Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy											Date: February 2020	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603801N *I Innovative Naval Prototypes (INP) Adv Tec Dev*							
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	196.092	129.003	141.948	-	141.948	134.163	126.888	126.696	129.230	Continuing	Continuing
2480: *SSL-TM*	0.000	0.000	8.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	8.000
2481: *EMRG*	0.000	0.000	7.368	9.500	-	9.500	0.000	0.000	0.000	0.000	0.000	16.868
2731: *High Energy Laser Counter ASCM Project (HELCAP)*	0.000	0.000	0.000	29.500	-	29.500	14.000	4.000	0.000	0.000	0.000	47.500
2958: *Cyberspace Activities*	0.000	0.000	14.498	16.489	-	16.489	15.939	0.000	0.000	0.000	0.000	46.926
3400: *Innovative Naval Prototypes (INP) Adv Tech Dev*	0.000	156.512	91.137	0.000	-	0.000	8.501	10.482	49.760	50.756	Continuing	Continuing
3416: *HIJENKS*	0.000	0.000	0.000	14.465	-	14.465	7.656	0.000	0.000	0.000	0.000	22.121
3423: *LOCUST*	0.000	0.000	0.000	12.750	-	12.750	3.396	0.000	0.000	0.000	0.000	16.146
3450: *AMOS*	0.000	0.000	0.000	4.524	-	4.524	3.480	4.525	0.000	0.000	0.000	12.529
3451: *CLAWS*	0.000	0.000	0.000	15.300	-	15.300	14.339	0.000	0.000	0.000	0.000	29.639
3452: *ELEKTRA*	0.000	0.000	0.000	10.869	-	10.869	12.926	9.946	4.973	5.072	Continuing	Continuing
3453: *Hypersonic Booster*	0.000	0.000	0.000	0.000	-	0.000	0.000	20.000	30.000	30.600	Continuing	Continuing
3454: *MDUSV*	0.000	0.000	0.000	1.115	-	1.115	0.000	0.000	0.000	0.000	0.000	1.115
3455: *MINERVA*	0.000	0.000	0.000	10.936	-	10.936	12.926	11.935	6.963	7.102	Continuing	Continuing
3457: *Long Range Targeting*	0.000	0.000	0.000	10.000	-	10.000	21.000	33.000	35.000	35.700	Continuing	Continuing
3458: *Undersea Warfare Efforts*	0.000	0.000	0.000	2.500	-	2.500	0.000	0.000	0.000	0.000	0.000	2.500
3459: *Super Swarm (SS)*	0.000	0.000	0.000	4.000	-	4.000	20.000	33.000	0.000	0.000	0.000	57.000
9999: *Congressional Adds*	0.000	39.580	8.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	47.580

Note

In FY 2020, three new stand alone project units were created for three Innovative Naval Prototypes (INP) major focus areas to better consolidate and coordinate the acceleration of these efforts. The three project units are: 2480 Solid State Laser Technology Maturation (SSL TM), 2481 the Electro-Magnetic Railgun, and 2958 Cyberspace Activities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy	Date: February 2020
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603801N *I Innovative Naval Prototypes (INP) Adv Tec Dev*

In FY 2021, a new stand alone project unit, High Energy Laser Counter ASCM Project (HELCAP) will be established as Project 2731 to specifically differentiate HELCAP efforts from other efforts in the Directed Energy R-2 Activity under Project 3400.

The FY 2020 Appropriation Act directed ONR to establish appropriate projects for prototyping efforts to provide additional acquisition oversight, fiscal clarity and adherence to financial management practices. Within this PE, INP funding was moved from Proj 3400 Innovative Naval Protoypes (INP) Adv Tech Dev to new stand-alone projects as indicated below starting in FY 2021.

- Proj 3416: HIJENKS
- Proj 3423: LOCUST
- Proj 3450: AMOS
- Proj 3451: CLAWS
- Proj 3452: ELEKTRA
- Proj 3453: Hypersonic Booster
- Proj 3454: MDUSV
- Proj 3455: MINERVA
- Proj 3457: Long Range Targeting
- Proj 3458: Undersea Warfare Efforts
- Proj 3459: Super Swarm (SS)

A. Mission Description and Budget Item Justification

The Office of Naval Research (ONR) portfolio includes efforts that solve problems and respond to mission requirements, as well as, exploratory research for new ideas and breakthrough capabilities. Larger in scope, scale and risk Innovative Naval Prototypes (INP) are selected for their high-payoff and potential to revolutionize operational concepts. The efforts described in this Program Element (PE) continue the Applied Research work in PE 0602792N for promising INPs with Advanced Technology Development activities. INP investments define the future of U.S. naval forces. Due to high technical risk, INPs often have long trial-and-error timeframes to work through challenges, but typically no more than three years between decision points. INP efforts mature technologies from a Technology Readiness Level (TRL) of 2 or 3 to a TRL of 6. As such, INPs require applied and advanced technology development funding to bridge from concept to working prototype. INPs prove technological and capability potential, validate production feasibility, and acquisition potential. ONR demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to a new acquisition programs. INPs are selected by senior leadership in the Department of the Navy.

This Program Element (PE) funds Advanced Technology Development (ATD) that includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment. Efforts in this PE generally have Technology Readiness Levels TRL) of 4 (component and/or breadboard validation in laboratory environment.), 5 (component and/or breadboard validation in relevant environment.), or 6 (system/subsystem model or prototype demonstration in a relevant environment).

Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Navy	Date: February 2020
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603801N *I Innovative Naval Prototypes (INP) Adv Tec Dev*

Because to the nature of these projects described, technology development plans have been written with limited details due to information security concerns. Specific information on each project will be provided separately to the Congressional oversight committees.

B. Program Change Summary ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	202.394	133.303	141.948	-	141.948
Current President's Budget	196.092	129.003	141.948	-	141.948
Total Adjustments	-6.302	-4.300	0.000	-	0.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-12.300			
• Congressional Rescissions	-	-			
• Congressional Adds	-	8.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-6.302	0.000			
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2019	FY 2020
Project: 9999: *Congressional Adds*		
Congressional Add: *Electromagnetic Railgun*	9.654	0.000
Congressional Add: *Railgun with Hypervelocity Projectile*	29.926	0.000
Congressional Add: *Advanced thermal and power technology for improved DEW SWAP*	0.000	8.000
Congressional Add Subtotals for Project: 9999	39.580	8.000
Congressional Add Totals for all Projects	39.580	8.000

Change Summary Explanation

funding: No significant change.

Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 2480 / *SSL-TM*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
2480: *SSL-TM*	0.000	0.000	8.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	8.000

Note

Solid State Laser Technology Maturation (SSL TM) plans and associated resources are realigned from Project 3400 in Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tech Dev into this new Project 2480 within PE 0603801N effective FY 2020.

A. Mission Description and Budget Item Justification

Solid State Laser Technology Maturation (SSL TM) is a multi-year effort in various stages of research and development within the Navy's Innovative Naval Prototypes (INP) Program. SSL-TM will develop a maritime laser weapons system prototype and test it on a representative test platform for a naval surface combatant, and conduct the required laser weapon system engineering, design, integration and testing necessary to have a testable, experimental prototype. This system will be capable of supporting missions such as defense against small boat and Unmanned Aerial Vehicle (UAV) swarms and Intelligence, Surveillance and Reconnaissance (ISR) disruption and defeat. The project will conduct at-sea testing on the full laser weapon system demonstrator (i.e., prototype) from a representative test platform for a naval surface combatant.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Solid State Laser Technology Maturation (SSL TM)	0.000	8.000	0.000	0.000	0.000
Description: Solid State Laser Technology Maturation (SSL-TM) is a multi-year effort to develop a maritime laser weapons system prototype and test it on a representative test platform for a naval surface combatant, and conduct the required laser weapon system engineering, design, integration and testing necessary to have a					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 2480 / *SSL-TM*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
testable, experimental prototype. This system will be capable of supporting missions such as defense against small boat and Unmanned Aerial Vehicle (UAV) swarms. ***FY 2020 Plans:*** At-sea testing and experimentation will be conducted with full laser weapon system demonstrator (i.e. prototype) on an active duty navy surface combat ship. During this period the technical performance will be evaluated in various atmospheric and sea state conductions while conducting operational missions and exercises. Lessons learned from operations and maintenance will be documented to inform development of future laser weapons systems development efforts. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease in funding from FY 2020 to FY 2021 is due to the completion of Advanced Technology Development efforts under this Activity.					
Accomplishments/Planned Programs Subtotals	0.000	8.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0603382N/2480: *SSL-TM*	0.000	3.922	11.909	-	11.909	5.434	3.992	0.000	0.000	0.000	25.257

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 2481 / *EMRG*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
2481: *EMRG*	0.000	0.000	7.368	9.500	-	9.500	0.000	0.000	0.000	0.000	0.000	16.868

Note

Electro-Magnetic Railgun (EMRG) plans and associated resources are realigned from Project Unit 3400 in Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 2481 effective FY 2020.

A. Mission Description and Budget Item Justification

Electro-Magnetic Railgun (EMRG) is a high-power, kinetic energy weapon capable of launching precision guided projectiles using electricity instead of chemical propellants. This multi-year effort will build a Railgun Weapon System (RGWS) by designing, fabricating and integrating EMRG subsystems and components into a weapon system that brings new capabilities, increased capacity and improved operational economy to fleet operations at sea. With its increased velocity and extended range, EMRG provides multi-mission potential for hypersonic missile defense, anti-air & surface warfare, and naval surface fire support. The Activity identified in Project Unit 2481 specifically addresses Advanced Technology Development in support of the EMRG high-power, kinetic energy weapon prototype development Innovative Naval Prototype (INP) effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Electro-Magnetic Railgun (EMRG)	0.000	7.368	9.500	0.000	9.500
Description: The Electro-Magnetic Railgun (EMRG) is a high-power, kinetic energy weapon capable of launching precision guided projectiles using electricity instead of chemical propellants. This multi-year effort will build a Railgun Weapon System (RGWS) by designing, fabricating and integrating EMRG subsystems and components into a weapon system that brings new capabilities, increased capacity and improved operational					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 2481 / *EMRG*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
economy to fleet operations at sea. With its increased velocity and extended range, EMRG provides multi-mission potential for hypersonic missile defense, anti-air & surface warfare, and naval surface fire support. ***FY 2020 Plans:*** Design, fabricate and integrate Electro-Magnetic Railgun (EMRG) subsystems and components into a system prototype including fully trainable, elevatable mount capable of rep-rate operations. Continue developing and testing prototype rep-rate railgun launcher that is suitable for installation in a prototype railgun gun mount. Conduct system level assessments of a Railgun Weapon System that is capable of closing the fire control loop. Demonstrate integration and use of Hyper Velocity Projectile (HVP) in a fixed elevation Railgun located at White Sands Missile Range. Conduct preliminary prototype system tests and demonstrations to prove the technological feasibility of the EMRG capability and assess sub-system and component operability under stressing rep-rate conditions. Develop next generation pulsed power (NGPP) system performance specifications for shipboard applications. Perform full-scale testing of long-life railgun launcher material solutions inserted in laboratory launchers. Design, build, test, and evaluate iterative electromagnetic railgun composite launcher prototypes to demonstrate the technological feasibility, performance, multi-shot life, and suitable firing rate of the system. ***FY 2021 Base Plans:*** Complete Anti-Air Warfare (AAW) demonstrations to prove capability of Hyper Velocity Projectile (HVP) when fired from a railgun to engage stressing air threats. Complete risk reduction activities started in FY 2020 to document requirements for a future tactical shipboard Railgun Weapon System (RGWS). Complete system functional requirements and performance specifications for a shipboard RGWS. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in funding from FY 2020 to FY 2021 is due to additional efforts required for the demonstration of a Railgun Weapon System (RGWS) with prototype mount.					
Accomplishments/Planned Programs Subtotals	0.000	7.368	9.500	0.000	9.500

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 2481 / *EMRG*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 1319/0602792N/0000: *EM Railgun (EMRG)*	13.463	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	13.463
• RDTEN/0602792N/2481: *EM Railgun (EMRG)*	0.000	7.632	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	7.632
• 1319/0603801N/3400: *EM Railgun (EMRG)*	14.557	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	14.557

