Navy C2/Fires and provide critical ISR information. The Activity identified in Project Unit 3451 specifically addresses Applied Research in support of the CLAWS INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: CLAWS	19.943	25.871	2.475	0.000	2.475
Description: The CLAWS INP effort will develop an autonomous unmanned undersea weapon system capable of providing offensive effects to the Combatant Commanders beyond Phase 0 inside the first island chain. It will clandestinely extend the reach of large Unmanned Underwater Vehicles (UUVs) and increase the mission areas into kinetic effects. CLAWS will deliver algorithms to enable all families of UUVs to operate in complex, dynamic and degraded environments. CLAWS will demonstrate autonomous missions in denied waters, develop and demonstrate autonomous technologies for survivability of large UUVs, and develop autonomy and launch capabilities for special mission payloads. CLAWS will be able to complete missions 1&2 against near peer adversary defenses, maintain critical communication with Navy Command and Control (C2) and Fires and provide critical ISR information.					
FY 2022 Plans: Initiate research into critical technology for UUV navigation in GPS denied environment. Technology goal for 10 times increase in navigation in denied environments with testing in late FY22. The navigation will feed the development of a modular compact UUV combats system. This will be demonstrated with classified payload. Continue applied research for the development of autonomous payloads for extra-large unmanned undersea vehicles operating in denied and contested areas. Payloads will be both kinetic and non-kinetic. Additional effort will include development of autonomy to increase the operator trust for kinetic payloads in contested areas and the development of autonomy and command and control required for swarm payload from extra-large unmanned undersea vehicle.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3451 / *CLAWS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Specific FY 2022 objectives include: - Demonstration of autonomy algorithms to link with C2 system for deployment of effect for cross domain unmanned system - Develop of autonomy for deployment for non-kinetic effect in varying environmental conditions Develop autonomy to leverage onboard environmental measurements and C2 reach back to provide mission advantage ***FY 2023 Base Plans:*** - Complete applied research for the development of autonomous payloads for extra-large unmanned undersea vehicles operating in denied and contested areas. Payloads will be both kinetic and non-kinetic. Additional effort will include development of autonomy to increase the operator trust for kinetic payloads in contested areas and the development of autonomy and command and control required for swarm payload from extra-large unmanned undersea vehicle. Specific FY 2023 objectives include: - Demonstration of autonomy algorithms to link with C2 system for deployment of effect for cross domain unmanned system - Develop of autonomy for deployment for non-kinetic effect in varying environmental conditions including modest sea states and cloud cov-Develop autonomy to leverage onboard environmental measurements and C2 reach back to provide mission advantage. Integrate Navy Oceanographic model results into UUV mission planning. Complete: Final report and knowledge transfer of technology to navy acquisition. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease from FY2022 to FY2023 in Proj 3451 CLAWS is due to the completion of applied research for the development of autonomous payloads for extra-large unmanned undersea vehicles operating in denied and contested areas. Final reporting will occur FY2023.					
Accomplishments/Planned Programs Subtotals	19.943	25.871	2.475	0.000	2.475

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3451 / *CLAWS*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3451: *CLAWS*	14.390	14.285	7.812	-	7.812	0.000	0.000	0.000	0.000	0.000	36.487

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3452 / *ELEKTRA*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3452: *ELEKTRA*	0.000	5.686	3.967	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.653

A. Mission Description and Budget Item Justification

Complex multi-domain threats can overwhelm the operator and individual platforms ability to defend the force. The ELEKTRA INP effort is developing "Human on the Loop" Artificial Intelligence (AI) enabled algorithms to perform force level kinetic/non-kinetic kill chain optimization and coordination across multiple domains at machine to machine speeds to increase the lethality and survivability of the Force. ELEKTRA will demonstrate AI/ML ability to coordinate kinetic/non kinetic effects autonomously with heterogeneous platforms, the ability to operate in degraded environments for hours and the ability to coordinate and execute domain kill chains simultaneously. It will deploy artificial intelligent (AI) and machine learning (ML) architecture, neural networked computing and large data handling to enable real time, force level effects assignment, coordination and resource management. The Activity identified in Project Unit 3452 specifically addresses Applied Research in support of the ELEKTRA INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: ELEKTRA	5.686	3.967	0.000	0.000	0.000
Description: Complex multi-domain threats can overwhelm the operator and individual platforms ability to defend the force. The ELEKTRA INP effort is developing "Human on the Loop" Artificial Intelligence (AI) enabled algorithms to perform force level kinetic/non-kinetic kill chain optimization and coordination across multiple domains at machine to machine speeds to increase the lethality and survivability of the Force. ELEKTRA will demonstrate AI/machine learning (ML) ability to coordinate kinetic/non kinetic effects autonomously with heterogeneous platforms, the ability to operate in degraded environments for hours and the ability to coordinate and execute domain kill chains simultaneously. It will deploy an AI/ML architecture, neural networked computing and large data handling to enable real time, force level effects assignment, coordination and resource management.					
FY 2022 Plans: Complete applied research for the development and expansion of capabilities developed in FY 2021. Research includes advanced analytics and initial prototyping for increasing the complexity of kinetic/non-kinetic kill chains and battle management. FY 2022 thrust areas include research for applying machine learned commanders intent, threat evaluation analytics, researching Distributed Maritime Operations warfare concepts, effects coordination techniques, required data analytics, and Human-Machine teaming concepts for AI applications to					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3452 / *ELEKTRA*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
enable synchronizing forces across Intelligence, Surveillance and Reconnaissance (ISR), C2 , Naval C2, surface combat systems and aircraft mission computers at the operational and tactical levels. ***FY 2023 Base Plans:*** N/A ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding from FY 2022 o FY 2023 in Proj: 3452 ELEKTRA is due to Applied Research program phase completion.					
Accomplishments/Planned Programs Subtotals	5.686	3.967	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3452: *ELEKTRA*	10.242	12.876	9.847	-	9.847	4.924	5.022	0.000	0.000	0.000	42.911

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3453 / *Hypersonic Booster*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3453: *Hypersonic Booster*	0.000	3.740	29.915	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	33.655

A. Mission Description and Budget Item Justification

The Hypersonic Booster INP is intended to leverage the best ongoing hypersonic air-breathing vehicle technologies and tailor those to address naval requirements for CVN compatibility and F/A 18E/F carriage. Originally founded upon a redesign/resizing of the DARPA Hypersonic Air-breathing Weapon Concept (HAWC) prototype, the Hypersonic Booster INP will consider all promising hypersonic air-breathing prototype vehicle candidate concepts that have already undergone significant government-industry investment and will lead to achievement of Navy goals; to include cost, schedule and performance. This INP has chosen a multiphase approach to ensure that the most promising concept and associated performer are chosen to deliver this breakthrough technology. The Activity identified in Project Unit 3453 specifically addresses Applied Research in support of the Hypersonic Booster INP effort.

