

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603640M / <i>MC Advanced Technology Demo</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	0.000	242.160	291.183	280.285	-	280.285	254.337	251.529	252.457	249.996	Continuing	Continuing
2223: <i>Marine Corps ATD</i>	0.000	102.250	109.260	118.421	-	118.421	126.171	127.120	131.202	133.826	Continuing	Continuing
2297: <i>Futures Directorate</i>	0.000	89.324	104.071	157.064	-	157.064	123.166	119.310	116.054	110.865	Continuing	Continuing
2958: <i>Cyberspace Activities</i>	0.000	4.635	4.752	4.800	-	4.800	5.000	5.099	5.201	5.305	Continuing	Continuing
9999: <i>Congressional Adds</i>	0.000	45.951	73.100	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	119.051

A. Mission Description and Budget Item Justification

The United States Navy/Marine Corps team is the most potent naval fighting force in the world. Fundamental to their success are the technologies necessary for effective Distributed Maritime Operations (DMO), Expeditionary Advanced Base Operations (EABO), and Littoral Operations in Contested Environments (LOCE). The Office of Naval Research (ONR) combines knowledge of the naval mission with researchers to select and explore solutions critical to expeditionary warfighting needs. It has become clear the joint force needs a capability that operates persistently and with maximum organic mobility and dispersion to compete and deter in the contact and blunt layers. This Program Element (PE) supports investments in critically needed capabilities as outlined in Force Design 2030, to operate below the threshold of armed conflict by winning the reconnaissance and counter-reconnaissance competition in facilitating deterrence by detection.

These future challenges and portents demand robust technologies for the Marine Corps, but the technology options are constrained. They must have a lightweight deployable character, and the ability to operate in austere conditions with little fixed infrastructure or support while retaining the agility and lethality of an integrated maneuver force. Technology must provide full spectrum capability against robust and complex peer and near-peer adversaries while meeting Size, Weight, Power, Cost limitations, and information availability within Distributed, Intermittent and Limited environments.

The approach within this Program Element (PE) encompasses ideas that support both revolutionary and evolutionary capabilities, and in this way considers and balances both "push" and "pull" aspects of technology projects. This PE matures technologies emerging from PE 0602131M-Marine Corps Landing Force Technology to develop concept prototypes and initial experimentation to confirm feasibility in an environment relevant to operations.

This 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 (TRLs) 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).

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

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo
--	---

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	249.340	224.155	0.000	-	0.000
Current President's Budget	242.160	291.183	280.285	-	280.285
Total Adjustments	-7.180	67.028	280.285	-	280.285
• Congressional General Reductions	-	-0.608			
• Congressional Directed Reductions	-	-5.464			
• Congressional Rescissions	-	-			
• Congressional Adds	-	73.100			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-7.181	0.000			
• Rate/Misc Adjustments	0.001	0.000	0.000	-	0.000
• Adjustments to Budget Year	-	-	280.285	-	280.285

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

Project: 9999: *Congressional Adds*

Congressional Add: *Expeditionary Process, Exploitation, and Dissemination*

Congressional Add: *Adaptive Threat Force Footprint*

Congressional Add: *Ensure Defense and Operational Resilience for USMC Tactical Cyber & Spectrum Man*

Congressional Add: *USMC Force Design - Closed Classified Wargaming Network and Naval Integration*

Congressional Add: *USMC Force Design - Organic Reconnaissance, Surveillance, and Target Acquisition*

Congressional Add: *Marine Corps force Design Acceleration - Project Artemis*

Congressional Add: *Marine Corps Mission Support Station Demonstration*

Congressional Add: *Advanced mission planning system SBIR technology insertion*

Congressional Add: *Data analysis and sharing augmentation*

Congressional Add: *Low-cost atrittable aircraft technology*

Congressional Add: *Adaptive future force*

Congressional Add: *AI-powered tactical ISR*

Congressional Add: *Expeditionary mission support*

Congressional Add: *Platform agnostic weapons system*

Congressional Add: *Stand-off security inspection and surveillance system*

	FY 2021	FY 2022
	4.827	4.000
	5.792	0.000
	9.654	0.000
	0.965	0.000
	4.344	0.000
	10.715	0.000
	9.654	0.000
	0.000	5.000
	0.000	2.000
	0.000	25.000
	0.000	8.000
	0.000	5.100
	0.000	10.000
	0.000	5.000
	0.000	9.000

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Navy	Date: April 2022
---	-------------------------

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603640M / <i>MC Advanced Technology Demo</i>
---	--

Congressional Add Details (\$ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Congressional Add Subtotals for Project: 9999	45.951	73.100
Congressional Add Totals for all Projects	45.951	73.100

Change Summary Explanation

Funding: Project 2297: The \$52.993M increase from FY 2022 to FY 2023 supports United States Marine Corps (USMC) service level experimentation and serves as a catalyst for Force Design 2030. The Marine Corps' experimentation plan for Force Design 2030 supports a redefined organizational structure capable of supporting service approved operating concepts such as Expeditionary Advanced Base Operations (EABO), Stand In Forces, all domain Reconnaissance-Counter- Reconnaissance, and Distributed Maritime Operations (DMO). Each of these concepts calls for enabling units with next generation unmanned intelligence, surveillance, and reconnaissance (ISR) and weaponized systems, enhanced situational awareness tools, communication infrastructure, and enhanced prototypes for littoral maneuver. Increase from FY 2022 to FY 2023 will specifically provide a cohesive package of technologies to assess the kill web ecosystem within the future operating environment and properly validate Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities and Policy (DOTMLPF-P) implications across a broad spectrum of warfighting capabilities.

Technical: No significant change.

Schedule: No significant change.

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

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
2223: Marine Corps ATD	0.000	102.250	109.260	118.421	-	118.421	126.171	127.120	131.202	133.826	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project funds technology demonstration, experimentation, and prototyping; and more technologically mature projects within the Future Naval Capability (FNC) process as means to inform, enhance, enable, and invent future concepts and capabilities with new Science and Technology (S&T). This project is organized into ten activities, the core of which is represented by the eight Expeditionary Warfighting Capability Areas.

Emphasized within this project are increased efforts to actively demonstrate advanced technologies and system concepts. These demonstrations and experiments focus on the specific technologies, not necessarily their operational application, and vary based on the technical maturity of the project. This early technology exposure gives Marines a view into the future and enables them to use their imagination and innovation to envision novel employment of the technology and inform the acquisition process.

