Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Navy											Date: February 2015	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603640M *I MC Advanced Technology Demo*							
COST ($ in Millions)	**Prior Years**	**FY 2014**	**FY 2015**	**FY 2016 Base**	**FY 2016 OCO**	**FY 2016 Total**	**FY 2017**	**FY 2018**	**FY 2019**	**FY 2020**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	128.772	128.320	137.562	-	137.562	140.416	142.407	142.368	142.368	Continuing	Continuing
2223: *Marine Corps ATD*	0.000	86.606	85.605	91.450	-	91.450	93.355	94.664	94.925	93.976	Continuing	Continuing
2297: *Futures Directorate*	0.000	42.166	42.715	46.112	-	46.112	47.061	47.743	47.443	48.392	Continuing	Continuing

A. Mission Description and Budget Item Justification

The efforts described in this Program Element (PE) are based on investment directions as defined in the Naval Science and Technology (S&T) Strategic Plan approved by the S&T Corporate Board (June 2012). This strategy is based on needs and capabilities from Navy and Marine Corps guidance and input from the Naval Research Enterprise (NRE) stakeholders (including the Naval enterprises, the combatant commands, the Chief of Naval Operations (CNO), and Headquarters Marine Corps)to include specific Marine Corps objectives defined by the USMC S&T Strategic Plan. It provides the vision and key objectives for the essential S&T efforts that will enable the continued supremacy of United States Naval forces in the 21st century. The Strategy focuses and aligns Naval S&T with Naval missions and future capability needs that address the complex challenges presented by both rising peer competitors and irregular/asymmetric warfare. It also directly supports Expeditionary Force 21 (EF 21), which is now the Marine Corps' capstone concept that establishes the vision and goals for USMC S&T over the next 10 years and provides a plan for guiding the design and development of the future force. One third of the Marine Corps operating forces will be forward deployed. These forces will be task-organized into a greater variety of formations, capable of operating from a more diverse array of ships dispersed over wider areas, in order to meet the Combatant Commanders' security cooperation and partner engagement requirements. In the event of crises, those forces will be able to composite these distributed formations into larger, cohesive naval formations. This presents both challenges and opportunities for USMC S&T. Expeditionary Force 21 will inform future decisions regarding how the Marine Corps will adjust organizational structure to exploit the value of regionally focused forces. A fixed geographic orientation will facilitate Marine Commanders and their staffs with more frequent interactions with theater- and component-level organizations, establishing professional bonds and a shared sense of the area's challenges and opportunities. Expeditionary Force 21 provides the basis for future Navy and Marine Corps capability development to meet the challenges of the 21st Century. The vision for Expeditionary Force 21 is to provide guidance for how the Marine Corps will be postured, organized, trained, and equipped to fulfill the responsibilities and missions required around the world. Through Expeditionary Force 21, the Marine Corps intends to operate from the sea and provide the right sized force in the right place, at the right time.

As a key component of naval expeditionary forces, the Marine Corps has unique and technologically stressing requirements because of its expeditionary mission and intensive operational tempo, Marine Air-Ground Task Force (MAGTF) structure, and conduct of maneuver warfare. Critical requirements in this PE are: Command, Control, Communications, Computers (C4); Intelligence, Surveillance, and Reconnaissance (ISR); maneuver techniques and means; force protection; logistic sustainment; human performance, training and education; and firepower. There are ongoing actions to develop and demonstrate advanced technologies and concepts in operational environments. Joint service efforts are aligned with Defense Technology Objectives and Joint Warfighting Capability Objectives. In addition, there is funding for experimentation in warfighting concepts as well as operational assessment of emerging technologies, to include technical support of operating forces to assess military utility of selected technologies. This PE specifically supports: continued development of enhanced warfighting capabilities through field experiments with Marine operating forces; rapid response to low-, mid-, and high-intensity conflicts as well as methods for countering irregular threats; and expansion of seabasing and naval force packaging capabilities. The investment directly assists in fulfilling the forward presence requirements of Sea Shield and the transformational capabilities prescribed

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by Sea Strike. The Future Naval Capability (FNC) process is supported and funds are programmed accordingly. This PE is largely focused on demonstration of products and capabilities from the knowledge base and Discovery and Invention (D&I) phases of Naval S&T. As Naval partners, the Navy and Marine Corps S&T Team strive to transition technologies that will implement objectives outlined in the Naval Operations Concept. This PE also funds technical solutions designed to increase Naval force capability, such as the Naval Expeditionary Combat Command. Investments in S&T provide the opportunities for future capabilities and will prevent technological surprise. The PE as a whole will advance the amphibious and expeditionary capabilities for the Combatant Commanders. The Marine Corps Service Campaign Plan (MCSCP) is the lens through which USMC S&T priorities are acted upon in order to support the future development of the Total Force.

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

B. Program Change Summary ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Previous President's Budget	132.336	128.397	137.562	-	137.562
Current President's Budget	128.772	128.320	137.562	-	137.562
Total Adjustments	-3.564	-0.077	-	-	-
• Congressional General Reductions	-	-0.077			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-3.564	-			

Change Summary Explanation

Technical: Not applicable.