In FY 2023, Proj: 3453 Hypersonic Booster is terminated and its funding realigned to other projects in this program element.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Hypersonic Booster	3.740	29.915	0.000	0.000	0.000
Description: The Hypersonic Booster INP is intended to leverage the best ongoing hypersonic air-breathing vehicle technologies and tailor those to address naval requirements for CVN compatibility and F/A 18E/F carriage. Originally founded upon a redesign/resizing of the DARPA Hypersonic Air-breathing Weapon Concept (HAWC) prototype, the Hypersonic Booster INP will consider all promising hypersonic air-breathing prototype vehicle candidate concepts that have already undergone significant government-industry investment and will lead to achievement of Navy goals; to include cost, schedule and performance. This INP has chosen a multiphase approach to ensure that the most promising concept and associated performer are chosen to deliver this breakthrough technology. The Activity identified in Project Unit 3453 specifically addresses Applied Research in support of the Hypersonic Booster INP effort. In FY 2023, Proj: 3453 Hypersonic Booster is terminated and its funding realigned to other projects in this program element. ***FY 2022 Plans:*** Continue applied research efforts in characterizing the performance of key components and assemblies to include: free jet testing of the scramjet engine while installed in the cruiser configuration, static ballistic testing of the solid propellant booster motor, and dynamic testing of the separation assembly. Efforts include fabrication					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3453 / *Hypersonic Booster*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
of hardware for the vehicle's compressed forebody and engine inlet assembly for characterizing and tuning the scramjet engine via a series of freejet tests in the NAS Langley wind tunnel. ***FY 2023 Base Plans:*** N/A ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding from FY22 to FY23 in Proj: 3453 Hypersonic Booster is due to the termination of this Project.					
Accomplishments/Planned Programs Subtotals	3.740	29.915	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3454 / *MDUSV*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3454: *MDUSV*	0.000	4.570	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	4.570

A. Mission Description and Budget Item Justification

The Medium Displacement Unmanned Surface Vehicle (MDUSV) project will develop and test a 132 ft. unmanned surface vehicle with ocean-spanning range, months of endurance, good seakeeping, and substantial payload. The vessel will have a high level of autonomy for independent operations under sparse supervisory control and have utility for a variety of Navy missions. MDUSVs capable of deployed blue-water operations with operator trust in safe, reliable operation, long-range and endurance autonomous operations. This will create a new paradigm for Navy surface force, a hybrid manned/unmanned force, and enable new tactics in performing naval missions. The Activity identified in Project Unit 3454 specifically addresses Applied Research in support of the MDUSV INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: MDUSV	4.570	0.000	0.000	0.000	0.000
Description: The Medium Displacement Unmanned Surface Vehicle (MDUSV) project will develop and test a 132 ft. unmanned surface vehicle with ocean-spanning range, months of endurance, good seakeeping, and substantial payload. The vessel will have a high level of autonomy for independent operations under sparse supervisory control and have utility for a variety of Navy missions. MDUSVs capable of deployed blue-water operations with operator trust in safe, reliable operation, long-range and endurance autonomous operations. This will create a new paradigm for Navy surface force, a hybrid manned/unmanned force, and enable new tactics in performing naval missions. ***FY 2022 Plans:*** N/A ***FY 2023 Base Plans:*** N/A ***FY 2023 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	4.570	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3454: *MDUSV*	2.514	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	2.514

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3454 / *MDUSV*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3455 / *MINERVA*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3455: *MINERVA*	0.000	5.621	3.966	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	9.587

A. Mission Description and Budget Item Justification

The need to operate in a multiple domain environment against highly capable peers requires improved decision quality and reduced decision timelines. MINERVA will develop AI and Machine-Learning (ML) capabilities to improve mission planning, intelligence gathering, execution and assessment. Minerva will deliver next-generation decision aids by combining operations research with emerging AI capabilities to create learning, self-adaptive automation that supports Composite Warfare Commander's (CWC) and their staffs at the Fleet, Force and Group echelons. It will establish a DevOps environment that includes warfighter staffs in the development and integration of new capabilities. The Activity identified in Project Unit 3455 specifically addresses Applied Research in support of the MINERVA INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: MINERVA	5.621	3.966	0.000	0.000	0.000
Description: The need to operate in a multiple domain environment against highly capable peers requires improved decision quality and reduced decision timelines. MINERVA will develop AI and Machine-Learning (ML) capabilities to improve mission planning, intelligence gathering, execution and assessment. Minerva will deliver next-generation decision aids by combining operations research with emerging AI capabilities to create learning, self-adaptive automation that supports Composite Warfare Commander's (CWC) and their staffs at the Fleet, Force and Group echelons. It will establish a DevOps environment that includes warfighter staffs in the development and integration of new capabilities. ***FY 2022 Plans:*** Continue applied research on emerging artificial intelligence and machine learning, and efforts associated with the development and expansion of a multi-domain integrated fires control prototype developed in FY 2021. Artificial intelligence and machine learning methods will be applied to undersea, surface, air, and space tactical decision aids to enhance the fidelity of kinetic/non-kinetic kill chains. These tactical decision aids will combine into a multi-domain battle management automation capability that will enable the synchronization of forces across Intelligence, Surveillance and Reconnaissance, Command & Control and combat systems at the operational and tactical levels.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3455 / *MINERVA*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Continue applied research on emerging artificial intelligence and machine learning methods to predict an adversary's surface warship or submarine kinematic space (position, velocity) and what is the likelihood of a specific enemy course of action/intent. ***FY 2023 Base Plans:*** N/A ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The decrease in funding from FY 2022 to FY 2023 is due to maturation and completion of the applied research in this program element (PE) and project, and associated migration of efforts to advanced technology development investment in PE 0603801N, Project 3455.					
Accomplishments/Planned Programs Subtotals	5.621	3.966	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3455: *MINERVA*	10.307	12.876	11.816	-	11.816	6.894	7.031	0.000	0.000	0.000	48.924