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Command, Control, Communications, Computers (C4)	22.628	24.123	26.572	0.000	26.572
Articles:	-	-	-	-	-
Description: This activity investigates robust, resilient, and secure networked communications pathways and capability that support an expeditionary force's distributed and disaggregated operations. Research supports both networked and local computation for communications that exploits the expeditionary forces close physical proximity to threats while mitigating shortfalls commensurate within Distributed, Intermittent, and Limited environments. Expeditionary forces must operate in the cyber domain and in addition to defending communications networks, vehicles, and weapons systems, are reliant on electronic controllers for basic operations and as such are susceptible to cyberattacks.					
Technologies addressed within this activity include secure, robust, self-forming, mobile communications networks; distributed computing to support information dissemination to all echelons; improved capabilities in over-the-horizon, beyond line-of-sight, and restricted environment communications and sensors; and software and data processing to support formation of an appropriate common picture. Other efforts include power management, low detectability, conforming to Size, Weight, Power, Cost constraints, and interoperability within the joint environment.					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Further, this activity integrates and demonstrates enhanced communications and situational awareness capabilities in experimental and warfighting environments reflecting USMC operations. Advanced technology resources will be developed and applied to complement commercial, other service, and defense agency investments to produce a technology base addressing identified Marine Corps technology gaps. Focus will be on developing component level prototypes and experimentation in relevant environments.</p> <p>FY 2022 Plans: -Continue to emphasize operating in contested and denied electromagnetic spectrum (EMS) environments. The goal of operating ubiquitously in multifunction electronic warfare domains will be achieved by reducing size to handheld form factor focused heavily on the continued development and integration of multiple underlying technologies into systems and subsystems with the purpose of demonstrating the tactical exploitation of information and the EMS. To address resiliency requirements of Command, Control, Communications, Computers (C4) this effort is closely coordinated with the Intelligence, Surveillance, and Reconnaissance and Expeditionary Cyber research portfolio also described herein so as to most efficiently exploit multifunction capabilities in portable reduced Size, Weight, Power, and Cost systems. This integrated rapid co-design, prototyping, and experimentation approach will reduce time needed to provide new capabilities to the US Marine Corps.</p> <p>The following efforts are in collaboration with the CRIT and MuDRaCE FNC activities in this PE/project and leverage experimental discoveries under the MAGTF C4 project to accelerate development of high priority capabilities. -Continue development to demonstrate technologies that include advanced signature management, machine learning, interoperability, spectrum maneuver, damage assessment monitoring, and information dominance for tactical edge systems. -Continue the development to demonstrate portable distributed multi-domain sensor and surveillance technologies in portable expeditionary warfare form factor to protect forces in denied and contested EM environments.</p> <p>FY 2023 Base Plans: Complete: The following efforts are in collaboration with the Cognitive Radio Frequency Inference Technology (CRIT) and Multi Domain Radar for the Contested Environment (MuDRaCE) FNC activities in this PE/project and leverage experimental discoveries under the MAGTF C4 project to accelerate development of high priority capabilities.</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Articles:	-	-	-	-	-
<p>Description: The activity investigates a large variety of weapons technologies to enhance fires capabilities of Fleet Marine Forces as part of joint maritime campaigns to counter emerging threats and create new opportunities for the joint force to secure operational advantage. Research efforts increase range, lethality, and capacity, while maintaining mobility and tempo to operate inside actively contested maritime domains, to achieve overmatch fires capabilities when operating within the adversary's intelligence, surveillance, collection, and weapons ranges. Focus on low size, weight, power, and cost of weapons components and weapon systems, having low manpower and cognitive burdens to operate, with low logistics burdens, stresses technical solutions. This activity furthers the maturity of researched technology solutions by also developing the integration required to effectively demonstrate and test emergent capabilities. Weapons system technologies being developed include fire control, launch and propulsion, precision guidance, navigation, and control, seekers, fuzing, and lethality.</p> <p>FY 2022 Plans: Continue development of integrated technologies for low-cost, extended range, precision guided munitions, having improved lethality and special effects payloads for use against various types of stationary and moving targets on land and water, and in satellite and network denied environments. - Complete development of automated fire control technologies enabling automated target classification and prioritization for weaponized unmanned ground vehicles.</p> <p>FY 2023 Base Plans: Continue: - Development of integrated technologies for low-cost, extended range, precision guided munitions, having improved lethality and special effects payloads for use against various types of stationary and moving targets on land and water, and in satellite and network denied environments.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: There is no significant change from FY 2022 to FY 2023</p>					
Title: Force Protection	12.275	11.527	13.900	0.000	13.900
Articles:	-	-	-	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Description: This activity investigates new ways and means to protect forces and materiel across all operational settings from contested sea-land surface interfaces to complex urban environments. The portfolio protects against adversaries' challenges such as guided-rockets and missiles, mobile coastal artillery, threat Electronic Warfare and Counter Intelligence, and Surveillance and Reconnaissance. Mines and obstacles both in the water and ashore also complicate amphibious landings. The activity invests in vehicle survivability aspects that are exacerbated due to Size, Weight, and Power Cost constraints inherent to Marine Corps operation and the harsh nature of the amphibious environment.</p> <p>Technologies addressed include lightweight armor for ballistic and underbody blast protection, advanced sensors for counter tactical surveillance, active protection, and signature management. This activity also considers technology for payloads, packages and sensors that are needed by amphibious vehicles (both manned and unmanned) including mine counter measures; explosive hazard defeat systems; and obstacle and threat detection systems as well as technologies for improved protection for individuals against blast, ballistic and blunt impact threats.</p> <p>Technologies in this activity enable Marine Corps forces to maintain operational tempo through a range of environments by avoiding or detecting surveillance and targeting capabilities before engagement; counter detection and targeting (e.g. long range sniper, urban shooter, rocket propelled grenades) and delay vehicle detection and identification through signature management/control.</p> <p>FY 2022 Plans:</p> <ul style="list-style-type: none"> - Technologies and systems supporting the neutralization of threat unmanned aerial systems via kinetic means will complete - Efforts that emphasize sensors and systems to enable autonomous amphibious assault under mined and obstacle environments will continue. The efforts will focus on multi-domain operations and extending the range at which these unmanned systems are able to perform and execute the assault mission. - Efforts looking at counters to autonomy and sensors/perception will initiate. - Examine technologies for the utility of High Energy Laser (HEL) in Expeditionary operations, including robust, compact, lightweight lasers, with tracking, and optical components to enable Low Altitude Air Defense (LAAD) with non-kinetic weapon hard kill 					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Develop disposable heterogeneous multi-domain unmanned vehicles (UxVs), capable of rapid manufacture at scale. The UxVs will operate as swarms, utilizing and mimicking the organizational principles found in social insects/birds/fishes to overwhelm the adversaries' kill chain.</p> <ul style="list-style-type: none"> - Develop low-cost robotic autonomy systems in support of amphibious operations (e.g., ISR, mine-counter-measure, breaching, fire support, and logistics). - Develop and demonstrate human-machine teaming concepts and appropriate military tactics. The end state will demonstrate swarming multi-domain platforms capable of delivering military capabilities over land and sea. <p>FY 2023 Base Plans: Continue:</p> <ul style="list-style-type: none"> - Continue efforts looking at counters to autonomy and sensors/perception. - Continue to examine technologies for the utility of High Energy Laser (HEL) in Expeditionary operations, including robust, compact, lightweight lasers, with tracking, and optical components to enable Low Altitude Air Defense (LAAD) with non-kinetic weapon hard kill. - Continue development of low-cost robotic autonomy systems in support of amphibious operations (e.g., ISR, mine-counter-measure, breaching, fire support, and logistics). - Continue development and demonstrate human-machine teaming techniques and procedures appropriate to military tactics. The end state will demonstrate swarming multi-domain platforms capable of delivering military capabilities over land and sea. - Continue efforts that emphasize sensors and systems to enable autonomous amphibious assault under mined and obstacle environments will continue. The efforts will focus on multi-domain operations and extending the range at which these unmanned systems are able to perform and execute the assault mission. - Develop disposable heterogeneous "least-capable" multi-domain unmanned vehicles (UxVs), that can be rapidly manufactured at scale. The UxVs will operate as swarms, utilizing the organizational principles found in social insects/birds/fishes to overwhelm an adversary's kill chain. <p>Initiate:</p> <ul style="list-style-type: none"> - Initiate force-on-force experimentation for countering heterogeneous multi-domain autonomous swarm attacks in Expeditionary Advanced Basing Operations (EABO) scenarios. - Initiate a follow-on and focused research effort to develop compact rapid analysis and sensing systems to assess expeditionary operational site by detecting battle damages, surface and sub-surface explosive hazards detection and classification. <p>FY 2023 OCO Plans:</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A					
<p><i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> The increase in funding from FY 2022 to FY 2023 is due to the initiation of efforts in (1) force-on-force experimentation for countering heterogeneous multi-domain autonomous swarm attacks in Expeditionary Advanced Base Operations (EABO) scenarios and efforts to (2) develop compact rapid analysis and sensing systems to assess expeditionary operational sites by detecting and classifying battle damage, and surface and sub-surface explosive hazards. These efforts will enhance the counter detection and targeting capabilities for Marine Corps forces and directly supports EABO and Force Design 2030.</p>					
<p><i>Title:</i> Human Performance, Training and Education</p> <p align="right"><i>Articles:</i></p>	5.107	5.465	6.329	0.000	6.329
<p><i>Description:</i> This activity investigates several technology investment areas; warrior resilience, and decision-making and expertise development. Warrior resilience is focused on advanced training technologies and methodologies that enhance neural, cognitive, and physical readiness. Decision making and expertise development accelerates development and improves the retention of skills in decision making, situation awareness, and individual and team adaptability and coordination on decentralized, dynamic and dispersed battlefields. Focus will be on developing component level prototypes for Marine for evaluation and experimentation.</p>	-	-	-	-	-
<p><i>FY 2022 Plans:</i> Conduct technology development to assess marksmanship lethality via automated capture of shot timing, accuracy, and physical performance. - Conduct technology development focused on human-machine teaming and multi-modal interactions at the small unit level that augment the warfighter and accelerate the Observe, Orient, Decide and Act (OODA) loop to improve decision-making capabilities. - Continue technology demonstrations to increase physical readiness and reduce potential injuries by using wearable physiological monitoring devices, predictive algorithms, health tracking capability, and related technologies that support Marine Corps' Human Performance programs. - Transition 3D terrain visualization, battlefield control measures and effects, and continue technology development with target identification and classification.</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Description: This activity investigates enhanced situational awareness, persistent surveillance, and tactical decision making through automated analysis of data and rapid integration of information and acquired knowledge. Specific technologies in this activity effectively present actionable information to decision-makers, especially those at the lower command levels. This includes biometric monitoring for expeditionary operations, operational Course of Action development, and autonomous surveillance in support of distributed operations. Conduct advanced development research on the impact of machine learning on mission outcomes. Will investigate the operational relevance of enhanced situational understanding and machine-aided tactical decision-making. This includes presenting actionable information (e.g. support to planning, mission monitoring, and re-planning) to decision makers.</p> <p>Further, this activity supports the demonstration of technologies to enhance situational awareness and tactical decision making through automated analysis, fusion of data, rapid integration of information, and acquired knowledge resulting in actionable intelligence at the lower command levels. The activity includes the demonstration of ISR efforts involving enhanced reconnaissance and persistent surveillance, and sensors for unmanned ground and aerial vehicles. Advanced technology demonstrations also include the collection of information (monitoring, sensing, and locating) in the 3-Dimensional urban battlespace as well as exploiting information (identifying and classifying data) as part of the intelligence preparation of the battlespace in order to facilitate operational maneuver and distributed operations.</p> <p>FY 2022 Plans: Develop and demonstrate new artificial intelligence (AI) systems to automate monitoring and alerting. Research will integrate video analytics with edge processing to create high-throughput detection, classification, and tracking across multiple operational domains.</p> <ul style="list-style-type: none"> - Prototype development using recommendation engines to adapt strategies based on adversary actions. - Continue advanced technology development on the operational utility of artificial intelligence/machine learning algorithms, and develop and demonstrate applications to apply these techniques to Marine Corps operations activities. - Continue development to generate synthetic data useful for machine learning while learning how to combine real data from training or operations. - Conduct demonstrations and experimentation with training and operational forces to understand the utility and impact of decision aids on improving and accelerating understanding and information-based decision-making, as well as reductions in operator workload. 					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>FY 2022 OCO Plans:</p> <p>FY 2023 Base Plans: Continue:</p> <ul style="list-style-type: none"> - Develop and demonstrate new artificial intelligence (AI) systems to automate monitoring and alerting. Research will integrate video analytics with edge processing to create high-throughput detection, classification, and tracking across multiple operational domains. - Develop a prototype using recommendation engines to adapt strategies based on adversary actions. - Advanced technology development on the operational utility of Artificial Intelligence and Machine Learning algorithms; develop, demonstrate, and experiment with these techniques during Marine Corps operations exercises and events. - Development to generate synthetic data useful for machine learning while learning how to combine real data from training or operations. - Demonstrations and experimentation with training and operational forces to understand the utility and impact of decision aids on improving and accelerating understanding and information-based decision-making, as well as reductions in operator workload. <p>Initiate:</p> <ul style="list-style-type: none"> - Develop fused common tactical picture, and tools to support planning, execution, and assessment that will allow commanders the all-domain situation awareness required to make informed and timely decisions. <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: There is no significant change from FY 2022 to FY 2023</p>					
<p>Title: USMC Future Naval Capabilities</p> <p align="right">Articles:</p> <p>Description: This R-2 Activity addresses the advanced technology development associated with the Marine Corps' participation in the Department of the Navy's (DoN) Future Naval Capabilities (FNC) Program. The objective of the work in this Program Element (PE) is to develop promising technologies emerging from the FNC technology candidates funded in PE 0602131M that have been matured to higher Technology Readiness Levels (TRLs). Investments in this activity are coordinated with similar and non-duplicative efforts in PE 0603673N. The FNC Program is structured to accelerate the transition of new technologies to the Fleet and Force. Each effort</p>	26.056	26.867	27.869	0.000	27.869
	-	-	-	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>is assessed for its technology maturity and transition commitment. Funding for FNCs, which have Technology Readiness Levels (TRLs) of 4/5 to 6 and also have transition funding commitments from acquisition Programs of Record, are resourced in this PE 0603640M MC Advanced Technology Demo. Funding for FNC technology candidates at lower TRLs (3 to 4) is resourced in PE 0602131M Marine Corps Landing Force Tech. ONR is working closely with the Resource Sponsors and acquisition stakeholders to develop high priority technological capabilities needed by the operational forces.</p> <p>FNC budget activity (BA) 2 investments develop candidate FNC technologies in an agile fashion by exploiting technology advances that respond rapidly to naval needs. This approach facilitates an optimum response when developing and maturing the technology options that can be developed further in this PE 0603640M MC Advanced Technology Demo.</p> <p>The FNC Program favors a high level of collaboration. Collaboration with the acquisition stakeholders and their resource sponsors is required. A complete accounting of the technology candidates being developed and a full disposition of each technology development effort funded in this PE is provided annually to the Congressional oversight committees.</p> <p>FY 2022 Plans: Cognitive Radio Frequency Inference Technology (CRIT): - In collaboration with Command, Control, Communications, Computers (C4) activity in this PE/project, continue the accelerated development of capabilities to demonstrate small form factor technologies that provide improved signature management of the Marine Air-Ground Task Force (MAGTF) in electromagnetic and information environments. This effort addresses a high priority Marine Corps capability gap and directly supports the National Defense Strategy by providing an 'advanced autonomous system' for 'forward force maneuver and posture resilience.</p> <p>Enabling Dynamic Operational RF (ENDOR): - Complete work on ENDOR by finishing fundamental development on its secure tactical computing infrastructure through incorporating the next generation of software cyber practices including a secure Linux operating system, containerization and application orchestration, leading to planned major demonstrations.</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Streamlined Marine After-Action Review Tool- Visualization (SMART-Viz): - Continue development of rapid, automation-assisted Streamlined Marine After-Action Review (AAR) Tools for Visualization that provide the right information, at the right time, at the right place, to the right echelon of command to improve training and lethality.</p> <p>Multi Domain Radar for the Contested Environment (MuDRaCE): - In collaboration with the Command, Control, Communications, Computers (C4) activity in this PE/project, continue the accelerated development of capabilities for a highly mobile multi-domain integrated radar system with improved effectiveness and survivability to support Marine Air-Ground Task Force (MAGTF) units in contested environments. This effort leverages MAGTF C4 networking and sensor development for system of systems capability to ensure key National Defense Strategy requirement for expeditionary 'forward force maneuver and posture resilience' and addresses a high priority Marine Corps capability gap.</p> <p>All Signal Tactical Real-Time Analyzer (ASTRAL) - Continue the development of a sensor receiver module able to detect, identify, and characterize complex signals in contested and congested electromagnetic environments. This program will develop novel topologies that help to address these applications using photonics. Particular emphasis will be given to the use of integrated photonics as a path to reduce overall system cost, size, weight and power (C-SWAP).</p> <p>Maintenance Tools for Operations and Training (MTOT) - Develop software applications (e.g. augmented reality) to improve training availability and accessibility, as well as analytics to support student assessment to address training gaps within the Marine Corps Deliberate Universal Needs</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Statement (D-UNS) on Enterprise Level Maintenance Simulation Training Solution.</p> <p>FY 2023 Base Plans: Continue: Maintenance Tools for Operations and Training (MTOT) - Continue to develop software applications (e.g. augmented reality) and content to improve training availability and accessibility, as well as analytics and algorithms to support student assessment and tailor training to address training gaps within the Marine Corps Deliberate Universal Needs Statement (D-UNS) on Enterprise Level Maintenance Simulation Training Solution.</p> <p>Streamlined Marine After-Action Review Tool- Visualization (SMART-Viz): - Complete development, exit criteria testing, and transition of Streamlined Marine After-Action Review (AAR) Tools for Visualization to Marine Corps Program Manager for Training Systems to support force-on-force and simulation-based training to improve lethality.</p> <p>All Signal Tactical Real-Time Analyzer (ASTRAL): - Complete development of the sensor receiver module to provide full spectral awareness in a contiguous RF range, unifying recent advances in spectral and correlative analysis, signal processing, and monolithic photonics-electronics integration.</p> <p>Cognitive Radio Frequency Inference Technology (CRIT): - Complete development of small form factor technologies that provide organic, easy to understand and use signature management of the Marine Air-Ground Task Force (MAGTF) in electromagnetic and information environments.</p> <p>Multi Domain Radar for the Contested Environment (MuDRaCE): - Complete development of portable, distributed multi-domain sensor and surveillance technologies in portable expeditionary warfare form factor to improve effectiveness and survivability in denied and contested electromagnetic environments.</p> <p>Poison Apple (PA)</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Advance the broad range of technologies to demonstrate the military utility of enhancing combat capability by increasing energy production, storage, distribution, and curbing energy consumption of the individual Marine and other tactical assets.</p> <p>- Conduct advanced system research into the scaled use of high specific power solar cell for Marine Corps applications ranging from the individual warfighter to augmenting the power and combat endurance unmanned robotic vehicles.</p> <p>- Progress efforts to investigate energy-efficient planning for unmanned aircraft, enabling modular and reconfigurable tactical microgrids and wave energy technologies.</p> <p>FY 2023 Base Plans: Continue:</p> <p>- Advance the broad range of technologies to demonstrate the military utility of enhancing combat capability by increasing energy production, storage, distribution, and curbing energy consumption of the individual Marine and other tactical assets with a particular emphasis on supporting distributed operations.</p> <p>- Progress efforts towards energy-aware aerial logistics, modular and reconfigurable tactical microgrids, aluminum-powered expeditionary energy sources and energy-intensive distributed operations.</p> <p>Complete:</p> <p>- Complete advanced system research into the scaled use of high specific power solar cell for Marine Corps applications ranging from the individual warfighter to augmenting the power and combat endurance unmanned robotic vehicles.</p> <p>Initiate:</p> <p>- Initiate a follow-on and focused research effort developing mission risk-based predictive maintenance technology. Demonstrate in laboratory and progress to field implementation of mission risk-based predictive maintenance technology to allow pre-planning of maintenance and repair requirements sufficiently far in advance to minimize mission interruption and facilitate longer horizon, more energy efficient distribution of Class IX materiel.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement:</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