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy											Date: February 2020	
Appropriation/Budget Activity 1319 / 3					R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*				Project (Number/Name) 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*			
COST ($ in Millions)	**Prior Years**	**FY 2019**	**FY 2020**	**FY 2021 Base**	**FY 2021 OCO**	**FY 2021 Total**	**FY 2022**	**FY 2023**	**FY 2024**	**FY 2025**	**Cost To Complete**	**Total Cost**
2731: *High Energy Laser Counter ASCM Project (HELCAP)*	0.000	0.000	0.000	29.500	-	29.500	14.000	4.000	0.000	0.000	0.000	47.500

Note

High Energy Laser Counter ASCM Project (HELCAP) plans and associated resources are realigned from Project 3400 in Program Element (PE) 0603801N Innovative Naval Prototypes (INP) Adv Tec Dev into this new Project 2731 within PE 0603801N effective FY 2021. This is not a new start.

A. Mission Description and Budget Item Justification

High Energy Laser Counter ASCM Project (HELCAP): Defeating Anti-Ship Cruise Missiles (ASCMs) with a laser weapon system presents several technical challenges. The High Energy Laser Counter ASCM Project HELCAP will assess, develop, experiment, and demonstrate the various laser weapon system technologies and methods of implementation required to defeat ASCMs.

HELCAP will leverage the knowledge gained in the Navy Laser Family of Systems (NLFoS) efforts that include:
- Alternative Laser Sources for higher powers, also known as the Ruggedized High Energy Laser (RHEL) activities;
- Solid State Laser Tech Maturation activities that provides initial key enabling technical solutions in high power lasers and beam control, and will provide opportunities for single ship operational and sustainment learning;
- Surface Navy Laser Weapon System Increment 1 (SNLWS Inc. 1) project that provides the initial combat system integration and installation knowledge for Aegis platforms, and multi-ship battle force operations knowledge;
- Optical Dazzling Interdictor Navy (ODIN) that provides Counter-ISR technical and fleet operational knowledge.

This leveraged knowledge and new HELCAP technical solutions to the C-ASCM problem will enable a fully informed decision to rapidly field an integrated, fleet ready, HEL Weapon.

HELCAP activities being conducted in this project include technology assessments, laser lethality investigations, and advanced beam control. This project passes technology to follow on HELCAP activities being conducted under Program Element (PE) 0603925N Directed Energy and Electric Weapon Systems.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: HELCAP	0.000	0.000	29.500	0.000	29.500
Description: The High Energy Laser Counter ASCM Project (HELCAP) will expedite the development, experimentation, integration and demonstration of critical technologies to defeat crossing Anti-Ship Cruise Missiles (ASCM) by addressing the remaining technical challenges, e.g.: atmospheric turbulence, automatic target identification and aim point selection, precision target tracking with low jitter in high clutter conditions, advanced beam control, and higher power HEL development. HELCAP will assess, develop, experiment, and demonstrate the various laser weapon system technologies and methods of implementation required to defeat ASCMs in a crossing engagement. ***FY 2020 Plans:*** See related HELCAP FY 2020 plans shown in Project 3400 / Innovative Naval Prototypes (INP) AdvTech Dev ***FY 2021 Base Plans:*** Continue in the development phase and enter the integration phase of an overall multi-year effort whose objective is to conduct development, experimentation, and demonstration of critical technologies to defeat crossing Anti-Ship Cruise Missiles (ASCM) including laser lethality, advanced beam control, and high energy laser sources. Continue ASCM defeat analysis and assessments including lethality, engagement modeling, atmospheric propagation characterization, and beam control. Complete fabrication and factory acceptance testing of a beam control testbed. Implement testbed technology insertion, and perform additional laser/materiel component interaction testing Related FY 2021 HELCAP project plans in with BA 04 funds under Program Element (PE) 0603925N Directed Energy and Electric Weapon Systems Project 2731 include systems engineering, mission analysis, and the design completion, fabrication, and integration of major components of a HELCAP prototype system. Planning and preparations for FY 2022-FY 2023 system experimentation and demonstrations utilizing the prototype system will also continue. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 2731 / *High Energy Laser Counter ASCM Project (HELCAP)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
The increase in funding in this Project Unit is due to the realignment of efforts related to HELCAP from PE 0603801N, Project Unit 3400 Directed Energy/Electric Weapons R-2 Activity, in order to differentiate the HELCAP efforts from the other directed energy/ electric weapon efforts. The funding increase associated with HELCAP from FY 2020 to FY 2021 is due to increased investment to accelerate HELCAP technology development to counter the ASCM threat to Naval platforms.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	29.500	0.000	29.500

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• 1319/ 0603925N/ 2731: *High Energy Laser Counter ASCM Project*	0.000	6.750	38.012	-	38.012	29.952	15.462	6.506	3.251	0.000	99.933

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 2958 / *Cyberspace Activities*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
2958: *Cyberspace Activities*	0.000	0.000	14.498	16.489	-	16.489	15.939	0.000	0.000	0.000	0.000	46.926

Note

Project 2958 was established separately in this Program Element (PE) beginning in FY 2020 to better isolate and identify Innovative Naval Prototype (INP) efforts addressing Cyberspace INP advanced technology development.