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3456 / *Full Spectrum Undersea Warfare*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3456: *Full Spectrum Undersea Warfare*	0.000	14.916	20.940	39.600	-	39.600	42.570	42.570	42.570	43.421	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Full Spectrum Undersea Warfare (FSUSW) Project will develop new technology for offensive and defensive warfare conducted on the seabed, in the sea (i.e. subsea), and from the sea. FSUSW focuses on Theatre Undersea Warfare (TUSW), Joint Targeting and Strike, and Subsea and Seabed Warfare (SSW). There are five thrust areas of FSUSW that are key to enabling Chief of Naval Operations Guidance (CNOG), Distributed Maritime Operations (DMO), and the Commandant's Stand in Force with manned and unmanned warfighting capability. These thrust areas were specifically chosen in direct collaboration with STRATCOM, INDO-PACOM, Fleet and Undersea Warfare Commanders and validated with regular Flag officer engagements. These applied research efforts will enable future undersea weapon systems (e.g., Maritime Strike Tomahawk and ADCAP variants), COCOM campaigns, and operational plans. FSUSW thrust areas include 1) Undersea effectors, 2) Integrated expeditionary subsea system of systems, 3) Multi-Vehicle Torpedo Tube Development System (MVTTDS), 4) Undersea UAV for Over-The-Horizon (OTH) effects and 5) Undersea Launched Devices to enable Commanding Officers and Regional Combatant Commander effects. The five thrust areas are technically and operationally interconnected.

The efforts described in this Project address the Applied Research associated with the Innovative Naval Prototypes (INP) Program. These investments represent game changing technologies with the potential to revolutionize operational concepts. They are disruptive in nature, as they would dramatically change the way naval forces fight. Due to high technical risk, INPs typically have long duration but have no more than three years between decision points. They mature technologies from a Technology Readiness Level (TRL) of 2 or 3 to a
TRL of 6. As such, INPs require both Budget Activity (BA) 2 and BA3 funding. The BA3 INP funds are specified in a separate Program Element (PE), 0603801N Innovative Naval Prototypes (INP) Adv Tec Dev in the Undersea Warfare Efforts, Project 3458.

Information security concerns preclude fully detailed descriptions of project efforts, research activities, and technology development plans. Specific information on each project and activity will be provided separately to the Congressional oversight committees.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Undersea Warfare Efforts	14.916	20.940	39.600	0.000	39.600
Description: The FSUSW Project will develop new technology for offensive and defensive warfare conducted on the seabed, in the sea (i.e. subsea), and from the sea. FSUSW will address three thrusts identified in the Undersea Warfare Development Command's document, "Full Spectrum Undersea Warfare Concept of Operations (CONOPS)". These thrusts are: advanced offensive missions for submarines, subsea and seabed warfare, and distributed undersea warfare. Distributed undersea warfare technology will enable full participation					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3456 / *Full Spectrum Undersea Warfare*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
of all undersea warfare assets in the Navy's Distributed Maritime Operations concept. FSUSW missions this Project addresses include Anti-Submarine Warfare (ASW), Anti Surface Warfare, Strike, Intelligence, Surveillance, and Reconnaissance, Mine Warfare, and Subsea and Seabed Warfare (SSW). The FSUSW Project includes the Affordable Mobile ASW Surveillance System (AMASS) research and will leverage technology developed in the separate PE 06022792N, Project Unit 3450, AMOS. ***FY 2022 Plans:*** Continued applied research to: - Improve the reliability and packing of components from modeling, simulation, breadboard of undersea UAV and undersea launched devices. - Conduct full scale experimentation, comparing legacy devices and developing devices to confirm performance envelopes to establish technical feasibility for scaling. - Complete applied research development for undersea launched devices with expectation to initiate advanced technology development of small devices in 2023. - Improve autonomy to enhance device sensors, emitters and communications by reducing emissions. - Develop optimized navigation and power alternatives that could have a notable mission performance enhancement for given vehicle diameter. - Conduct live, virtual, constructive experimentation with existing subsea sub-systems to characterize performance and technology options for expeditionary subsea system of systems, including data collection at sea. ***FY 2023 Base Plans:*** Continue: - Train and evaluate autonomy and automatic target recognition for joint undersea surveillance and targeting UUV - Conduct scaled experimentation and full scale interoperability in support of manned platform task execution, - Conduct live, virtual, constructive experimentation - Continue applied research development for larger undersea launched devices - Continue development of navigation and power alternatives that could have a notable mission performance. Complete: - Reliability and packing of components for small devices - Testing - Small diameter device host platform optimization.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3456 / *Full Spectrum Undersea Warfare*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Initiate: - Train acoustic unmanned detection algorithms for specific joint undersea surveillance and targeting UUV tasks - Independently and autonomously conduct specific undersea tasks - Design and initial prototype of undersea UAV and countermeasures with advanced autonomy, enabling warfighting task execution without humans in the loop for larger sized ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY 2022 to FY 2023 is due to the planned funding profile growth to support expanding Applied Research to larger devices and maturation of Applied Research in this activity through the fabrication of hardware and conducting a larger number of data collection and testing events.					
Accomplishments/Planned Programs Subtotals	14.916	20.940	39.600	0.000	39.600

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3461 / *MASS*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3461: *MASS*	0.000	0.000	4.487	4.950	-	4.950	7.920	0.000	0.000	0.000	0.000	17.357

Note

This activity is being broken out from PE 0603801N Project Unit 3459 Super Swarm to provide increased visibility and focus on this technical challenge area at the BA2 level.