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

There is no significant change from FY 2022 to FY 2023

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Title: Maneuver</p> <p align="right">Articles:</p> <p>Description: This activity investigates new ways and means to land forces and material through contested sea-land surface interfaces and then conduct maneuver warfare. In order to enable future Amphibious Operations, research efforts will support autonomous operations across the sea-surf-ground environment, improved fuel efficiency and speed of amphibious vehicles, amphibious vehicle technologies, water performance, and amphibious payloads to change the dynamics of a surface amphibious assault. This includes the emergence of manned-unmanned teaming and autonomous vehicle collaboration.</p> <p>The technologies included in this work address areas of mobility, materials, propulsion, signature reduction, modularity, and unmanned systems. This also encompasses navigating the surf zone by a small autonomous vehicle, navigating negative obstacles on land at speed, overcoming adversarial intent, and developing low-cost robotic autonomy kits to support of expeditionary amphibious operations (e.g., ISR, mine-counter-measures, breaching, fire support, and logistics).</p> <p>FY 2022 Plans: Continue the development and evaluation of mobility technologies and future concepts for the ground and amphibious fleet to improve maneuverability across a range of challenging terrain environments. Demonstration platforms will continue to be used for further development of technologies to enable enhanced land operations and seamless transition between land and water environments. - Expand efforts on the automation and autonomy systems to include development of low- cost, unmanned swarming amphibious assault capable platforms with a focus on performance in the surf zone and beach environments. Conduct experimentation in increasingly challenging environments to evaluate system performance.</p> <p>FY 2023 Base Plans: Continue: - Researching advanced intelligent mobility technologies for ground and amphibious platforms to improve mobility and maneuverability across littoral and inland terrain. Demonstration platforms will continue to be utilized to assess potential future capabilities.</p>	11.588	15.359	15.900	0.000	15.900
	-	-	-	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2223 / Marine Corps ATD

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Expand efforts related to the low-cost, unmanned swarming amphibious assault capable platforms to include addition of enhanced autonomy capabilities and utilization and demonstration of advanced payloads for future operations. Conduct experimentation to understand feasibility and utility for military applications.</p> <p>Initiate:</p> <p>- Research advanced drivetrain technologies, system designs, and platforms to assess capability of future military tactical truck systems to improve fuel efficiency, extend range, reduce greenhouse gases, and provide on-board auxiliary power and energy.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: There is no significant change from FY 2022 to FY 2023</p>					
Accomplishments/Planned Programs Subtotals	102.250	109.260	118.421	0.000	118.421

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy										Date: April 2022		
Appropriation/Budget Activity 1319 / 3					R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo				Project (Number/Name) 2297 / Futures Directorate			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
2297: Futures Directorate	0.000	89.324	104.071	157.064	-	157.064	123.166	119.310	116.054	110.865	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The mission of the Marine Corps Warfighting Laboratory / Futures Directorate (MCWL/FD) is to generate and examine threat-informed operating concepts and capabilities and provide analytically-supported recommendations to inform subsequent force design and development activities. The Deputy Commandant, Combat Development and Integration (DC, CD&I) is the United States Marine Corps (USMC) advocate for Science and Technology (S&T). MCWL's Commanding General (CG) is the proponent of USMC S&T and serves as the USMC Executive Agent for Marine Corps S&T. The MCWL/FD also serves as the Marine Corps' liaison to the Joint Staff for Joint Concept Development and Experimentation; thereby, facilitating service-specific experiments as well as participation in joint service experimentation.

As reflected in strategic guidance, expeditionary forces will provide an ever-ready quick strike force to protect United States (US) interests. MCWL/FD pursues concepts, capabilities, and solutions to ensure that Marines of the future force will be effectively organized, trained, and equipped to win across the range of military operations in an uncertain and complex environment. Prioritized investments in S&T are necessary to enable the future Marine Corps and maintain a technological advantage over our adversaries.

This project is organized into 6 activities, the core of which are represented by the Warfighting Capability Areas of the Marine Air-Ground Task Force (MAGTF). The project emphasizes development and demonstration of advanced technology capability concepts, and the examination of their operational application and military utility in the context of formal wargames, Modeling, Simulation, and Analysis (MS&A), and live-force field experimentation with Marines. This operational experimentation directly supports Marine Corps combat development to inform future capability requirements and optimize the acquisition process.

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Combat Service Support (CSS) and Force Protection	15.513	34.559	73.324	0.000	73.324
Articles:	-	-	-	-	-
Description: This activity includes Marine Corps Warfighting Laboratory / Futures Directorate (MCWL/FD) Combat Service Support and Force Protection experimentation efforts, to include overarching experimentation planning/execution, management, technical, and engineering support, assessment of equipment, new Tactics, Techniques, and Procedures (TTPs), training opportunities, and proposed organizational changes associated with enhanced capabilities. This activity develops technology in support of a more distributed technologically advanced force, increasing range, effectiveness, sustainability, and survivability of the Marine Corps Air-Ground Task Force (MAGTF). Most programs listed below are considered major (valued at \$500K or more) or have near					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

real-time operational impact. Investments in this activity are conducted under the Thrust Areas of Expeditionary Logistics, Expeditionary Medical, Force Protection, or Autonomy and Robotics.