A. Mission Description and Budget Item Justification

This Project contains all Advanced Technology Development 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 Project 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.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Cyber	0.000	14.498	16.489	0.000	16.489
Description: This R2 Activity contains all Advanced Technology Development 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.					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 2958 / *Cyberspace Activities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Cyber threats continue to grow and rapidly proliferate. Technologies developed in this R2 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 2020 Plans:*** Conduct Advanced Technology Development of tools and techniques to achieve an automated, systematic reduction of any computing system's attack surface across all its layers of computing. Continue development and demonstration of tools and techniques enabling powerful tailoring of an end-system computing environment to match the needs of deployed applications and users, removing software bloat and unused features, resulting in significantly reduced cyber attack surface for both known and unknown vulnerabilities. ***FY 2021 Base Plans:*** Continue Advanced Technology Development of tools and techniques to achieve an automated, systematic reduction of any computing system's attack surface across all its layers of computing. Continue to mature the suite of tools and techniques that enable a powerful tailoring of an end-system computing environment to reduce cyber attack surface. Conduct rapid demonstrations of the technologies in various systems within the Navy to evaluate the efficacy of the tools. Complete initial debloat tool feasibility analysis. Early results of the analysis have validated technological feasibility of the approaches and are beginning to quantify the highly compelling operational impact for cyber protection. Initiate advanced capability analysis of software debloat projects for Java, compiled C/C++, and low-level system firmware. This task is necessary to study system integration techniques for the tooling and to demonstrate capabilities for acquisition programs. Continue development of communications protocol subsetting and automated dialect generation to reshape cyber attack surface. Continue development of non-destructive microelectronics inspection methods that would provide a critical new capability for scalable cyber supply chain protection. ***FY 2021 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 2958 / *Cyberspace Activities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in funding from FY 2020 to FY 2021 is due to the planned ramp-up in the Advanced Technology Development effort under this Activity.					
Accomplishments/Planned Programs Subtotals	0.000	14.498	16.489	0.000	16.489

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/2958: *CYBERSPACE ACTIVITIES*	0.000	27.269	28.511	-	28.511	26.061	0.000	0.000	0.000	0.000	81.841

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3400 / *Innovative Naval Prototypes (INP) Adv Tech Dev*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3400: *Innovative Naval Prototypes (INP) Adv Tech Dev*	0.000	156.512	91.137	0.000	-	0.000	8.501	10.482	49.760	50.756	Continuing	Continuing

Note

In FY 2020, three new stand alone project units were created for three INP major focus areas to better consolidate and coordinate the acceleration of these efforts. The three project units are: 2480 Solid State Laser Technology Maturation (SSL TM), 2481 the Electro-Magnetic Railgun, and 2958 Cyberspace Activities. These projects were moved from Project Unit 3400.

The FY 2020 Appropriation Act directed ONR to establish appropriate projects for prototyping efforts to provide additional acquisition oversight, fiscal clarity and adherence to financial management practices. Within this PE, INP funding was moved from Proj 3400 Innovative Naval Protoypes (INP) Adv Tech Dev to new stand-alone projects as indicated below starting in FY 2021.

- Proj 3416: HIJENKS
- Proj 3423: LOCUST
- Proj 3450: AMOS
- Proj 3451: CLAWS
- Proj 3452: ELEKTRA
- Proj 3453: Hypersonic Booster
- Proj 3454: MDUSV
- Proj 3455: MINERVA
- Proj 3457: Long Range Targeting
- Proj 3458: Undersea Warfare Efforts
- Proj 3459: Super Swarm (SS)

A. Mission Description and Budget Item Justification

The efforts described in this Project address the Advanced Technology Development 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. INP investments do not necessarily lead to subsequent development or procurement phases, but they do have the goal of moving into the acquisition process within the Future Years Defense Program (FYDP). 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 BA2 INP funds are specified in a separate Program Element (PE), 0602792N Innovative Naval Prototypes (INP) Applied Res. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3400 / *Innovative Naval Prototypes (INP) Adv Tech Dev*

capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Cyber ***Description:*** This R2 Activity contains all Advanced Technology Development 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 R2 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 2020 Plans:*** N/A ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A	12.273	0.000	0.000	0.000	0.000
Title: Directed Energy / Electric Weapons ***Description:*** The FY 2020 Appropriation Act directed ONR to establish appropriate projects for prototyping efforts to provide additional acquisition oversight, fiscal clarity and adherence to financial management practices. Within this PE, INP funding was moved from Proj 3400 Innovative Naval Protoypes (INP) Adv Tech Dev to new stand-alone projects as indicated below starting in FY 2021. - Proj 2731: HELCAP	95.484	33.142	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3400 / *Innovative Naval Prototypes (INP) Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
- Proj 3416: HIJENKS - Proj 3453: Hypersonic Booster ***FY 2020 Plans:*** Develop technology for High Energy Laser Counter Anti-Ship Cruise Missile (ASCM) Project (HELCAP) by conducting development, experimentation, and demonstration of critical technologies to defeat crossing Anti-Ship Cruise Missiles (ASCM). This Applied Technology Development effort will include the following activities: assess development requirements including ASCM lethality and engagement parametric analysis, atmospheric propagation characterization, and beam control; design and fabricate a beam control testbed; and perform laser/materiel component interaction testing. HELCAP activities being conducted with 6.3 funds in this PE are focused on the assessment, development, and experimentation associated with lethality, advanced beam control, and laser sources. Related HELCAP project plans in PE 0603925N Directed Energy and Electric Weapon System Project 2731 include technology integration to support automated laser weapon control in integrated detect to defeat demonstrations. Continue Advanced Technology Development efforts associated with a Radio Frequency (RF) effects payload (a joint USAF/USN project) that has scalable electromagnetic effects. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease in FY 2021 is due to the realignment of the HELCAP and HIJENKS INP efforts from this Activity in Project Unit 3400, Program Element (PE) 0603801N Innovative Naval Prototypes (INP) Adv Tec Dev, to new stand-alone Project Units as follows: - Proj 2731: HELCAP - Proj 3416: HIJENKS					
Title: Electromagnetic Maneuver Warfare ***Description:*** This R-2 Activity contains all 6.3 Innovative Naval Prototype (INP) investments that are developing new technologies for Electromagnetic Maneuver Warfare (EMW). The electromagnetic spectrum is a key operational maneuver space enabled by continuous, real-time awareness of all spectrum activity. This R-2	15.561	16.091	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3400 / *Innovative Naval Prototypes (INP) Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Activity supports spectrum dominance which included efforts that focus on communications, surveillance, Electronic Warfare (EW) and electronics to understand and shape the battle space. The ability to assure access to the full spectrum is essential for battle space awareness and threat surveillance/weapon sensor engagement. Technologies within this activity will provide for integrated and distributed forces capable of dynamic synchronized actions through interoperable forces by incorporation of autonomous/disaggregated systems to increase flexibility and reach within the electromagnetic spectrum. ***FY 2020 Plans:*** Conduct Advanced Technology Development efforts, demonstrating continuous spectrum monitoring for real-time prioritization and use of the electro-magnetic spectrum for shipboard systems and information operations, electronic warfare, surface warfare, undersea warfare, and air warfare missions across the entire battlegroup in a contested environment. Conduct a final at-sea Flexible Distributed Array (FlexDAR) demonstration. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease in funding from FY 2020 to FY 2021 is due to the completion of Electromagnetic Maneuver & Control Capability (EMC2) program in FY 2020.					
Title: Undersea Warfare ***Description:*** The FY 2020 Appropriation Act directed ONR to establish appropriate projects for prototyping efforts to provide additional acquisition oversight, fiscal clarity and adherence to financial management practices. Within this PE, INP funding was moved from Proj 3400 Innovative Naval Protoypes (INP) Adv Tech Dev to new stand-alone projects as indicated below starting in FY 2021. - Proj 3450: AMOS - Proj 3458: Undersea Warfare Efforts ***FY 2020 Plans:*** Initiate Advanced Technology Development efforts associated with a mobile sensing system that can be deployed anywhere in the Arctic via a sea ice-based buoy that enables the critical infrastructure necessary to	1.441	4.493	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3400 / *Innovative Naval Prototypes (INP) Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
support persistent sensing at a lower cost that via manned platforms. This Arctic Mobile Observing System (AMOS) will operate via a sea ice-based buoy that enables the critical infrastructure necessary to support persistent sensing at a lower cost and with less risk than deploying manned platforms in the Arctic. Activities include buoy node construction and testing, software development, vehicle acquisition, and Arctic-hardening of sensors and platforms. The project includes domain-specific engineering development, upgrading UUV platform designs for the Arctic environment, developing the power and communication buoy node for the Arctic domain, incorporating mature and maturing UUV sensing capabilities into vehicles and ensure suitability for Arctic operations. The project will also develop under-ice CONOPS for the autonomous UUV network, building on capabilities developed under previous efforts for vehicle autonomy, re-charging, sensing, communication, and Command, Control, Communication & Computers (C4I), and develop new capabilities for operating under sea ice. A key thrust will be to enable an under-ice acoustic navigation system for unmanned platforms, suitable for use in any GPS-denied operational area. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease in FY 2021 is due to the realignment of the AMOS and Undersea Warfare INP efforts from this Activity in Project Unit 3400, Program Element (PE) 0603801N Innovative Naval Prototypes (INP) Adv Tec Dev, to new stand-alone Project Units as follows: - Proj 3450: AMOS - Proj 3458: Undersea Warfare Efforts					
Title: Unmanned and Autonomous Systems ***Description:*** The FY 2020 Appropriation Act directed ONR to establish appropriate projects for prototyping efforts to provide additional acquisition oversight, fiscal clarity and adherence to financial management practices. Within this PE, INP funding was moved from Proj 3400 Innovative Naval Protoypes (INP) Adv Tech Dev to new stand-alone projects as indicated below starting in FY 2021. - Proj 3451: CLAWS - Proj 3423: LOCUST	31.753	24.654	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3400 / *Innovative Naval Prototypes (INP) Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
- Proj 3454: MDUSV - Proj 3459: Super Swarm (SS) ***FY 2020 Plans:*** Conduct Advanced Technology Development efforts associated with: The development of autonomous payloads for extra-large unmanned undersea vehicles and complete first CLAWS autonomy/payload demo; A robust, scalable, flexible, multi-functional swarming unmanned UxS vehicle systems providing cross-domain capability, human-swarm interdependence/interaction that is employable from surface, sub-surface, airborne, and ground manned and unmanned systems; A long endurance, unmanned surface vehicle with medium displacement that can be autonomously controlled in high sea states with a demonstrated multi-mission/multi-payload capability, including support for the Sea Hunter 2 builder's trial. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease in FY 2021 is due to the realignment of the CLAWS, LOCUST, MDUSV and Super Swarm (SS) INP efforts from this Activity in Project Unit 3400, Program Element (PE) 0603801N Innovative Naval Prototypes (INP) Adv Tec Dev, to new stand-alone Project Units as follows: - Proj 3451: CLAWS - Proj 3423: LOCUST - Proj 3454: MDUSV - Proj 3459: Super Swarm (SS)					
Title: Artificial Intelligence	0.000	12.757	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3400 / *Innovative Naval Prototypes (INP) Adv Tech Dev*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Description: The FY 2020 Appropriation Act directed ONR to establish appropriate projects for prototyping efforts to provide additional acquisition oversight, fiscal clarity and adherence to financial management practices. Within this PE, INP funding was moved from Proj 3400 Innovative Naval Protoypes (INP) Adv Tech Dev to new stand-alone projects as indicated below starting in FY 2021. - Proj 3452: ELEKTRA - Proj 3457: Long Range Targeting - Proj 3455: MINERVA ***FY 2020 Plans:*** In collaboration with the applied research supporting this same INP research, actions are being taken to rapidly mature the advanced technology development efforts required to demonstrate machine speed battle management tools to support continuous analysis and planning at the operational and tactical levels, enabling the dynamic synchronization of forces and actions across intelligence, surveillance and reconnaissance, and combat systems. Conduct developmental efforts of Long Range Targeting, which directly accelerates and reduces risks to multiple programs. ***FY 2021 Base Plans:*** N/A ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The decrease in FY 2021 is due to the realignment of the ELEKTRA, Long Range Targeting and MINERVA INP efforts from this Activity in Project Unit 3400, Program Element (PE) 0603801N Innovative Naval Prototypes (INP) Adv Tec Dev, to new stand-alone Project Units as follows: - Proj 3452: ELEKTRA - Proj 3457: Long Range Targeting - Proj 3455: MINERVA					
Accomplishments/Planned Programs Subtotals	156.512	91.137	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3400 / *Innovative Naval Prototypes (INP) Adv Tech Dev*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3416 / *HIJENKS*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3416: *HIJENKS*	0.000	0.000	0.000	14.465	-	14.465	7.656	0.000	0.000	0.000	0.000	22.121

Note

HIgh-power Joint Electromagnetic Non-Kinetic Strike (HIJENKS) plans and associated resources are realigned from Project Unit 3400 in Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3416 effective FY 2021. This is not a new start.