A. Mission Description and Budget Item Justification

The rising use of air, surface, and sub-surface unmanned and autonomous systems requires a paradigm shift in the development, production, and life-cycle management of these systems in order to gain a competitive advantage against adversarial capabilities as well as allow for fielding of significant numbers (1000's to 10,000's) in an increasingly budget-constrained acquisition environment. The growth in rapid prototyping and additive manufacturing technologies presents an opportunity to capitalize on these advances though applied research efforts focused on scale-up both in terms of rapid production of relevant quantities as well as greatly increasing the physical size of platforms produced far beyond what is currently achievable. Manufacturing of Autonomous Systems at Scale (MASS) efforts will utilize wide range of advanced manufacturing methods combined with adaptive digital design processes with "Design for Low-Cost Platform Attriteability" as a major attribute to avoid the platform cost growths normally associated with exquisite systems development. This also represents the ability to rapidly modify platform attributes based on evolving operational needs and quickly insert into build process without costly retooling. Secondary goals focus on increasing commonality of critical components across platforms and design of these in modular fashion in order to manage supply chain vulnerability. Lastly, the project will look at ability to place manufacturing capability as far forward/afloat as possible to reduce the logistics tail and speed delivery of capability at-scale into the fleet. The activity identified in Project Unit 3461 MASS specifically addresses Applied Research in support of the MASS effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Manufacture of Autonomous Systems at Scale (MASS)	0.000	4.487	4.950	0.000	4.950
Description: The rising use of air, surface, and sub-surface unmanned and autonomous systems requires a paradigm shift in the development, production, and life-cycle management of these systems in order to gain a competitive advantage against adversarial capabilities as well as allow for fielding of significant numbers (1000's to 10,000's) in an increasingly budget-constrained acquisition environment. The growth in rapid prototyping and additive manufacturing technologies presents an opportunity to capitalize on these advances though applied research efforts focused on scale-up both in terms of rapid production of relevant quantities as well as greatly increasing the physical size of platforms produced far beyond what is currently achievable. Manufacturing of Autonomous Systems at Scale (MASS) efforts will utilize wide range of advanced manufacturing methods combined with adaptive digital design processes with "Design for Low-Cost Platform Attriteability" as a major attribute to avoid the platform cost growths normally associated with exquisite systems development. This also represents the ability to rapidly modify platform attributes based on evolving operational needs and					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3461 / *MASS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
quickly insert into build process without costly retooling. Secondary goals focus on increasing commonality of critical components across platforms and design of these in modular fashion in order to manage supply chain vulnerability. Lastly, the project will look at ability to place manufacturing capability as far forward/afloat as possible to reduce the logistics tail and speed delivery of capability at-scale into the fleet. The activity identified in Project Unit 3461 MASS specifically addresses Applied Research in support of the MASS effort. ***FY 2022 Plans:*** Continue Manufacturing of Autonomous Systems at Scale (MASS) efforts to utilize wide range of advanced manufacturing methods combined with adaptive digital design processes focused on large scale (both size and quantity) platforms of interest with Design for Attriteability as a major attribute. Secondary goals focused on managing supply chain vulnerability an supply chain assurance for critical and common components and manufacturing capability as far forward/afloat as possible. ***FY 2023 Base Plans:*** Continue: Continue Manufacturing of Autonomous Systems at Scale (MASS) efforts to utilize wide range of advanced manufacturing methods for based on design for attritability. Continue MASS digital design efforts to couple rapid adaptive processes focused on large scale (both size and quantity) platforms of interest. Complete: Complete MASS down-selection of technologies for experimentation. Complete design workshops for experimentation. Initiate: Initiate design modeling and simulation for composite and metallic large structural alternatives for attritable Super Swarm (Project 3459) agents and Deployment and Employment of Autonomous Long Range Systems (DEALRS) (Project 3462) swarm delivery marsupial host platforms. New design modifications will be based on FY22 design feedback. Initiate methods for supply chain assurance for critical and common components and manufacturing capability for swarm agents as far forward/afloat as possible.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3461 / *MASS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Initiate ruggedization of equipment for forward manufacturing. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 is due to the planned increase in materials purchased and their utilization applied to attritable platforms.					
Accomplishments/Planned Programs Subtotals	0.000	4.487	4.950	0.000	4.950

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3461: *mASS*	0.000	0.988	3.960	-	3.960	4.950	4.950	0.000	0.000	0.000	14.848

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy										Date: April 2022		
Appropriation/Budget Activity 1319 / 2					R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*				Project (Number/Name) 3462 / *DEALRS*			
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
3462: *DEALRS*	0.000	0.000	5.983	6.930	-	6.930	10.890	6.930	0.000	0.000	0.000	30.733

Note

This activity is being broken out from PE 0603801N Project Unit 3459 Super Swarm to provide increased visibility and focus on this technical challenge area at the BA2 level.

A. Mission Description and Budget Item Justification

Adversary Anti-Access and Area Denial (A2/AD) capabilities continue to improve but remain focused on targeting specific US and joint force capabilities. The Deployment and Employment of Autonomous Long Range Systems (DEALRS) project will develop technologies that sidestep, operate below the threshold, or deplete adversary A2/AD capabilities. DEALRS will specifically develop technologies to enable low-cost unmanned systems that can maneuver across theater-level ranges to penetrate, operate within, and launch strikes from within adversary A2/AD system coverage. This project will develop technologies to increase the range and endurance of autonomous systems while maintaining tactically relevant speeds, loiter times, and signatures with low cost. It will also address technologies that enable the marsupial launch of terminal engagement autonomous unmanned systems across all domains from larger and/or longer-range host systems that bring them to the launch area and the associated technologies needed to ensure roboticized and autonomous startup and launch of the marsupial systems without human intervention. The Activity identified in Project Unit 3462 DEALRS specifically addresses Applied Research in support of the INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: DEALRS	0.000	5.983	6.930	0.000	6.930
FY 2022 Plans: Continue efforts to explore concepts for the Deployment and Employment of Autonomous Long Range Systems (DEALRS) across all domains. Efforts will focus on platforms enhancements as well as marsupial concepts to allow extremely large numbers of systems to traverse long distances with minimal human intervention to bring them into the operations area.					
FY 2023 Base Plans: Continue: Continue efforts to explore concepts for the DEALRS across all domains. Efforts will focus on swarm agent range/ endurance enhancements as well as marsupial host / children swarm delivery concepts to allow extremely large numbers of systems to traverse long distances with minimal human intervention to bring them into the operations area.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3462 / *DEALRS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Continue efforts to demonstrate concepts for DEALRS across all domains. Efforts will focus on scaling up promising concepts to demonstrate trans-Oceanic deployment and employment of large numbers of unmanned systems to deliver desired effects in the areas of operation. Initiate: Initiate efforts for scale-up of promising full-system designs and components for objective Deployment and Employment of Autonomous Long Range Systems (DEALRS) swarm delivery marsupial host platform. Design will be informed by FY22 and early FY23 activities. Initiate concept exploration of alternative launcher methodologies to increase numbers of swarm platforms can be transported and deployed. Effort will be informed by FY22 / early FY23 Super Swarm (Project 3459) and Manufacture of Autonomous Systems at Scale (MASS) (Project 3461) activities. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 is due to the planned development of a marsupial platform to achieve the Long-Range delivery goals of the program.					
Accomplishments/Planned Programs Subtotals	0.000	5.983	6.930	0.000	6.930