FY 2022 Plans:

- Unmanned Logistics and Defense - Continue development and experimentation with highly autonomous and synchronous logistics capabilities in support of expeditionary Marine Air-Ground Task Force (MAGTF) operations. Assess execution of high tempo unmanned sustainment to dispersed and disaggregated forces during joint combined air-ground operations in contested environments including transiting over water from surface vessels to shore and other surface vessels. Continue to utilize autonomous connectors to conduct littoral staging and autonomous resupply. Objectives include providing a landing craft, utility (LCU) with hardened autonomy system that can deploy with Marine Expeditionary Units as part of extended user evaluations (EUEs) to inform requirements for autonomous and unmanned crafts in the littorals.

- Sustainment - Continue to sustain and investigate multiple technologies integrated within the MAGTF to experiment with alternate vehicle power, extended mobility, hybrid energy, expeditionary fuel distribution, and small unit water purification to enable logistics demand reduction and provide alternate sustainment to the MAGTF at all levels. Continue experimentation with hybrid power systems, providing the MAGTF with a tactical, highly mobile, transportable, and versatile power generating and power scavenging platform. Design, develop, manufacture, and test an amphibious towable fuel container (unit/system); improving the MAGTFs capability to rapidly transport and distribute fuel to support units maneuvering and conducting operations in a contested environment. Conduct a Limited Technical Assessment (LTA) on the ability to organically construct expeditionary air fields, roadways, and hardened structures. Investigate and leverage existing water purification technologies to enable purification, storage, and distribution to sustain disaggregated units.

- Counter UAS - In response to the emergent small UAS (Group I & II) threats, continue to develop an enhanced capability to locate, identify, access, and neutralize small UAS threats. Tasks include exploring/developing autonomous and semi-autonomous counter UAS solutions; developing and demonstrating the capability to execute an end-to-end kill chain in multiple environments; neutralizing targets in an effective, cost efficient manner; and demonstrating the ability to employ counter UAS assets from the seabase to support Marine forces in austere locations. Develop automatic target recognition algorithm for radar optics as well as a library of 3-dimensional imagery to enhance current technology, reduce false positives, and shorten the systematic kill-chain for targeting.

FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Explosive Detection/Defeat - Continue to develop an autonomous explosive detection and defeat capability; integrating specialized sensors for enhanced neutralization. Efforts include merging the technologies of detection defeat and autonomy in order to address multiple threats resulting in a robust system that will be markedly more capable over the current single modality systems. The objective is to develop a system capable of detecting 95% of commonly faced explosive hazards and/or defeating them with no more than a 20% false alarm rate in a time period adequate to support Marine Corps ground maneuver elements.</p> <p>- Medical - Continue to experiment with systems to support a smaller, modular, multifunctional medical concept that can support medical care ashore and Marine Littoral Regiments (MLR) by performing studies, integration with unmanned systems, demonstrations, and experimentation. Integrate automated casualty care to provide therapeutic care during movement. Integrate, test, and demonstrate wearable bio-sensors and their applicability to a multifunctional medical team supporting the MLR.</p> <p>- Warfighter Performance - Continue to provide increased lethality and mobility to the warfighter through the integration of technology directly attributable to individual combat equipment. Develop, test, and assess a Radio Agile Integrated Device (RAID) Plate, removing the functional components from multiple handheld radios and consolidating them on the warfighter's back in order to provide a fully integrated communication and power solution designed to interface with the dismounted Marine's end user device.</p> <p>- Littoral Connectors - Expand development and enhancement of capabilities for diversified distribution, providing risk worthy, inexpensive platforms for maneuver and sustainment distribution. Utilize current commercial technology to enhance maneuver to and from seabases and expeditionary advanced bases in the littorals with the ability to deliver directly to the users at shore. Objective is to provide direct logistical support to forces ashore, inform program of record (POR) (Light Amphibious Warship) and acquisition strategy, increase performance ability, survivability, and resiliency of current surface connectors (range, endurance, payload, utility), and mitigate distribution gaps by delivering from the seabase directly to the beach.</p> <p>- Robotic Modernization - Initiate effort to provide ground combat element robotic asset maintenance, repair, and upgrades; ultimately ensuring systems viability for experimentation. Efforts include evaluating and integrating both POR and non-POR payloads, leveraging developed, commercially available technologies, and performing tests, demonstrations, and assessments prior to dedicated live-force experimentation.</p> <p>FY 2023 Base Plans:</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Unmanned Logistics and Defense:</p> <ul style="list-style-type: none"> - Continue development and experimentation with highly autonomous and synchronous logistics capabilities in support of expeditionary Marine Air-Ground Task Force (MAGTF) operations. - Continue to assess execution of high tempo unmanned sustainment to dispersed and disaggregated forces during joint combined air-ground operations in contested environments including transiting over water from surface vessels to shore and other surface vessels. - Complete development efforts in support of littoral staging and autonomous resupply, which provides a landing craft, utility (LCU) with hardened autonomy system that can deploy with Marine Expeditionary Units as part of extended user evaluations (EUEs) to inform requirements for autonomous and unmanned crafts in the littorals. <p>Sustainment:</p> <ul style="list-style-type: none"> - Continue to sustain and investigate multiple technologies integrated within the MAGTF to experiment with alternate vehicle power, extended mobility, hybrid energy, expeditionary fuel distribution, and small unit water purification to enable logistics demand reduction and provide alternate sustainment to the MAGTF at all levels. - Complete experimentation with hybrid power systems. - Complete design, development, manufacturing, and testing of an amphibious towable fuel container (unit/system). - Complete evaluating Limited Technical Assessment (LTA) results on the ability to organically construct expeditionary air fields, roadways, and hardened structures. - Initiate demonstrations with naval logistics information technology integration with low earth orbit and military satellite networks; ultimately reducing reliance on continuous emission systems and leveraging low probability of detection waveforms. - Initiate the research, design, and build of a littoral maneuver enabler prototype. <p>Counter Unmanned Aerial System (UAS):</p> <ul style="list-style-type: none"> - Complete efforts to develop an enhanced capability to locate, identify, access, and neutralize small UAS threats. - Complete development efforts for automatic target recognition algorithms for radar optics as well as a library of 3-dimensional imagery to enhance current technology, reduce false positives, and shorten the systematic kill-chain for targeting. <p>Explosive Detection/Defeat:</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<ul style="list-style-type: none"> - Continue to develop an autonomous explosive detection and defeat capability; integrating specialized sensors for enhanced neutralization. - Initiate spiral technology development to produce a mobile explosive hazard in-depth defense. <p>Medical:</p> <ul style="list-style-type: none"> - Continue to experiment with systems to support a smaller, modular, multifunctional medical concept that can support medical care ashore and Marine Littoral Regiments (MLR) by performing studies, integration with unmanned systems, demonstrations, and experimentation. - Continue to integrate, test, and demonstrate wearable bio-sensors and their applicability to a multifunctional medical team supporting the MLR. - Complete integration of automated casualty care, providing therapeutic care during movement. - Initiate research regarding the constraints of performing medical interventions aboard shallow draft vessels. <p>Warfighter Performance:</p> <ul style="list-style-type: none"> - Continue to provide increased lethality and mobility to the warfighter through the integration of technology directly attributable to individual combat equipment. - Continue to develop, test, and assess a Radio Agile Integrated Device (RAID) Plate. - Initiate development of common user interface and fully integrate Primary, Alternate, Contingency, Emergency (PACE) plan for dismounted troops. <p>Littoral Connectors:</p> <ul style="list-style-type: none"> - Continue development and enhancement of capabilities for diversified distribution, providing risk worthy, inexpensive platforms for maneuver and sustainment distribution. Utilize current commercial technology to enhance maneuver to and from seabases and expeditionary advanced bases in the littorals with the ability to deliver directly to the users at shore. Efforts will advance anti-access and area denial capabilities to forward deployed forces. <p>Robotic Modernization:</p> <ul style="list-style-type: none"> - Continue to provide ground combat element robotic asset maintenance, repair, and upgrades; ultimately ensuring systems viability for experimentation and user evaluation. <p>Camouflage, Concealment, and Detection (CC&D):</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Initiate the development of CC&D capabilities, enabling persistence within enemy's Weapons Engagement Zone (WEZ).</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The funding increase from FY 2022 to FY 2023 is directly attributable to the following areas:</p> <ul style="list-style-type: none"> - Sustainment: - Initiation of demonstrations with naval logistics information technology integration with low earth orbit and military satellite networks. - Continue to manage and experiment with a Stern Landing Vessel (SLV) to assess, evaluate and experiment with a SLV to inform future naval surface vessel requirements, develop tactics, techniques and procedures (TTPs), and refine Distributed Maritime Operations (DMO)/Expeditionary Advanced Base Operations (EABO) concept of operations (CONOPS), pertaining to Force Design 2030. Specifically, additional funds support the execution of a 2nd hull, providing enhanced maneuver to and from seabases and expeditionary advance bases in the littoral with the ability to deliver all classes of supply, up to 38 passengers, directly to the users at shore via a full width (40ft) stern ramp. The SLV has a shallow vee-hull, transits at 14 knots in sea state 5, survivable in seat state 7, possess a 10-ton crane, and has the ability to tow other surface vessels. This effort supports the Navy's program of record Light Amphibious Warship (LAW), PMS-317, and shall serve as a validation of stern-landing vessels vice traditional bow-landing vessels. This package directly supports Naval and Joint Forces by providing Joint Force Maritime Component Commanders and Geographic Combatant Commanders a reliable, survivable, and lethal Marine Corps unit to deploy within the enemy's threat weapon engagement zone (WEZ) in support of joint operating concepts. - Medical: - Initiation of research regarding the constraints of performing medical interventions aboard shallow draft vessels. <p>Camouflage, Concealment, and Detection (CC&D):</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate
--	---	--

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
---	---------	---------	--------------	-------------	---------------

- Initiate the development of CC&D capabilities, enabling persistence within enemy's Weapons Engagement Zone (WEZ).					
---	--	--	--	--	--

Title: Fires, Targeting, and Maneuver	5.236	6.499	11.744	0.000	11.744
--	-------	-------	--------	-------	--------

Articles:	-	-	-	-	-
------------------	---	---	---	---	---

Description: This activity includes Marine Corps Warfighting Laboratory / Futures Directorate (MCWL/FD) experimentation efforts in the areas of fires, targeting, and maneuver, to include overarching experimentation planning/execution, management, technical, and engineering support, assessment of equipment, new Tactics, Techniques, and Procedures (TTPs), training programs, and proposed organizational changes associated with enhanced capabilities. This area increases fires, targeting, and maneuver related troop environmental awareness, lethality, and mobility using fused sensors as well as unmanned weaponized and reconnaissance air and ground vehicle platforms to support experimentation. Most programs listed below are considered major (valued at \$500K or more) or have near real-time operational impact. Investments in this activity are conducted under the Thrust Areas of Marine Air-Ground Task Force (MAGTF) Fires, Maneuver, and Autonomy and Robotics.