A. Mission Description and Budget Item Justification

The HIgh-power Joint Electromagnetic Non-Kinetic Strike (HIJENKS) INP effort 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 Advanced Technology Development in support of the HIJENKS INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: HIJENKS	0.000	0.000	14.465	0.000	14.465
Description: The HIgh-power Joint Electromagnetic Non-Kinetic Strike (HIJENKS) INP effort 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					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3416 / *HIJENKS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
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. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Continue Joint USAF/USN project for High Powered Microwave (HPM) payload integration into an airborne platform to enable dynamic demonstration and testing of a multi-target HPM payload to provide non-kinetic strike options for electronic target degrade/disrupt/disable capability. Focus on payload integration and platform modifications to enable testing along with range development. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the HIgh-power Joint Electromagnetic Non-Kinetic Strike (HIJENKS) effort from Project Unit 3400 in Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3416.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	14.465	0.000	14.465

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/3416: *HIJENKS*	0.000	0.000	22.320	-	22.320	9.943	0.000	0.000	0.000	0.000	32.263
• RDTEN/0603382N/3416: *HIJENKS*	0.000	0.000	14.981	-	14.981	16.945	24.690	0.000	0.000	0.000	56.616

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3423 / *LOCUST*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3423: *LOCUST*	0.000	0.000	0.000	12.750	-	12.750	3.396	0.000	0.000	0.000	0.000	16.146

Note

Low-Cost UAV Swarming Technology (LOCUST) plans and associated resources are realigned from Project Unit 3400 in Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3423 effective FY 2021.

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." LOCUST 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 Advanced Technology Development in support of the LOCUST INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: LOCUST	0.000	0.000	12.750	0.000	12.750
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." LOCUST will					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3423 / *LOCUST*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
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 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Continue Advanced Technology Development efforts associated with development and flight testing of mission-oriented payloads in which cost, size, weight, and power reductions play a significant role in their utility. The "swarm architecture facing" portion of each of these payloads is a significant departure from traditional payload development and will also be investigated through evaluations of ability of payloads to request or drive a behavior from the swarm in addition to more traditional payload utilization approaches. Integration onto a range of platforms will be considered and appropriate design and certifications will be addressed. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the Low-Cost UAV Swarming Technology (LOCUST) effort from Project Unit 3400 in Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3423.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	12.750	0.000	12.750

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/3423: *LOCUST*	0.000	0.000	22.046	-	22.046	5.553	0.000	0.000	0.000	0.000	27.599
• RDTEN/0603382N/3423: *LOCUST*	1.879	2.960	3.561	-	3.561	6.425	5.949	0.000	0.000	0.000	20.787

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3423 / *LOCUST*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3450 / *AMOS*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3450: *AMOS*	0.000	0.000	0.000	4.524	-	4.524	3.480	4.525	0.000	0.000	0.000	12.529

Note

Arctic Mobile Observing System (AMOS) plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3450 effective FY 2021. This is not a new start.

A. Mission Description and Budget Item Justification

The Arctic Mobile Observing System (AMOS) INP 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 Advanced Technology Development in support of the AMOS INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: AMOS	0.000	0.000	4.524	0.000	4.524
Description: The Arctic Mobile Observing System (AMOS) INP 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					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3450 / *AMOS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
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 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Continue advanced technology development efforts associated with the following: - Integrating Command, Control, Communication and Computers (C4I) into the primary AMOS buoy node. - Constructing prototype nodes for deployment in Arctic field experiments. - Testing extended-duration survivability of AMOS nodes and platforms through year-long Arctic deployments. - Testing and evaluating UUV docking and recharge systems under sea ice in the Arctic. - Demonstrating domain-specific autonomous behaviors in a simulated environment to enable long-duration Arctic deployment. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the Arctic Mobile Observing System (AMOS) effort from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3450.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	4.524	0.000	4.524

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/3450: *AMOS*	0.000	0.000	8.401	-	8.401	6.463	8.404	0.000	0.000	0.000	23.268

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3451 / *CLAWS*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3451: *CLAWS*	0.000	0.000	0.000	15.300	-	15.300	14.339	0.000	0.000	0.000	0.000	29.639

Note

CLAWS plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3451 effective FY 2021. This is not a new start.

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 Advanced Technology Development in support of the CLAWS INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: CLAWS	0.000	0.000	15.300	0.000	15.300
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 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					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3451 / *CLAWS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
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. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Continue Adv Tech Dev effort in CLAWS autonomy development: - Conduct an autonomy/payload demonstration for an extra-large unmanned undersea vehicle. - Develop and mature the autonomy and payload technology for contested littoral environments. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the CLAWS effort from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3451.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	15.300	0.000	15.300

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/3451: *CLAWS*	0.000	0.000	26.456	-	26.456	23.445	0.000	0.000	0.000	0.000	49.901

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3452 / *ELEKTRA*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3452: *ELEKTRA*	0.000	0.000	0.000	10.869	-	10.869	12.926	9.946	4.973	5.072	Continuing	Continuing

Note

ELEKTRA Non-Kinetic plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3452 effective FY 2021. This is not a new start.

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 Advanced Technology Development in support of the ELEKTRA INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: ELEKTRA	0.000	0.000	10.869	0.000	10.869
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					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3452 / *ELEKTRA*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
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. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Conduct Advanced Technology Development efforts to mature and demonstrate more complex kinetic/non-kinetic kill chains and Human-Machine interactive battle management tools working at machine to machine speeds to support continuous analysis, planning and execution at the operational and tactical levels that will enable the dynamic synchronization of forces and actions across intelligence, surveillance and reconnaissance, and combat systems. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the ELEKTRA Non-Kinetic effort from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3452.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	10.869	0.000	10.869

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/3452: *ELEKTRA*	0.000	0.000	6.032	-	6.032	3.977	0.000	0.000	0.000	0.000	10.009

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3453 / *Hypersonic Booster*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3453: *Hypersonic Booster*	0.000	0.000	0.000	0.000	-	0.000	0.000	20.000	30.000	30.600	Continuing	Continuing

Note

Hypersonic Booster plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3453 effective FY 2021.