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3462: *DEALRS*	0.000	0.987	4.950	-	4.950	5.940	5.940	7.920	8.078	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 3463 / *MATes*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
3463: *MATes*	0.000	0.000	4.986	6.435	-	6.435	9.900	9.900	4.950	5.049	Continuing	Continuing

Note

This activity is being broken out from PE 0603801N Project Unit 3459 Super Swarm to provide increased visibility and focus on this technical challenge area at the BA2 level.

A. Mission Description and Budget Item Justification

Traditionally, the utilization of autonomous systems is either operationally segregated from manned operations or requires a significant amount of human oversight when operating in conjunction with manned assets, which mitigates some of the advantage from using them. The goal of the Manned and Autonomous Teams (MATes) project is to develop autonomic robotic technology and collaborative autonomous behaviors that seamlessly operate across all domains in conjunction with manned units, allowing for real-time adaptation and optimization in a manner that streamlines the element of human interaction needed to share mission goals. This technology will monitor human or manned system teammate state, behavior, mission, and adversary threat status to anticipate and act in a tactically appropriate manner that is predictable, communicable, and trusted by the human/manned teammates and which enables autonomous system optimization in coordination with the human/manned teammate and mission objectives. Intuitive human/autonomous system interfaces will be developed to allow focus on higher-order decision-making tasks by the operators allowing for large numbers of autonomous systems (100's or 1000's) to be managed in support of manned operations. The activity identified in Project Unit 3463 MATes specifically addresses Applied Research in support of the MATes effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Manned and Autonomous Teams	0.000	4.986	6.435	0.000	6.435
Description: Traditionally, the utilization of autonomous systems is either operationally segregated from manned operations or requires a significant amount of human oversight when operating in conjunction with manned assets, which mitigates some of the advantage from using them. The goal of the Manned and Autonomous Teams (MATes) project is to develop autonomic robotic technology and collaborative autonomous behaviors that seamlessly operate across all domains in conjunction with manned units, allowing for real-time adaptation and optimization in a manner that streamlines the element of human interaction needed to share mission goals. This technology will monitor human or manned system teammate state, behavior, mission, and adversary threat status to anticipate and act in a tactically appropriate manner that is predictable, communicable, and trusted by the human/manned teammates and which enables autonomous system optimization in coordination with the human/manned teammate and mission objectives. Intuitive human/autonomous system interfaces will be developed to allow focus on higher-order decision-making tasks by the operators allowing for large numbers of autonomous systems (100's or 1000's) to be managed in support of manned operations. The					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3463 / *MATes*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
activity identified in Project Unit 3463 MATes specifically addresses Applied Research in support of the MATes effort. ***FY 2022 Plans:*** Continue efforts to explore autonomy, perception, and command and control (C2) concepts for Manned and Autonomous Teams (MATES) conducting complex multi-domain operations in proximity to each other along a spectrum of missions. Missions range from fully autonomous to highly supervised requiring an agile optimization as real-world factors change. ***FY 2023 Base Plans:*** Continue: Continue efforts to explore autonomy, perception, and command and control (C2) concepts for Manned and Autonomous Teams (MATES) conducting complex multi-domain operations in proximity to each other along a spectrum of missions. Autonomous systems will be swarm agents developed through Super Swarm (Project 3459) and Deployment and Employment of Autonomous Long Range Systems (DEALRS) (Project 3462). Autonomy, perception, and agent/ vehicle control schemes will be informed by Manufacture of Autonomous Systems at Scale (MASS) (Project 3461). Missions range from fully autonomous to highly supervised requiring an agile optimization as real-world factors change. Continue efforts to explore autonomy, perception, and command and control (C2) concepts for MATES conducting complex multi-domain operations in proximity to each other along a spectrum of missions. Initiate: Initiate activites researching an artificial theory of mind for Super Swarm (Project 3459) agents, allowing them to perceive current manned blue teammate behavior states and derive and act on anticipated future states and potential reactions to state changes. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase from FY22 to FY23 is due to the planned development of MATes toward fully autonomous swarm missions.					
Accomplishments/Planned Programs Subtotals	0.000	4.986	6.435	0.000	6.435

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 3463 / *MATes*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/3463: *MATes*	0.000	0.987	3.960	-	3.960	4.950	4.950	13.860	14.137	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 5891 / *INP Operational Analysis, Support and Experimentation Activity*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
5891: *INP Operational Analysis, Support and Experimentation Activity*	0.000	0.000	0.000	4.461	-	4.461	2.000	2.000	2.000	2.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

Effective in FY23, efforts in the Directed Energy/Electric Weapons Activity within Proj: 3400 INP Applied Research in PE 0602792N are broken out into this stand-alone Proj: 5891 Operational Analysis, Support and Experimentation Activity to broaden the spectrum of promising applied research efforts investigated within this Project and to provide additional acquisition oversight, fiscal clarity, and adherence to financial management practices at the Project level.