FY 2022 Plans:

- Unmanned Ground Vehicle (UGV) - Continue to provide a multi-purposed UGV, with modular payload architecture, with specific focus on vehicle sustainment as well as command and control structure. Continue to integrate program of record (POR) and non-POR payloads for the UGV platform that enhance dismounted units across the warfighting functions. Performed tests, demonstrations, and assessments prior to dedicated live-force experimentation. Focus areas include hostile threat detection, route clearance, common launcher integration, and automated target detection. Objective is to integrate a series of kinetic and non-kinetic payload options onto UGVs in order to enhance maneuverability, survivability, and lethality across warfighting communities.
- Aerial Munitions - Continue to pursue company level precision guided munitions to increase responsiveness, survivability, and lethality to the ground combat element. Continue experimentation with fully autonomous, remotely operated unmanned aerial systems (UASs) that served as a dual electro-optical (day) and infra-red (IR) (night), precision-guided, loitering munition designed to seek, locate, and engage selected targets.

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Multi-Domain Fires - Continue the examination and testing of precision guided munitions. Efforts promote artillery force protection. Initiate investigations into low cost hypersonic technologies as well as multi-Domain Over-the-Horizon (OTH) Targeting.</p> <p>FY 2023 Base Plans: Unmanned Ground Vehicle (UGV):</p> <ul style="list-style-type: none"> - Continue to provide a multi-purposed UGV, with modular payload architecture, with specific focus on vehicle sustainment as well as command and control structure. - Continue to integrate program of record (POR) and non-POR payloads for the UGV platform that enhance dismounted units across the warfighting functions. - Continue to perform tests, demonstrations, and assessments prior to dedicated live-force experimentation. <p>Aerial Munitions:</p> <ul style="list-style-type: none"> - Continue to pursue company level precision guided munitions to increase responsiveness, survivability, and lethality to the ground combat element. - Continue experimentation with fully autonomous, remotely operated unmanned aerial systems (UASs) that serves as a dual electro-optical (day) and infra-red (IR) (night), precision-guided, loitering munition designed to seek, locate, and engage selected targets. - Initiate development of a common launcher system that can be integrated onto ultra-light and autonomous vehicles; capable of firing light and medium or medium and heavy precision fires assets. - Initiate tasks to integrate existing weapons technology into a single killer munition. <p>Multi-Domain Fires:</p> <ul style="list-style-type: none"> - Continue the examination and testing of precision guided munitions. Efforts promote artillery force protection. - Complete investigations into low cost hypersonic technologies as well as multi-domain over-the-horizon (OTH) targeting. - Initiate the incorporation of POR command and control (C2) infrastructure with modified long-range aerial munitions to identify feasibility or recoverable, canister launched, platforms. - Initiate fire coordination cognizance investigations to reduce the cognitive load on fire support officers and commanders as they seek to understand events, make decisions, and take actions during high-stakes operations. - Initiate small unmanned close air support efforts to determine most capable product (platform + weapon + C2); leading to subsequent development and experimentation. 					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Initiate organic sensor-to-shooter data that expedites the targeting process at the tactical level by integrating national technical means and is interoperable with Joint fires. Funding will be used to conduct a series of Developmental Tests and Limited Technical Assessments that matures the technology and validates USMC service level requirements.</p> <p>- Initiate preliminary design for a hypersonic capability in the 227mm (~9 inch variant) form factor to fit into a M142 High Mobility Artillery Rocket System (HIMARS) Launcher and support an expeditionary concept of operation. Pursuing this size will enable the Marine Corps to leverage existing legacy program of record technologies for both the launcher system (HIMARS) and the command and control software Advanced Field Artillery Tactical Data System (AFATDS).</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The funding increase from FY 2022 to FY 2023 is due to the following efforts:</p> <p>Multi-Domain Fires:</p> <ul style="list-style-type: none"> - Initiation of small unmanned close air support efforts to determine most capable product (platform + weapon + C2); leading to subsequent development and experimentation. - Initiation of organic sensor-to-shooter data to expedite the targeting process at the tactical level by integrating national technical means and is interoperable with Joint fires. - Initiation of a preliminary design for a hypersonic capability to fit into a M142 High Mobility Artillery Rocket System (HIMARS) Launcher and support an expeditionary concept of operation. Pursuing this size will enable the Marine Corps to leverage existing legacy Program of Record technologies for both the launcher system (HIMARS) and the command and control software Advanced Field Artillery Tactical Data System (AFATDS). 					
<p>Title: Marine Air-Ground Task Force (MAGTF) Command, Control, Communications, and Computers (C4)</p> <p align="right">Articles:</p> <p>Description: This activity encompasses all Marine Corps Warfighting Laboratory/Futures Directorate (MCWL/ FD) Command, Control, Communications, and Computers (C4) experimentation efforts, to include overarching experimentation planning/execution, management, technical, and engineering support, assessment of equipment, new Tactics, Techniques, and Procedures (TTPs), training programs, and proposed organizational changes associated with enhanced C4 capabilities. The area provides cutting edge/enhanced Over-The-Horizon (OTH), Beyond Line of Sight (BLOS), satellite and non-satellite based C4 capabilities to support</p>	8.186	9.799	15.144	0.000	15.144
	-	-	-	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate
--	---	--