A. Mission Description and Budget Item Justification

The Navy currently lacks the ability to demonstrate a ship-launched, DARPA-developed HAWC Cruiser as the original USAF-RAAF air-launch effort did not address naval capabilities. Hypersonic Booster will develop a CVN-capable HAWC AUR for air-launched flight demonstration that will require a 25% reduction in overall length to enable fitment in CVN weapons elevators). The goal from the outset will be to leverage DARPA-developed HAWC program for naval applications. It will flight test a CVN compliant, Hypersonic Air-breathing Weapon Concept (HAWC) All-Up-Round (AUR) to demonstrate airframe and booster propulsion technologies. The Activity identified in Project Unit 3453 specifically addresses Advanced Technology Development in support of the Hypersonic Booster INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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)

N/A

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/3453: *HYPERSONIC BOOSTER*	0.000	0.000	10.000	-	10.000	30.000	15.000	0.000	0.000	0.000	55.000

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3453 / *Hypersonic Booster*

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3454 / *MDUSV*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3454: *MDUSV*	0.000	0.000	0.000	1.115	-	1.115	0.000	0.000	0.000	0.000	0.000	1.115

Note

Medium Displacement Unmanned Surface Vehicle (MDUSV) plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3454 effective FY 2021. This is not a new start.

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 Advanced Technology Development in support of the MDUSV INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: MDUSV	0.000	0.000	1.115	0.000	1.115
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					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3454 / *MDUSV*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
will create a new paradigm for Navy surface force, a hybrid manned/unmanned force, and enable new tactics in performing naval missions. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Continue Adv Tech Dev for integration, demonstration, and transition of autonomous control for medium displacement unmanned surface systems, focusing on common behaviors across multiple missions, additional perception capability and modalities, and testing methodologies for developing trust in the performance of autonomous systems. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the Medium Displacement Unmanned Surface Vehicle (MDUSV) effort from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3454.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	1.115	0.000	1.115

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/3454: *MDUSV*	0.000	0.000	4.850	-	4.850	0.000	0.000	0.000	0.000	0.000	4.850

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3455 / *MINERVA*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3455: *MINERVA*	0.000	0.000	0.000	10.936	-	10.936	12.926	11.935	6.963	7.102	Continuing	Continuing

Note

MINERVA - Artificial Intelligence (AI) Enhanced Warfighter Decision Superiority Capability plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3455 effective FY 2021. This is not a new start.

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 Advanced Technology Development in support of the MINERVA INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: MINERVA	0.000	0.000	10.936	0.000	10.936
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					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3455 / *MINERVA*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Fleet, Force and Group echelons. It will establish a DevOps environment that includes warfighter staffs in the development and integration of new capabilities. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Conduct advanced development research on Artificial Intelligence and Machine Learning (AI/ML) methods to infer an enemy course of action and predict enemy locations. In addition, measure mission planning services, mission execution and adjustment services; and human acceptance of AI/ML decision aid services. Develop methods to test and validate AI/ML enabled decision aiding services. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the MINERVA - Artificial Intelligence (AI) Enhanced Warfighter Decision Superiority Capability effort from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3455.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	10.936	0.000	10.936

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
• RDTEN/0602792N/3455: *MINERVA*	0.000	0.000	5.965	-	5.965	3.977	0.000	0.000	0.000	0.000	9.942

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3457 / *Long Range Targeting*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3457: *Long Range Targeting*	0.000	0.000	0.000	10.000	-	10.000	21.000	33.000	35.000	35.700	Continuing	Continuing

Note

Long Range Targeting (LRT) plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3457 effective FY 2021. This is not a new start.

A. Mission Description and Budget Item Justification

Long Range Targeting emphasizes the specific naval use of AI in an integrated system that addresses a warfighting challenge. This project contains coordinated investments in Applied Research that contribute to the Long Range Targeting (LRT) Innovative Naval Prototype (INP). This Advanced Technology Development, in coordination with a complimentary Applied Research investment in Program Element (PE) 0602792N Innovative Naval Prototypes (INP) Applied Res, will create an overall capability for LRT. Technologies within this activity will enable integrated and distributed forces capable of dynamic synchronized actions. Investments include technologies for sense and sense making and Artificial Intelligence for predictive mission-focused analytics that autonomously gather, analyze, compile, interpret, and visualize a fused tactical and national all source data picture to improve planning and decision making speeds. Investments will also establish a distributed Artificial Intelligence capability that can function in a harsh and adversarial environment, determine an optimal response and react in real-time. The Activity identified in Project Unit 3457 specifically addresses Advanced Technology Development in support of the LRT INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Long Range Targeting	0.000	0.000	10.000	0.000	10.000
Description: Long Range Targeting emphasizes the specific naval use of AI in an integrated system that addresses a warfighting challenge. This project contains coordinated investments in Applied Research that contribute to the Long Range Targeting (LRT) Innovative Naval Prototype (INP). This Advanced Technology					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3457 / *Long Range Targeting*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Development, in coordination with a complimentary Applied Research investment in Program Element (PE) 0602792N Innovative Naval Prototypes (INP) Applied Res, will create an overall capability for LRT. Technologies within this activity will enable integrated and distributed forces capable of dynamic synchronized actions. Investments include technologies for sense and sense making and Artificial Intelligence for predictive mission-focused analytics that autonomously gather, analyze, compile, interpret, and visualize a fused tactical and national all source data picture to improve planning and decision making speeds. Investments will also establish a distributed Artificial Intelligence capability that can function in a harsh and adversarial environment, determine an optimal response and react in real-time. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Complete Adv Tech Dev on framework/architecture studies for Long Range Targeting; Initiate development efforts for sensor and communication technologies and prototypes to fill the gaps identified and needed to achieve the Long Range Targeting capability; Initiate planning for test, integration, demonstration and experiment activities for Long Range Targeting. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the Long Range Targeting (LRT) effort from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3457.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	10.000	0.000	10.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3458 / *Undersea Warfare Efforts*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3458: *Undersea Warfare Efforts*	0.000	0.000	0.000	2.500	-	2.500	0.000	0.000	0.000	0.000	0.000	2.500

Note

Undersea Warfare Efforts plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3458 effective FY 2021. This is not a new start.