The efforts described in this Project address the Applied Research associated with Innovative Naval Prototype (INP) Operational Analysis, Support and Experimentation Activity efforts that are used to further explore the development of future INP topics and proposals. These efforts evaluate, study/analyze and/or perform any basic applied research-focused investigative experimentation activities which will support the identification of potential INP topics for future investment consideration. The use of Operational Analysis, Support and Experimentation Activity funds can help accelerate and/or create a flexible response to emerging requirements or threats by identifying a potential INP topic for consideration in a more time-efficient and/or effective manner.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: INP Operational Analysis, Support and Experimentation	0.000	0.000	4.461	0.000	4.461
Description: Effective in FY23, efforts in the Directed Energy/Electric Weapons Activity within Proj: 3400 INP Applied Research in PE 0602792N are broken out into this stand-alone Proj: 5891 Operational Analysis, Support and Experimentation to broaden the spectrum of promising applied research efforts investigated within this Project and to provide additional acquisition oversight, fiscal clarity, and adherence to financial management practices at the Project level. The efforts described in this Project address the Applied Research associated with Innovative Naval Prototype (INP) Operational Analysis, Support and Experimentation efforts that are used to further explore the development of future INP topics and proposals. These efforts evaluate, study/analyze and/or perform any basic applied research-focused investigative experimentation activities which will support the identification of potential INP topics for future investment consideration. The use of Operational Analysis, Support and Experimentation funds can help accelerate and/or create a flexible response to emerging requirements or threats by identifying a potential INP topic for consideration in a more time-efficient and/or effective manner.					
FY 2022 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5891 / *INP Operational Analysis, Support and Experimentation Activity*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A ***FY 2023 Base Plans:*** - Initiate program support and applied research activities associated with exploring the development of future INP topics and proposals. - Evaluate, study/analyze and/or perform any basic applied research-focused investigative experimentation activities to inform and identify potential future INP investment areas. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 5891 INP Operational Analysis, Support and Experimentation is due to the initiation of this Project which is established from the re-alignment of funding from the Directed Energy/Electric Weapons Activity within Proj: 3400 INP Applied Research in PE 0602792N to broaden the spectrum of promising applied research efforts investigated.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	4.461	0.000	4.461

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 5892 / *Full Spectrum Information Warfare*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
5892: *Full Spectrum Information Warfare*	0.000	0.000	0.000	4.000	-	4.000	7.000	0.000	0.000	0.000	0.000	11.000

A. Mission Description and Budget Item Justification

The Full Spectrum Information Warfare (FSIW) effort will develop integrated holistic Counter-C5ISRT capability, techniques and CONOPS to defeat adversarial capacity growth to include the effects of the maritime environment on tactics and effectiveness in order to provide the proliferation of C-C5ISRT payloads on small to large platforms and software to calculate EM propagation and take into account environmental conditions from "DC to Daylight" e.g. from VLF/HF through optical frequencies to optimize both passive and active C-C5ISRT technology use.

The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations.

The Activity identified in this Project Unit specifically addresses Applied Research in support of the FSIW INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Full Spectrum Information Warfare	0.000	0.000	4.000	0.000	4.000
Description: The Full Spectrum Information Warfare (FSIW) effort will develop integrated holistic Counter-C5ISRT capability, techniques and CONOPS to defeat adversarial capacity growth to include the effects of the maritime environment on tactics and effectiveness in order to provide the proliferation of C-C5ISRT payloads on small to large platforms and software to calculate EM propagation and take into account environmental conditions from "DC to Daylight" e.g. from VLF/HF through optical frequencies to optimize both passive and active C-C5ISRT technology use. The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5892 / *Full Spectrum Information Warfare*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations. The Activity identified in this Project Unit specifically addresses Applied Research in support of the FSIW INP effort. ***FY 2022 Plans:*** N/A ***FY 2023 Base Plans:*** Initiate applied research in support of the development of Full Spectrum Information Warfare(FSIW). Specific efforts include the following: - Develop a test scenario with real tropospheric and ionospheric conditions based on one of the EW Field Demos (for example in the LSE or Rough Series). Identify cases of observed extended or reduced ranges, clutter, and detectability and compare predicted to observed conditions. - Analyze emerging material science for possible breakthroughs in passive countermeasures - Investigate cyber vulnerabilities in imagers and potential threat AI/ML algorithms - Investigate a high-level architecture for MUM-T C-C5ISRT employment - Extend current planning aids for space-based ISR to surface and airborne fixed/ mobile systems. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 5892 Full Spectrum Information Warfare (FSIW) is due to the initiation of this Project.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	4.000	0.000	4.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5892 / *Full Spectrum Information Warfare*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 5893 / *Decision Superiority*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
5893: *Decision Superiority*	0.000	0.000	0.000	1.700	-	1.700	1.200	0.000	0.000	0.000	0.000	2.900

A. Mission Description and Budget Item Justification

The Decision Superiority (DS) effort will improve the speed and quality of decisions when conducting undersea warfare activities at the tactical edge that does not require persistent communication reach back. This will be achieved through the development of Decision Aids (DAs) using a holistic Human-Machine-Teaming (HMT) and training approaches and processes to optimize warfighter decisions (e.g. sonar operations, maintenance repair, personnel rotations).

The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations.

The Activity identified in this Project Unit specifically addresses Applied Research in support of the Decision Superiority INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Decision Superiority	0.000	0.000	1.700	0.000	1.700
Description: The Decision Superiority (DS) effort will improve the speed and quality of decisions when conducting undersea warfare activities at the tactical edge that does not require persistent communication reach back. This will be achieved through the development of Decision Aids (DAs) using a holistic Human-Machine-Teaming (HMT) and training approaches and processes to optimize warfighter decisions (e.g. sonar operations, maintenance repair, personnel rotations). The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5893 / *Decision Superiority*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
The Activity identified in this Project Unit specifically addresses Applied Research in support of the Decision Superiority INP effort. ***FY 2022 Plans:*** N/A ***FY 2023 Base Plans:*** Initiate applied research in support of the development of the Decision Superiority (DS) INP. Specific efforts include the following: - Studies and operational characterization of problems, tasks, data, decisions, and metrics related to undersea warfare. - Modeling and simulation architecture development to inform iterative development, training, and evaluation in a realistic mission environment. HMT design and evaluation analysis to support warfighter decisions making related to emerging technologies. - Develop adaptive training process informed by identified warfighter decisions, HMT evaluation process, and operational metrics - Develop and conduct initial research studies related to mental endurance and decision making performance to inform personnel rotation and scheduling technologies ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 5893 Decision Superiority (DS) is due to the initiation of this Project.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	1.700	0.000	1.700

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 5894 / *Direct-X*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
5894: *Direct-X*	0.000	0.000	0.000	2.500	-	2.500	0.000	0.000	0.000	0.000	0.000	2.500

A. Mission Description and Budget Item Justification

The Direct-X effort will develop space based ISRT with direct downlink into kill chains supporting all domain effects in a Distributed Maritime Operations construct. The focus is on advances in the following lines of effort:
P1 - Orchestration, tasking and resilient C3
P2 - Threat prioritized low cost on orbit payloads
P3 - On orbit processing and analyitic AI/ML
P4 - Direct-to-shooter kill chains
P5 - On orbit effects

The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations.