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>experimentation. Programs listed below are considered major (valued at \$500K or more) or have near real-time operational impact. Investments in this activity are conducted under the Thrust Areas of Command, Control, Communications, and Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) and Cyber/Electronic Warfare (Cyber/EW).</p> <p>FY 2022 Plans:</p> <ul style="list-style-type: none"> - Asymmetric Command and Control (C2) - Continue to improve the stability, reliability, security, and performance of the current Iridium-based, push-to-talk (PTT), and position location information (PLI) system architecture for use in experiments with live-force units across a wide spectrum of ground, air, and surface operations. Continue to expand the use of mini-crypto on a Trellis Ware network and apply the mini-crypto capability to end user devices using the established experimental network/service via the Iridium 9523 modem. - Integrated C2 - Continue experimentation with an MV-22 (aircraft) internally transportable communications platform that receives, processes, and disseminates digital information from organic sensors wirelessly to dismounted users. Tasks include advanced waveform development and integration, advanced track and video processing development, and satellite On-the-Move (OTM) efforts. Initiate development of a persistent satellite communications (SATCOM) point-of-presence to enable Expeditionary Advanced Base (EAB), Distributed Maritime Operations (DMO), and Joint All-Domain C2 (JADC2) experimentation. - Electronic Warfare (EW) / Information Environment Operations - Continue pursuing electronic warfare efforts; to include providing tactical and deployable capabilities to locate, degrade, and/or deny adversaries use of the electromagnetic spectrum (EMS) encompassing elements of EW Support, Electronic Protection, and Electronic Attack measures. Initiatives include: Sensors and Jammers, C2, signal classification, and signal simulation. Initiate the development of a contested environment simulation tool. Initiate efforts to test and assess Tactical Spectrum Warfare Analysis Tools (TSWAT). Continue cyberspace warfare efforts, focusing on integrated cyber-hardening capabilities, external hacking / counterfeit electronics detection, and initiate development, testing, and assessment of combat systems for cyberspace monitoring. - Air Command - Complete development, assessment, and experimentation with tactical and itinerant air C2; specifically supporting a dispersed and disaggregated joint force. <p>FY 2023 Base Plans:</p> <p>Asymmetric Command and Control (C2):</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Continue to provide secure "one-to-many" (netted) push-to-talk (PTT) voice and command, control, communications, and computers (C4) data services to disadvantaged users in an easy to use, hand-held radio for both mounted and dismounted operations with no reliance on local ground infrastructure.</p> <p>- Continue mini-crypto development.</p> <p>- Initiate mission play-back capabilities for enhanced analysis and training and continue development and limited technical assessments with an expeditionary transportable communications platform.</p> <p>- Initiate a series of limited technical assessments to provide secure "one-to-many" (netted) push-to-talk (PTT) voice and command, control, communications, and computers (C4) data services to disadvantaged users in an easy to use, hand-held radio for both mounted and dismounted operations with no reliance on local ground infrastructure.</p> <p>Integrated C2:</p> <p>- Continue experimentation with an expeditionary transportable communications platform.</p> <p>- Continue the development of persistent satellite communications (SATCOM) point-of-presence to enable Expeditionary Advanced Base (EAB), Distributed Maritime Operations (DMO), and Joint All-Domain C2 (JADC2) experimentation.</p> <p>- Initiate the integration of a proliferated-Low Earth Orbit (pLEO) satellite constellation capability which will facilitate connectivity to elements of the Family of Integrated Targeting Cells (FITC) and other pLEO enabled platforms and agencies.</p> <p>Electronic Warfare (EW) / Information Environment Operations:</p> <p>- Continue to pursue multiple electronic and cyber-secure warfare efforts.</p> <p>- Complete efforts to test and assess, which provide a ruggedized case for sensing WiFi, Bluetooth, and other electro-magnetic transmissions.</p> <p>- Initiate the development and integration of an airborne EW/Signals Intelligence (SIGINT) radio frequency sensor that is optimized for Group I - III unmanned aerial system (UAS) deployment.</p> <p>- Initiate the integration of a full-spectrum SIGINT and EW capability onto Group V UAS. Effort will provide a modular system architecture with the ability to integrate into multiple platforms.</p> <p>- Initiate experimentation with a cyber application of swarmable, autonomous UASs used to accomplish intelligence, surveillance, and reconnaissance (ISR) and EW operations in a contested environment.</p> <p>- Initiate the development of a resilient, cyber-secure high-performance network within the littorals.</p> <p>Naval Force Tactical Communications:</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy				Date: April 2022	
Appropriation/Budget Activity 1319 / 3		R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo		Project (Number/Name) 2297 / Futures Directorate	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					
<p>- Initiate experimentation opportunities for high frequency silent transmission over a resilient meshed network. Developed technology will support C2 in heavily contested electro-magnetic environments (EME).</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The funding increase from FY 2022 to FY 2023 is due to the following effort:</p> <p>Asymmetric Command and Control (C2):</p> <ul style="list-style-type: none"> - Initiation of a series of limited technical assessments to provide secure "one-to-many" (netted) push-to-talk (PTT) voice and command, control, communications, and computers (C4) data services to disadvantaged users in an easy to use, hand-held radio for both mounted and dismounted operations with no reliance on local ground infrastructure. - Integration of a proliferated-Low Earth Orbit (pLEO) satellite constellation capability which will facilitate connectivity to elements of the Family of Integrated Targeting Cells (FITC) and other pLEO enabled platforms and agencies. 					
<p>Title: Marine Air-Ground Task Force (MAGTF) Intelligence, Surveillance, and Reconnaissance (ISR)</p> <p align="right">Articles:</p> <p>Description: This activity includes Marine Corps Warfighting Laboratory / Futures Directorate (MCWL/FD) Intelligence, Surveillance and Reconnaissance (ISR) related experimentation efforts, to include overarching experimentation planning/execution, management, technical, and engineering support, assessment of equipment, new Tactics, Techniques, and Procedures (TTPs), training programs, and proposed organizational changes associated with enhanced ISR capabilities. Using a variety of fused sensors to mesh data, video, and images and incorporating a common tactical controller to operate multiple air and ground ISR platforms, this area enhances small unit situational awareness as well as exploitation and forward engagement ability via experimentation. Programs listed below are considered major (valued at \$500K or more) or have near real-time operational impact. Investments in this activity are conducted under the Thrust Areas of Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) and Autonomy and Robotics.</p> <p>FY 2022 Plans:</p>					
	22.681	24.474	25.884	0.000	25.884
	-	-	-	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Unmanned Aerial Systems (UASs) - Continue to explore, expand mission sets, and exploit the tactical potential of small UASs across multiple Marine Corps domains, focusing on autonomy, innovative applications, and the most advanced small UAS technology. Objectives include increasing ground maneuver force capability with small UASs by integrating critical payloads for immediate use and incorporating new platforms, sensors, and command and control into United States Marine Corps (USMC) UAS operations. Seek to develop Group I long endurance (24+ hour) small UAS. Investigate and assess vertical take-off and landing (VTOL) Group II UAS capabilities. Efforts support providing a small tactical UAS, compatible with the Naval Surface Fleet to align with long-term USMC UAS ship-board requirements. Objectives include integrating, testing, and demonstrating a heavy fuel engine to expand Department of the Navy (DoN) organic ship-board operations; modifying to address other threshold requirements such as Type 1 encryption, electromagnetic interference (EMI) shielding, and global positioning system (GPS) hardening. Initiate efforts using larger UASs to develop shipboard operations using an Electric VTOL (EVTOL), evaluating new power and propulsion technology as well as leveraging the rapidly advancing Urban Air Mobility (UAM) commercial segment. Effort will inform an Analysis of Alternatives (AoA) for an inexpensive next generation helicopter, capable of performing and surviving within an Expeditionary Advanced Base (EAB) construct, reducing maintenance requirements, and dependence on fossil fuels.</p> <p>- Robotic Autonomous Command and Control (C2) - Continue to investigate and experiment with enabling technologies combining sensor and telemetry data from multiple unmanned platforms (ground, surface (water), and air). Incorporate large, medium, and small autonomous as well as C2 (radio and tablet) platforms to integrate, test, and demonstrate fully integrated manned-unmanned teaming concepts with collaborative control between Marines and robotic autonomous assets.</p> <p>- Mapping - Complete investigations into providing a small, lightweight, semi-autonomous system that can self-navigate structure interiors and subterranean environments while simultaneously creating real-time three-dimensional (3D) maps.</p> <p>- Fused Integrated Networking - Continue development and experimentation using an aerial communications gateway platform. Objectives include networking mobile distributed multi-domain sensors, fires, and C2 platforms; supporting high throughput at operationally relevant ranges; leveraging low probability of intercept/ low probability of detection/anti-jam (LPI/LPD/AJ) attributes; reconfiguration to optimize throughput and reduce latency in a given threat environment; and optimized pass fires/C2 information in the form of pre/post-processed information between sensors, shooters, and/or C2 agencies in order to enable a "kill web".</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Air-Launched Reconnaissance - Complete efforts to provide a multi-role, long reach, expeditionary, next generation network of ISR capabilities. Program objective is to demonstrate an unmanned attritable aerial asset arriving at least 5 minutes ahead of a manned assault aircraft, providing threat updates on objective for go/no go landing decision.</p> <p>- Information Operations - Continue to develop and enhance capabilities to increase situational awareness and influence decision making. Integrate capabilities in the information operation environment, to include monitoring, engaging, and producing effects. Conduct limited technical assessments and exercises to evaluate emergent technologies and develop TTPs. Investigate technologies and experimentation opportunities to support the operational utility of artificial intelligence/machine learning algorithms, developing Marine Corps intelligence and logistics applications. Effort seeks to develop tools to improve and accelerate information-based decision-making as well as reductions in operator workload.</p> <p>- Space - Continue to develop capabilities to conduct electronic warfare against UASs in support of MAGTF operations. Provide LPI/LPD C2 link for autonomous surface vessels and demonstrate a communication pathway in a C2 degraded environment. Initiate experimentation efforts to reduce overall cost of distributed, space-based observations. Objective seeks to deploy micro satellites made from semi-conductor fabrication technology. Investigate theory that satellites can be made inexpensively and powerful by leveraging existing high volume design/manufacturing/test infrastructures.</p> <p>FY 2023 Base Plans: Unmanned Aerial Systems (UASs):</p> <ul style="list-style-type: none"> - Continue to explore, expand mission sets, and exploit the tactical potential of small UASs across multiple Marine Corps domains, focusing on autonomy, innovative applications, and the most advanced small UAS technology. - Continue development of Group I long endurance (24+ hour) small UAS. - Continue to investigate and assess vertical take-off and landing (VTOL) Group II UAS capabilities. Objectives still include integrating, testing, and demonstrating a heavy fuel engine to expand Department of the Navy (DoN) organic ship-board operations. - Continue to explore Group II fixed wing and VTOL payload development. - Continue efforts to provide a highly automated/autonomously operated cargo drone that supports organic resupply via an aerial cargo vehicle; supporting a squad sized element. - Complete efforts using larger UASs to develop shipboard operations using an electric VTOL (EVTOL) asset. 					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Initiate specialized payload development for Group 2 and 3 UAS organic to tactical units for extended endurance, increased lethality, and developmental testing.</p> <p>Robotic Autonomous Command and Control (C2):</p> <p>- Continue to investigate and experiment with enabling technologies combining sensor and telemetry data from multiple unmanned platforms (ground, surface (water), and air).</p> <p>Fused Integrated Networking:</p> <p>- Continue development and experimentation using an aerial communications gateway platform. Objectives include developing a podded C4 gateway prototype optimized to be hosted on a Group V Mid-Altitude Long Endurance (MALE) UAS as well as optimizing multi-domain (air, land, and sea) system-to-system interoperability; enabling joint targeting (planned and/or dynamic); and providing a robust capacity to locally hosted applications and services.</p> <p>Information Operations:</p> <p>- Continue to develop and enhance capabilities to increase situational awareness and influence decision making.</p> <p>- Continue to investigate technologies and experimentation opportunities to support the operational utility of artificial intelligence/machine learning algorithms, developing Marine Corps intelligence and logistics applications.</p> <p>- Complete the integration of capabilities in the information operation environment, to include monitoring, engaging, and producing effects.</p> <p>Space:</p> <p>- Continue to develop capabilities to conduct electronic warfare in support of Marine Air-Ground Task Force (MAGTF) operations.</p> <p>- Continue to investigate experimentation opportunities for inexpensive commercial based satellites, leveraging existing high volume design/manufacturing/test infrastructures.</p> <p>- Complete low probability of intercept/low probability of detection (LPI/LPD) C2 link for autonomous surface vessels and demonstrate a communication pathway in a C2 degraded environment.</p> <p>- Complete experimentation efforts to reduce overall cost of distributed, space-based observations.</p> <p>- Initiate the construct and experimentation of integrated targeting cells.</p> <p>- Initiate investigations to search and receive messages transmitted outside standard frequency assignments and forward to deployed forces within the Expeditionary Advanced Base Operations (EABO) construct.</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy				Date: April 2022	
Appropriation/Budget Activity 1319 / 3		R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo		Project (Number/Name) 2297 / Futures Directorate	
B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)					
<p>- Initiate Family of Integrated Targeting Cells (FITC) development in order to enhance the tactical-national interfaces that can support the over-the-horizon awareness, identification, and targeting in stressing environments. Prototypes will demonstrate tactical and resilient networking and processing capabilities that can work with national, commercial, and in-theater tactical feeds to increase capabilities operating at the tactical edge.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The funding increase from FY 2022 to FY 2023 is due to the following effort:</p> <ul style="list-style-type: none"> - Unmanned Aerial Systems (UASs): - Initiation of specialized payload development for Group 2 and 3 UAS organic to tactical units for extended endurance, increased lethality, and developmental testing. 					
<p>Title: Marine Corps Warfighting Laboratory / Futures Directorate (MCWL/FD) Technical, Engineering, and Management Support</p> <p align="right">Articles:</p> <p>Description: Marine Corps Warfighting Laboratory / Futures Directorate (MCWL/FD) Technical, Engineering, and Management Support efforts include lab-wide, non-program specific experimentation doctrine, planning, management, and technical/engineering support, as well as technology transition tracking efforts. Tasks listed below are considered major (valued at \$500K or more) or have near real-time operational impact.</p> <p>FY 2022 Plans:</p> <ul style="list-style-type: none"> - Experimentation Analysis - Efforts now discussed within the Warfighting Excellence area, Modeling, Simulation, and Analysis paragraph. - Commercial Forecasting - Continue to explore new mechanisms to identify long-range commercially available technologies and innovations that may influence future Marine Corps investments. Program goals are to identify commercial innovations which impact future Marine Corps capabilities and leverage commercial dual use investments to preserve military S&T resources. Efforts focus on military focused technologies available in 10 to 20 years. 					
	15.512	5.795	8.671	0.000	8.671
	-	-	-	-	-