A. Mission Description and Budget Item Justification

The Undersea Warfare Efforts Project will develop new technology for offensive and defensive warfare conducted on the seabed, in the sea (i.e. subsea), and from the sea. Undersea Warfare Efforts 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 of all undersea warfare assets in the Navy's Distributed Maritime Operations concept. Undersea Warfare 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 Activity identified in Project Unit 3458 specifically addresses Advanced Technology Development in support of the Undersea Warfare INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Undersea Warfare Efforts	0.000	0.000	2.500	0.000	2.500
Description: The Undersea Warfare Efforts Project will develop new technology for offensive and defensive warfare conducted on the seabed, in the sea (i.e. subsea), and from the sea. Undersea Warfare Efforts 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					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3458 / *Undersea Warfare Efforts*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
submarines, subsea and seabed warfare, and distributed undersea warfare. Distributed undersea warfare technology will enable full participation of all undersea warfare assets in the Navy's Distributed Maritime Operations concept. Undersea Warfare 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). ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Initiate development of concepts, identification of enabling technologies, and analysis and testing of existing technologies for insertion into subsea and seabed warfare efforts. Initiate development of concepts for advanced offensive missions for submarines. Initiate concepts, identification of new enabling technologies and testing of existing technologies to enable distributed undersea warfare. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the Undersea Warfare Efforts effort from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3458.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	2.500	0.000	2.500

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 3459 / *Super Swarm (SS)*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
3459: *Super Swarm (SS)*	0.000	0.000	0.000	4.000	-	4.000	20.000	33.000	0.000	0.000	0.000	57.000

Note

Super Swarm (SS) plans and associated resources are realigned from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3459 effective FY 2021. This is not a new start.

A. Mission Description and Budget Item Justification

Swarming is a concept that allows for multi-domain, heterogeneous swarms of unmanned systems capable of rendering the counter's ability to scale either inadequate or irrelevant and includes offensive and defensive operations, own and adversarial employment, and a physical battlespace ranging from open ocean to ashore. The Super Swarm (SS) INP effort will develop an autonomous control system for multiple USV's consisting of cooperative task allocation, cooperative route planning/behaviors and shared situational awareness. The Swarm autonomy technology is leveraged by other programs including the Medium Displacement Unmanned Surface Vehicle (MDUSV) and the Autonomous USV FNC program. It will consist of the employment of sustainable large-scale robotic swarm warfare across all domains ahead of our adversaries to obviate costly and vulnerable legacy platforms and to gain a competitive advantage. The Activity identified in Project Unit 3459 specifically addresses Advanced Technology Development in support of the Super Swarm INP effort.

INP 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. INPs do not develop hardware for service use, rather they prove technological and production feasibility, and show naval utility and acquisition potential. The Office of Naval Research (ONR) demonstrates INPs in relevant environments. Successful experimentation and demonstrations present the Department of the Navy with disruptive capabilities that may lead to the obsolescence of existing capabilities and acquisition programs. 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.

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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Title: Super Swarm (SS)	0.000	0.000	4.000	0.000	4.000
Description: Swarming is a concept that allows for multi-domain, heterogeneous swarms of unmanned systems capable of rendering the counter's ability to scale either inadequate or irrelevant and includes offensive and defensive operations, own and adversarial employment, and a physical battlespace ranging from open ocean to ashore. The Super Swarm (SS) INP effort will develop an autonomous control system					

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy		Date: February 2020
Appropriation/Budget Activity 1319 / 3	**R-1 Program Element (Number/Name)** PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	**Project (Number/Name)** 3459 / *Super Swarm (SS)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
for multiple USV's consisting of cooperative task allocation, cooperative route planning/behaviors and shared situational awareness. The Swarm autonomy technology is leveraged by other programs including the Medium Displacement Unmanned Surface Vehicle (MDUSV) and the Autonomous USV FNC program. It will consist of the employment of sustainable large-scale robotic swarm warfare across all domains ahead of our adversaries to obviate costly and vulnerable legacy platforms and to gain a competitive advantage. ***FY 2020 Plans:*** N/A ***FY 2021 Base Plans:*** Continue Advanced Technology Development efforts associated with robust, scalable, flexible, multi-functional swarming unmanned UxS vehicle systems providing cross-domain capability, human-swarm interdependence/ interaction that is employable from surface, sub-surface, airborne, and ground manned and unmanned systems. Continue with efforts to deliver large numbers of UxS conducting extended-range maneuver and delivery of effects on targets. ***FY 2021 OCO Plans:*** N/A ***FY 2020 to FY 2021 Increase/Decrease Statement:*** The increase in FY 2021 is due to the realignment of the Super Swarm (SS) effort from Project Unit 3400 in this Program Element (PE) 0603801N Innovative Naval Prototype (INP) Adv Tec Dev into this new Project Unit 3459.					
Accomplishments/Planned Programs Subtotals	0.000	0.000	4.000	0.000	4.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2021 Navy			Date: February 2020
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603801N / *Innovative Naval Prototypes (INP) Adv Tec Dev*	Project (Number/Name) 9999 / *Congressional Adds*	

COST ($ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
9999: *Congressional Adds*	0.000	39.580	8.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	47.580

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other Projects.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2019	FY 2020
Congressional Add: Electromagnetic Railgun ***FY 2019 Accomplishments:*** These funds will advance development towards a tactical system with investment in the mount and Next Generation Pulsed Power (NGPP) required for shipboard operation. Funding will advance mount development to meet specifications for future shipboard application and develop modular concepts for evaluation and shipboard qualification testing. ***FY 2020 Plans:*** N/A	9.654	0.000
Congressional Add: Railgun with Hypervelocity Projectile ***FY 2019 Accomplishments:*** Funds will be used in the development of the tactical Railgun mount; development and testing Hypervelocity Projectile (HVP) components and all up rounds in a Railgun launch; and to support simulated operational scenarios to quantify the value of HVP fired from a Railgun. ***FY 2020 Plans:*** N/A	29.926	0.000
Congressional Add: Advanced thermal and power technology for improved DEW SWAP ***FY 2019 Accomplishments:*** N/A ***FY 2020 Plans:*** Conduct advanced technology development in C538: Advanced thermal and power technology for improved DEW SWAP.	0.000	8.000
Congressional Adds Subtotals	39.580	8.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A