The Activity identified in this Project Unit specifically addresses Applied Research in support of the Direct-X INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Direct-X	0.000	0.000	2.500	0.000	2.500
Description: The Direct-X effort will develop space based ISRT with direct downlink into kill chains supporting all domain effects in a Distributed Maritime Operations construct. The focus is on advances in the following lines of effort: P1 - Orchestration, tasking and resilient C3 P2 - Threat prioritized low cost on orbit payloads P3 - On orbit processing and analyitic AI/ML P4 - Direct-to-shooter kill chains P5 - On orbit effects The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5894 / *Direct-X*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations. The Activity identified in this Project Unit specifically addresses Applied Research in support of the Direct-X INP effort. ***FY 2022 Plans:*** N/A ***FY 2023 Base Plans:*** Initiate applied research in support of the development of the Direct-X INP. Specific efforts include the following: - Feasibility studies to identify state-of-the-art technologies that support these five lines of effort, and analyze them to capture technological gaps for enabling the DX concept. - Determine the sequencing of payloads to threats - Study outcomes and analysis of technological gaps to develop an investment strategy for an envisioned reconfigurable Naval constellation- ultimately converging on multifunction systems to support mission areas. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 5894 Direct-X is due to the initiation of this Project.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	2.500	0.000	2.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5894 / *Direct-X*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 5895 / *DMO through IAS*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
5895: *DMO through IAS*	0.000	0.000	0.000	2.950	-	2.950	4.500	0.000	0.000	0.000	0.000	7.450

A. Mission Description and Budget Item Justification

The Distributed Maritime Operations though Intelligent Autonomous Systems (DMO-IAS) effort will demonstrate IAS teams that can maneuver and close sea denial detect through engage/ assess kill-chains over tactically relevant ranges and extended mission durations, that maintain survivability through avoidance of detection, and that do not rely on vulnerable command and control systems. It will explore novel sensing, autonomy, and communications approaches that can be applied to other Navy IAS programs that enable robust, resilient IAS kill-chains.

The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations.

The Activity identified in this Project Unit specifically addresses Applied Research in support of the DMO through IAS INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: DMO through IAS	0.000	0.000	2.950	0.000	2.950
Description: The Distributed Maritime Operations though Intelligent Autonomous Systems (DMO-IAS) effort will demonstrate IAS teams that can maneuver and close sea denial detect through engage/ assess kill-chains over tactically relevant ranges and extended mission durations, that maintain survivability through avoidance of detection, and that do not rely on vulnerable command and control systems. It will explore novel sensing, autonomy, and communications approaches that can be applied to other Navy IAS programs that enable robust, resilient IAS kill-chains. The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5895 / *DMO through IAS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations. The Activity identified in this Project Unit specifically addresses Applied Research in support of the DMO through IAS INP effort. ***FY 2022 Plans:*** N/A ***FY 2023 Base Plans:*** Initiate applied research in support of the development of Distributed Maritime Operations through Intelligent Autonomous Systems (DMO through IAS). Specific efforts include the following: - Conduct operationally oriented study and simulation experiment to refine the potential of AI enabled IAS platforms - conducting collaborative DMO. - Integrate autonomy, onboard AI processing, and comms modalities onto surrogate UxS (draw from existing INP efforts). - Conduct live, force-on-force experiment against fleet assets to determine and validate kill-chain vulnerabilities and opportunities. - Lessons learned will inform efficacy and impact of a potential follow-on effort along with defined technical objectives and proposed paths for autonomy, sensing, AI, platform performance, and C2. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 5895 Distributed Maritime Operations through Intelligent Autonomous Systems (DMO through IAS) is due to the initiation of this Project.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	2.950	0.000	2.950

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5895 / *DMO through IAS*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 5896 / *Echidna*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
5896: *Echidna*	0.000	0.000	0.000	1.777	-	1.777	0.750	0.000	0.000	0.000	0.000	2.527

A. Mission Description and Budget Item Justification

The Echidna effort will develop additive capability and additive capacity which is classified. It will explore new mine development, to include improved sensing for a highly complex environment and target, improved lethality, endurance and power technologies, cost-effective additive manufacturing subcomponent technologies, and flexible, platform-agnostic engineering design (to include safe & arming device) to allow for novel and adaptable concepts of employment (CONEMP)

The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations.

The Activity identified in this Project Unit specifically addresses Applied Research in support of the Echidna INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Echidna	0.000	0.000	1.777	0.000	1.777
Description: The Echidna effort will develop additive capability and additive capacity which is classified. It will explore new mine development, to include improved sensing for a highly complex environment and target, improved lethality, endurance and power technologies, cost-effective additive manufacturing subcomponent technologies, and flexible, platform-agnostic engineering design (to include safe & arming device) to allow for novel and adaptable concepts of employment (CONEMP) The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5896 / *Echidna*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
The Activity identified in this Project Unit specifically addresses Applied Research in support of the Echidna INP effort. ***FY 2022 Plans:*** N/A ***FY 2023 Base Plans:*** Initiate applied research in support of the development of the Echidna INP. Specific efforts include the following: - Thrust 1: Lethality study, to include M&S for housing, and comparative analysis with legacy warhead and new explosive formulation - Thrust 2: Analysis of Alternatives (AoA) for dynamic sensing environment, target analysis - Thrust 3: Update 2021 ONR Subsea & Seabed Power (SSP) Roadmap to address Mining gaps. Establish T/O for endurance parameters, environmental considerations, approach for deployment. - Thrust 4: Additive manufacturing study for subcomponent technologies, to include prototype application Exit criteria for Phase 1: Integration schedule for subcomponent design (Thrust 1-3), and parallel subcomponent design and comparative analysis of test articles in representative environment (Thrust 4) ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 5896 Echidna is due to the initiation of this Project.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	1.777	0.000	1.777