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Technical Support - Provide a full range of overarching, lab-wide, engineering, analytical, technical, management, and business services; directly related to live-force experimentation. Efforts support the development of new or existing operational concepts, tactics, techniques, procedures, and technologies to prepare Marines for combat. These are critical components to feed into the combat development process. Related, program specific tasks/funding discussed within applicable sections of the exhibit.</p> <p>- Portfolio Analytics - Continue to build a comprehensive visualization tool for Marine Corps Warfighting Laboratory's (MCWL's) portfolio and integrate it with Science and Technology (S&T) efforts across the Department of the Defense's (DoD's) S&T community. Provide strategic portfolio management, simplifying the process of gathering and organizing organizational content into systemized digital frameworks for the automation of data driven reports, road mapping, and strategic planning. Increase awareness of performance and other project metrics due to high-level data analysis and visualization.</p> <p>- Collaboration - Continue to provide critical infrastructure to support the execution of S&T projects. The environment supports S&T development/execution as well as experimentation planning. Effort seeks to facilitate communication, problem solving, risk mitigation, and status reporting in the execution of S&T projects at all classification levels.</p> <p>FY 2023 Base Plans: Commercial Forecasting: - Continue to identify long-range commercially available technologies and innovations that may influence future Marine Corps investments. Efforts provide a means to ensure proactive awareness and leveraging of foreseeable developments in commercial cutting-edge technologies.</p> <p>Technical Support: - Continue to provide a full range of overarching, lab-wide, engineering, analytical, technical, management, and business services; directly related to live-force experimentation.</p> <p>Portfolio Analytics: - Continue to build a comprehensive visualization tool for the Marine Corps Warfighting Laboratory (MCWL) portfolio and integrate it with Science and Technology (S&T) efforts across the Department of Defense's (DoD's) S&T community. Since these efforts are tightly coupled with both Technical Support as well as Collaboration requirements, future discussions will be captured within the Technical Support arena.</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Collaboration: - Continue to provide critical infrastructure to support the execution of S&T projects. The provided laboratory facility co-locates experimentation designers/implementers with project teams and technologists to enhance effectiveness of experimentation design, development, implementation, reporting, prototyping, and outreach of results.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: The funding increase from FY 2022 to FY 2023 is directly attributable to Technical Support re-alignments to better identify command-level support versus specific project level function. This category did not experience any growth or decline from FY 2022 to FY 2023; however, the requested budget as shown is now better representative of overarching, lab-wide, non-program specific support.</p>					
<p>Title: Warfighting Excellence</p> <p align="right">Articles:</p> <p>Description: This activity includes Marine Corps Warfighting Laboratory / Futures Directorate (MCWL/FD) efforts in the development and assessment of joint and service warfighting concepts, joint and service missions, analysis of emerging threats and opportunities, and joint capability experimentation. It also includes MCWL/FD service experimentation (to include planning and analysis) in areas that impact multiple warfighting functions. Programs listed below are considered major (valued at \$500K or more) or have near- real-time operational impact.</p> <p>FY 2022 Plans: - Wargaming - Continue to plan and execute executive agent responsibilities for the Marine Corps Title Ten Wargame, Expeditionary Warrior, as well as other wargames to examine Marine Corps capstone, operating, and functional concepts and explore assigned topics. Efforts include all elements of the Commandant's Planning Guidance and National Defense Strategy. Permit improved wargaming collaboration, quantitative output, and qualitative output by utilizing technical personnel who provide scenario development, database management, simulation training to players, over the shoulder instruction to players, server management, network management, and accreditation of network and system support. This enables an agile wargaming</p>	22.196 -	22.945 -	22.297 -	0.000 -	22.297 -

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>capability, capable of exploring problems, developing insights, expanding assessment and analytical results, and supporting deliberations and excursions.</p> <ul style="list-style-type: none"> - Emerging Threats and Opportunities - Continue to assess and analyze the future security environment; identifying and analyzing emerging threats; and developing and appraising promising concepts, opportunities and technologies. Efforts provide broad-based technological and analytical support for United States Marine Corps (USMC) combat development and experimentation programs at the component, Service, and Joint levels. Support covers the full spectrum of combat development related missions and tasks, to include assessment of the strategic environment, future threats and adversaries, and associated geographic, environmental, economic, and demographic conditions that may influence the development of future warfighting concepts, experimentation, and capabilities. - Joint Concept Technology Demonstrations (JCTDs) - Continue to monitor and contribute to approved efforts that address joint and combatant command warfighting needs through the execution and demonstration of prototypes within two to four years. Complete technology development to enable barges/vessels to serve as distributed resupply nodes in support of littoral operations. Initiate efforts to provide kitted solutions to increase the survivability of expeditionary and permanent logistical support networks in an Anti-Access/Area Denial (A2/AD) environment. - Exercise Support - Continue multi-year effort to enhance the ability of the Marine Air-Ground Task Force (MAGTF) to conduct operations in the dense urban environment. Focus areas include manned-unmanned teaming functionality. - Innovation - Continue to conduct warfighter driven challenges to develop prototypes and foster innovation within the Marine Corps. Continue to reach out to fleet organizations, engage entities and develop required capabilities for further testing and evaluation. Integrate emergent technologies into experimental venues to access feasibility. - Modeling, Simulation, and Analysis - Continue to use modeling and simulation (M&S) tools and techniques to provide analysis to support capability development activities. Efforts provide sustained and progressive examination of 21st century warfighting concepts, plans, and capabilities. Force development activities include campaign level and mission/engagement level M&S, systems planning and analysis, model development, table top exercise support, assessment, and product generation for development of Marine Corps and Naval 					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>capabilities. Previously reported within the Operations (Support) area (now titled Technical, Engineering, and Management Support), continue to provide unique and comprehensive analytical expertise to facilitate and evaluate experiments in various warfighting areas. Analysts assist in experiment design, data collection during experiments, and performance of reconstruction and analysis of experiments. End products include comprehensive independent experiment analysis reports; detailing results and suggestions to increase effectiveness and efficiency.</p> <p>- Experimentation Opposition Force - Continue to demonstrate the abilities of a live adversary force. Force provides a realistic, adaptive, and cohesive adversary as well as civilian environmental characteristics.</p> <p>- Autonomous First Wave - Complete campaign to assess an ecosystem of technologies to better understand and advance capabilities to ultimately increase the lethality and effectiveness of the warfighter on tomorrow's battlefield. Conduct limited objective assessments to portray a multi-disciplinary, cross-functional, and intra-branch approach towards the larger foci of the Naval Fleet Experimentation (FLEX) Program and the Marine Corps' Service Level Experimentation Campaign Plan (SLCP), albeit assessing technologies at different phases of ship-to-shore maneuver and combat operations in an urban environment.</p> <p>- Joint Assessment Strategies - Complete participation in joint Defense Advanced Research Projects Agency (DARPA)-led initiative to analyze the hardest military challenges facing the United States and our allies. Experimentation efforts seek to inform future warfighting architectures and address/solve identified challenges.</p> <p>- Artificial Intelligence (AI) - Continue to leverage joint Component investments to investigate concepts, methods, toolkits, software applications, and ideologies to provide/promote AI support/use for MCWL concept based experimentation. Overall investment amounts decrease due to augmentation and support from joint partners within the Department of Defense (DoD).</p> <p>FY 2023 Base Plans: Wargaming: - Continue to plan and execute executive agent responsibilities for the Marine Corps Title Ten Wargame, Expeditionary Warrior, as well as other wargames to examine Marine Corps capstone, operating, and functional concepts and explore assigned topics. Efforts provide high-level, diverse wargaming support that embrace both the scope of joint wargaming and experimentation. Tasks support the combat development process by helping</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>to develop and refine emerging concepts, conceptualize force design, and identify capabilities and deficiencies within future operating environments.</p> <ul style="list-style-type: none"> - Continue to enhance on-demand, qualitative, and quantitative modeling capability that executes in a collaborative environment. This is provided by state-of-the-art equipment to improve visualization and allow for seamless collaboration output during wargaming scenarios. <p>Emerging Threats and Opportunities:</p> <ul style="list-style-type: none"> - Continue to assess and analyze the future security environment; identify and analyze emerging threats; and develop and appraise promising concepts, opportunities and technologies. Efforts include performing as an internal Marine Corps think tank dedicated to developing new ideas and concepts. - Continue to support the full spectrum of combat development-related missions and tasks, to include the assessment of future threats and adversaries and associated geographic, environmental, economic, and demographic conditions that may influence the development of future warfighting concepts, experimentation, and required capabilities in the areas of Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLEPF). <p>Joint Concept Technology Demonstrations (JCTDs):</p> <ul style="list-style-type: none"> - Continue to monitor and contribute to approved efforts that address joint and combatant command warfighting needs through the execution and demonstration of prototypes within two to four years. - Complete efforts to provide kitted solutions to increase the survivability of expeditionary and permanent logistical support networks in an Anti-Access/Area Denial (A2/AD) environment. - Initiate experimentation and complete efforts to enable barges/vessels to serve as distributed resupply nodes in support of littoral operations. - Initiate explorations into joint efforts that supplement force design initiatives. <p>Exercise Support:</p> <ul style="list-style-type: none"> - Continue multi-year effort to enhance the ability of the Marine Air-Ground Task Force (MAGTF). Focus areas include demonstrations of an unmanned kill-chain utilizing Group I and II unmanned aerial vehicles (UASs) with Electro-Optic Infrared (EO/IR) payloads and laser target designators, aerial loitering munitions, and unmanned ground vehicles. <p>Innovation:</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>- Continue to develop/conduct/refine warfighter driven challenges to develop/identify prototypes and foster innovation within the Marine Corps. During this series of exercises industry, academia, and the Naval Research and Development Establishment (NR&NE) are invited to demonstrate emerging technology/engineering innovations that address priority Navy and Marine Corps missions.</p> <p>- Continue to reach out to the fleet and conduct capability wheel workshops in order to identify vital requirements for future development of the Expeditionary Advanced Base Operations (EABO) construct. Where applicable, integrate emergent technologies into experimental venues to access feasibility.</p> <p>Modeling, Simulation, and Analysis:</p> <p>- Continue to investigate/use emerging modeling and simulation (M&S) tools and techniques to provide analysis to support capability development activities. Provide M&S of naval operations with a focus on the Pacific Theater. Efforts include conducting comprehensive kill-chain assessment processes to evaluate current and future offensive capabilities against defensive counter-capabilities between the United States and a range of potential adversaries.</p> <p>- Continue to provide a broad range of independent, unique, and comprehensive analytical expertise to facilitate and evaluate experiments in various warfighting areas. This includes the planning, development, and execution of M&S as well as experimentation events.</p> <p>Experimentation Opposition Force:</p> <p>- Continue to demonstrate/hone the abilities of a live adversary force. Force provides a realistic, adaptive, and cohesive adversary as well as civilian environmental characteristics; thus strengthening experiment hypotheses and objectives.</p> <p>Artificial Intelligence (AI):</p> <p>- Continue to leverage joint Component investments to investigate concepts, methods, toolkits, software applications, and ideologies to provide/promote AI support/use for MCWL concept based experimentation.</p> <p>- Initiate investigations into changing service culture, making it more receptive of AI capabilities, and demonstrating how AI can make missions more effective and efficient. The aim is to reduce human processes and decrease resources and time for administrative tasks as well as demonstrating AI capabilities to garner service-wide acceptance.</p> <p>FY 2023 OCO Plans:</p>					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2297 / Futures Directorate

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A					
<i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> No significant changes from FY22 to FY23.					
Accomplishments/Planned Programs Subtotals	89.324	104.071	157.064	0.000	157.064

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy										Date: April 2022		
Appropriation/Budget Activity 1319 / 3					R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo				Project (Number/Name) 2958 / Cyberspace Activities			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
2958: <i>Cyberspace Activities</i>	0.000	4.635	4.752	4.800	-	4.800	5.000	5.099	5.201	5.305	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Project activity provides freedom of maneuver and influence in the cyber-electronic warfare domain while simultaneously denying the same to the adversary and protecting critical command systems. Technologies are being developed using a multi-disciplinary approach that combines Radio Frequency electronics, digital signal processing, computer engineering, software engineering, machine learning and data science to support Naval Expeditionary warfighters operating with size, weight and power constrained equipment in Disrupted, Intermittent, Limited environments. Areas of applied research include distributed precision time, predictive software defined radio architectures, coordinated Cyber and Spectrum maneuver to mitigate detection and exploitation, tactical Cyber visualization, discovering and mapping networks in dense urban environments, contextual awareness and blind channel characterization.

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Expeditionary Cyber	4.635	4.752	4.800	0.000	4.800
Articles:	-	-	-	-	-
FY 2022 Plans:					
-Continue cyber related research into mitigation techniques related to USMC systems					
-Continue research to better identify key cyber terrain at the physical, logical, and cyber persona layers that can be visualized at small unit level					
-Complete cyber related activities to improve the overall cyber protection strategy for deployed systems at the battalion level and below that feed into the Marine Air-Ground Task Force (MAGTF) Information Group Integrated Command Center					
-Initiate research to develop of RF enabled EW/cyber networking that will deliver actions at scale through the integration of secure orchestration, cyber secure sensors, distributed beamforming and resilient networking technologies					
-Initiate research into automating cyber analysis and testing tools to enable software developers and reverse engineers to reduce the time required to conduct vulnerability analysis and software testing tasks.					
FY 2023 Base Plans:					
Continue:					
- Continue cyber related research into mitigation techniques related to USMC systems					
- Continue research to better identify key cyber terrain at the physical, logical, and cyber persona layers that can be visualized at small unit level					

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 2958 / Cyberspace Activities

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

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
- Continue research to develop of RF enabled EW/cyber networking that will deliver actions at scale through the integration of secure orchestration, cyber secure sensors, and resilient networking technologies - Continue research into automating cyber analysis and testing tools to enable software developers and reverse engineers to reduce the time required to conduct vulnerability analysis and software testing tasks.					
<i>FY 2023 OCO Plans:</i> N/A					
<i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> There is no significant change from FY 2022 to FY 2023					
Accomplishments/Planned Programs Subtotals	4.635	4.752	4.800	0.000	4.800

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 9999 / Congressional Adds
--	---	---

COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
9999: <i>Congressional Adds</i>	0.000	45.951	73.100	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	119.051
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Congressional Interest Items not included in other Projects.

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

	FY 2021	FY 2022
<p>Congressional Add: Expeditionary Process, Exploitation, and Dissemination</p> <p>FY 2021 Accomplishments: Conducted advanced technology development in expeditionary process, exploitation, and dissemination.</p> <p>FY 2022 Plans: Conduct advanced technology development in expeditionary process, exploitation, and dissemination.</p>	4.827	4.000
<p>Congressional Add: Adaptive Threat Force Footprint</p> <p>FY 2021 Accomplishments: Sustained by the FY 2020 Congressional Enhancement, the Adaptive Threat Force (ATF) has proved itself as a valuable addition to live-force experiments as the Marine Corps moves forward with the concepts of Expeditionary Advanced Base Operations (EABO), Littoral Operations in a Contested Environment (LOCE), and Force Design 2030 (FD 2030). The ATF continues to participate in experiment design to ensure that peer threat capabilities and operational methodologies are incorporated into each experiment. The ATF also continues to train and equip a peer threat adversary force to oppose experiment forces as they develop EABO, LOCE and assess FD 2030. This increases the accuracy and reliability of the data and results obtained. The ATF is central to the ongoing Infantry Battalion 2030 (IBX30) series of experiments that conclude in FY 2022. The ATF will support experiments with the Marine Littoral Regiment (MLR) which will begin in FY 2022 and extend at least until FY 2024. Explorations will inform MLR requirements through imaginative and innovative methods to understand the potential challenges involved in their insertion, command and control viability, sustainment, and survivability. Due to the size of the anticipated forces involved in the MLR experiments, MCWL foresees an increased use of modeling and simulation (M&S) within the experiment plans. To support this the ATF is working to advance a simulation system and incorporate threat force current and</p>	5.792	0.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 9999 / Congressional Adds
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
emerging capabilities to ensure opponents within the simulation truly represent the identified opposition. MCWL envisions expanding the ATF capability in the area of M&S to meet these requirements. FY 2022 Plans: N/A		
Congressional Add: Ensure Defense and Operational Resilience for USMC Tactical Cyber & Spectrum Man FY 2021 Accomplishments: Developed a Reference System Manager. Integrate ENDOR application orchestrator with SOSA reference task manager. Investigate MORA MDM message. Develop distributed mission planning reference tool. Build ENDOR enabled sensor mounted nodes. FY 2022 Plans: N/A	9.654	0.000
Congressional Add: USMC Force Design - Closed Classified Wargaming Network and Naval Integration FY 2021 Accomplishments: The Marine Corps Warfighting Laboratory's (MCWL's) Wargaming Division is establishing a closed, classified wargaming network (WarNet) capability at secret and top secret levels to incorporate new software tools in support of USMC Service wargames. Efforts include further development of a multi-domain/multiplayer software solution to enable player immersion, visualization, and realistic computer assisted adjudication, as well as data generation for post-game analysis. Program leverages emerging cloud capabilities to extend the WarNet architecture to the Marine Expeditionary Forces (MEFs) and Marine Corps Force Pacific (MARFORPAC) to enable collaborative and distributed wargaming. In conjunction, this Congressional Enhancement also accelerates multi-level-security modeling, simulation, and analysis capacity and capability to develop Marine Corps Mission Engineering Threads into Operational Navy (OPNAV) Naval Capabilities Integrated Process (NCIP) efforts. In total, these efforts build necessary analytical and modeling and simulation (M&S) rigor to support Commandant of the Marine Corps (CMC) Force Design programmatic decision-making. FY 2022 Plans: N/A	0.965	0.000
Congressional Add: USMC Force Design - Organic Reconnaissance, Surveillance, and Target Acquisition FY 2021 Accomplishments: Current levels of Marine Expeditionary Forces (MEU)-organic Airborne Intelligence Surveillance, and Reconnaissance (ISR)/Reconnaissance, Surveillance, and Target Acquisition (RSTA) are inadequate to meet demands and inflexible to meet operational constructs like Expeditionary Advanced Base Operations (EABO) and Littoral Operations in a Contested Environment (LOCE). Efforts support MEU operations with an advanced technology vertical take-off-and-landing (VTOL) unmanned aerial system (UAS) ISR platform to inform requirements towards Initial Operating Capability (IOC) of a replacement maritime MEU ISR platform	4.344	0.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022	
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 9999 / Congressional Adds	
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	
which will operationalize new Commandant of the Marine Corps (CMC) Force Design capabilities for EABO/ LOCE. <i>FY 2022 Plans:</i> N/A			
Congressional Add: Marine Corps force Design Acceleration - Project Artemis <i>FY 2021 Accomplishments:</i> Using rapid prototyping, Project Artemis outfits the Marine Corps' experimental Marine Littoral Regiment (MLR) with a cohesive set of next generation equipment. Project Artemis modernizes Marine Corps infantry squads with emerging and disruptive technologies in order to develop joint tactics, techniques, and procedures (TTPs) through an extended user evaluation - equipping six Marine Corps Rifle Squads (two rifle platoons) and supporting company headquarters with the latest technological advances in squad lethality. Efforts build the capabilities of "stand-in" forces in accordance with Commandant of the Marine Corps (CMC) Force Design 2030, by developing Manned-Unmanned Teaming (MUM-T) and next generation communication systems TTPs for the infantry squad. Program develops a family of common controllers for current and future weaponized and ISR unmanned ground and air vehicles (UGVs and UAVs), as well as outfits three squads with individual voice mesh network radios and surrogate heads-up displays. <i>FY 2022 Plans:</i> N/A	10.715	0.000	
Congressional Add: Marine Corps Mission Support Station Demonstration <i>FY 2021 Accomplishments:</i> Conduct advanced technology development in Marine Corps Mission Support Station Demonstration. <i>FY 2022 Plans:</i> N/A	9.654	0.000	
Congressional Add: Advanced mission planning system SBIR technology insertion <i>FY 2021 Accomplishments:</i> N/A <i>FY 2022 Plans:</i> Conduct technology development supporting advanced mission planning system SBIR technology insertion	0.000	5.000	
Congressional Add: Data analysis and sharing augmentation <i>FY 2021 Accomplishments:</i> N/A <i>FY 2022 Plans:</i> Conduct data analysis and sharing augmentation technology development	0.000	2.000	
Congressional Add: Low-cost atrittable aircraft technology	0.000	25.000	

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 9999 / Congressional Adds
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
FY 2021 Accomplishments: N/A		
FY 2022 Plans: Pursue demonstration and experimentation with the tactical and operational alternative uses of highly autonomous, low-cost unmanned aircraft in an operationally representative environment while simultaneously developing the requisite: concepts of employment (CONEMPS), concepts of operation (CONOPS), Tactics, Techniques, Procedures (TTP), and logistics requirements. Pursuits will utilize an unmanned aerial vehicle (UAV) that is runway independent and designed for operations from both austere and improved operations. Efforts are follow-on to an Air Force developmental program.		
Congressional Add: Adaptive future force	0.000	8.000
FY 2021 Accomplishments: N/A		
FY 2022 Plans: Conduct advance technology development supporting adaptive future force		
Congressional Add: AI-powered tactical ISR	0.000	5.100
FY 2021 Accomplishments: N/A		
FY 2022 Plans: In response to small drones proliferating on the battlefield, pursue the generation of real-time two-dimensional (2D) maps, near-real-time three-dimensional (3D) models, and analytical layers on handheld devices with no network connectivity required. Software development investigations (interoperable with existing Group 1 - 5 unmanned aerial systems (UASs) imaging payloads) are anticipated to drastically improve individual soldier's capabilities without the need to test and field new drone or mobile device hardware. Efforts are in concert with a similar FY 2022 Army Congressional enhancement.		
Congressional Add: Expeditionary mission support	0.000	10.000
FY 2021 Accomplishments: N/A		
FY 2022 Plans: Conduct technology development supporting expeditionary mission support objectives		
Congressional Add: Platform agnostic weapons system	0.000	5.000
FY 2021 Accomplishments: N/A		
FY 2022 Plans: Platform agnostic weapons system technology development		
Congressional Add: Stand-off security inspection and surveillance system	0.000	9.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy	Date: April 2022
--	-------------------------

Appropriation/Budget Activity 1319 / 3	R-1 Program Element (Number/Name) PE 0603640M / MC Advanced Technology Demo	Project (Number/Name) 9999 / Congressional Adds
--	---	---

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022
<i>FY 2021 Accomplishments:</i> N/A		
<i>FY 2022 Plans:</i> Conduct stand-off security inspection and surveillance system technology development		
Congressional Adds Subtotals	45.951	73.100

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

N/A

Remarks

D. Acquisition Strategy

N/A