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 5897 / *Hypersonic Technologies*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
5897: *Hypersonic Technologies*	0.000	0.000	0.000	8.000	-	8.000	6.000	0.000	0.000	0.000	0.000	14.000

A. Mission Description and Budget Item Justification

The Hypersonic Technologies effort will develop technologies that support the unique operational and environment aspects of hypersonic weapon systems. Efforts include: advanced materials; propulsion; stability and control; seekers and sensors; guidance, navigation, and control; and payloads and energetics.

The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations.

The Activity identified in this Project Unit specifically addresses Applied Research in support of the Hypersonic Technologies INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Hypersonic Technologies	0.000	0.000	8.000	0.000	8.000
Description: The Hypersonic Technologies effort will develop technologies that support the unique operational and environment aspects of hypersonic weapon systems. Efforts include: advanced materials; propulsion; stability and control; seekers and sensors; guidance, navigation, and control; and payloads and energetics. The efforts described in this Project address the Applied Research associated with concept of a "Seedling". These "Seedling" efforts are short duration applied research efforts to explore technology concepts which have the potential to provide revolutionary and/or disruptive warfighting capability. As a "Seedling" concept matures, a determination is made whether or not a continuing INP effort is warranted or appropriate. "Seedlings" are typically one to two year efforts and use applied research to analyze the feasibility of technology and subsystems to assess if the technologies can be proposed as an INP. They will research lower TRL technologies to explore technology concepts and lay preliminary groundwork for an INP proposal to continue technology development and full-scale technology/operational demonstrations. The Activity identified in this Project Unit specifically addresses Applied Research in support of the Hypersonic Technologies INP effort.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5897 / *Hypersonic Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
FY 2022 Plans: N/A ***FY 2023 Base Plans:*** Initiate applied research in support of the development of the Hypersonic Technologies INP. Specific efforts include the following: - Award a Base Contract, under which the vendor would deliver S&T-tailored system requirements and an S&T-tailored preliminary design. - Initiate of a Contract Option One effort, which would culminate with an S&T-tailored critical design. ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 5897 Hypersonic Technologies is due to the initiation of this Project.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	8.000	0.000	8.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 5899 / *Precision Fire Control*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
5899: *Precision Fire Control*	0.000	0.000	0.000	23.539	-	23.539	22.261	14.040	4.880	0.980	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Precision Fire Control (PFC) effort will develop a fire control architecture that delivers high precision, high update rate guidance solutions to enable cruise missile defense with small, low-cost interceptors and dramatically increase number of interceptors per ship or Expeditionary Advanced Base. It will develop fire control capability for multiple interceptors (missiles and gun projectiles) that contribute to layered defense of surface combatants, expeditionary forces, and homeland protection. Develop PFC-enabled low-cost missile (LCM) based on existing 2.75" rocket components.

The Activity identified in this Project Unit specifically addresses Applied Research in support of the PFC INP effort.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Precision Fire Control	0.000	0.000	23.539	0.000	23.539
Description: The Precision Fire Control (PFC) effort will develop a fire control architecture that delivers high precision, high update rate guidance solutions to enable cruise missile defense with small, low-cost interceptors and dramatically increase number of interceptors per ship or Expeditionary Advanced Base. It will develop fire control capability for multiple interceptors (missiles and gun projectiles) that contribute to layered defense of surface combatants, expeditionary forces, and homeland protection. Develop PFC-enabled low-cost missile (LCM) based on existing 2.75" rocket components. The Activity identified in this Project Unit specifically addresses Applied Research in support of the PFC INP effort. ***FY 2022 Plans:*** N/A ***FY 2023 Base Plans:*** Initiate applied research in support of the development of the Precision Fire Control (PFC) INP. Specific efforts include the following: - Leverage results of prior fire control architecture studies, experiments, and current technologies to complete requirements and functional designs for fire control hardware and software. - Begin prototyping of PFC fire control elements and HVP flight test units.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 2	**R-1 Program Element (Number/Name)** PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	**Project (Number/Name)** 5899 / *Precision Fire Control*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
- Internal warfare center investments are contributing to concept exploration and performance predictions ***FY 2023 OCO Plans:*** N/A ***FY 2022 to FY 2023 Increase/Decrease Statement:*** The increase in funding from FY22 to FY23 in Proj: 5899 Precision Fire Control (PFC) is due to the initiation of this Project.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	23.539	0.000	23.539

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
• RDTEN/0603801N/5899: *Precision Fire Control*	0.000	0.000	0.527	-	0.527	8.673	10.352	19.520	15.128	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy			Date: April 2022
Appropriation/Budget Activity 1319 / 2	R-1 Program Element (Number/Name) PE 0602792N / *Innovative Naval Prototypes (INP) Applied Res*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	13.515	3.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	16.515

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other Projects.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022
Congressional Add: Thermoplastic tailorable universal feedstock composites ***FY 2021 Accomplishments:*** Conducted research to produce highly aligned short fiber thermoplastic composite feedstock which can be formed to produce small but complex aerospace parts which are cost competitive with CNC machined Aluminum parts. ***FY 2022 Plans:*** N/A	9.654	0.000
Congressional Add: Thermoplastic Composities for Lightweight Naval Applications ***FY 2021 Accomplishments:*** Conducted applied research in Thermoplastic Composities for Lightweight Naval Applications. ***FY 2022 Plans:*** N/A	3.861	0.000
Congressional Add: Accelerate proliferated LEO narrowband capability ***FY 2021 Accomplishments:*** N/A ***FY 2022 Plans:*** Conduct accelerate proliferated LEO narrowband capability applied research	0.000	3.000
Congressional Adds Subtotals	13.515	3.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A