Schedule: Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy			Date: February 2015
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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
2223: *Marine Corps ATD*	-	86.606	85.605	91.450	-	91.450	93.355	94.664	94.925	93.976	Continuing	Continuing

A. Mission Description and Budget Item Justification

Critical Marine Corps requirements/imperatives addressed in this Project are: Maneuver; Force Protection; Human Performance, Training and Education; Logistics; Command, Control, Communications and Computers (C4); Intelligence, Surveillance and Reconnaissance (ISR) and Firepower. These are ongoing efforts to develop and demonstrate advanced technologies and system concepts in an operational environment. Multiple transitions into the Sub-system/Component Advanced Development Phase are planned, as well as fieldable prototyped to reduce risk in System Concept Development and Demonstration. A tactically effective Mine Countermeasures (MCM) capability is vital to Force Protection and necessary if Maneuver on land is to become a functional component of Naval Expeditionary Maneuver Warfare. Maneuver, supported by MCM provides synchronization and speed of detection, breaching, clearance, proofing, and marking operations. This project supports: 1) engaging regional forces in decisive combat on a global basis; 2) responding to all other contingencies and missions in the full spectrum of combat operations (high, middle, and low intensity), in Military Operations in Urban Terrain (MOUT), and in Operations other than War (OOTW); and 3) warfighting experimentation. By providing the technologies to enable these capabilities, this project supports the goals and objectives of the Strike, Littoral Warfare and Surveillance Joint Mission Areas. These are ongoing efforts to develop and demonstrate advanced technologies and system concepts in an operational environment.

In addition, this project supports the goals and objectives of the Littoral Combat/Power Projection related Enabling Capability (EC) within the Future Naval Capabilities (FNC) portfolio. The focus of the EC within this PE is technology related to Urban, Asymmetric, and Expeditionary Operations (UAEO). The UAEO Capability Gap is a science and technology developmental area that is of the highest importance to Marine Corps operations in Iraq and Afghanistan and is one of the highest ranked Capability Gaps prioritized by the Chief of Naval Operations and the Marine Corps Combat Development Command (MCCDC). The UAEO technology gap is being pursued as part of an overall effort that addresses the Sea Strike Capability Gap.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS (C4)	5.981	6.266	6.374	-	6.374
Description: This activity integrates and demonstrates enhanced communications and situational awareness in warfighting environments and communication and situational awareness technologies for near term USMC operations. The focus is on development and leveraging advanced C4 technologies to enable enhanced Distributed Operations, Irregular Warfare, and Marine Corps Expeditionary Warfare. Specifically, the C4 Thrust intends to demonstrate markedly improved capabilities in over-the-horizon (OTH), beyond line-of-sight, and restricted environment communications; mobile networking; tactical decision making; tactical situational awareness; and small unit position location and navigation. Advanced technology resources will be applied to complement commercial, other service, and defense agency investments to produce a technology base to address identified Marine Corps technology gaps.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
FY 2014 Accomplishments: - Continued urban navigation with limited Global Positioning System availability demonstrations. - Continued demonstrations of improved urban communications capabilities. - Continued developing tailored tactical Human to Machine Interfaces aligned to primary operational functions and non-intrusive within the battlespace. - Continued creating services for the tactical network that are fully operable with DCGS and the DCGS Integration Backbone. - Continued Application-Network Architectures, Conformal Antenna Integration and Demonstration Spiral 2 and C3 for the Individual Marine Spiral Two. - Continued Application Network Architecture (reprioritized from FY11) and Automated Small Unit Decision Tools. - Continued Advanced Communications Systems and Small Unit C3. - Continued creating a service oriented sensor network for expeditionary forces' current and future tactical sensors. - Initiated smart radio efforts. ***FY 2015 Plans:*** - Continued all efforts from FY2014, except those noted as completed. - Continue urban navigation with limited Global Positioning System availability demonstrations. - Continue demonstrations of improved urban communications capabilities. - Continue developing tailored tactical Human to Machine Interfaces aligned to primary operational functions and non-intrusive within the battlespace. - Continue creating services for the tactical network that are fully operable with DCGS and the DCGS Integration Backbone. - Continue Application-Network Architectures, Conformal Antenna Integration and Demonstration Spiral 2 and C3 for the Individual Marine Spiral Two. - Continue Application Network Architecture (reprioritized from FY11) and Automated Small Unit Decision Tools. - Continue Advanced Communications Systems and Small Unit C3. - Continue smart radio efforts. - Complete creating a service oriented sensor network for expeditionary forces' current and future tactical sensors. - Initiate Tactical Cyber Warfare. - Initiate mobile security.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate Networking On-The-Move Technology insertion. ***FY 2016 Base Plans:*** - Continue urban navigation with limited Global Positioning System availability demonstrations. - Continue demonstrations of improved urban communications capabilities. - Continue developing tailored tactical Human to Machine Interfaces aligned to primary operational functions and non-intrusive within the battlespace. - Continue creating services for the tactical network that are fully operable with DCGS and the DCGS Integration Backbone. - Continue Application-Network Architectures, Conformal Antenna Integration and Demonstration Spiral 2 and C3 for the Individual Marine Spiral Two. - Continue Application Network Architecture (reprioritized from FY11) and Automated Small Unit Decision Tools. - Continue Advanced Communications Systems and Small Unit C3. - Continue Tactical Cyber Warfare. - Continue smart radio efforts. - Continue Networking On-The-Move Technology insertion. - Complete mobile security. - Initiate MAGTF C2 Technology insertion. ***FY 2016 OCO Plans:*** N/A					
Title: FIREPOWER ***Description:*** This activity develops technology for application on current and future expeditionary weapons and elements of the kill chain. It includes, but is not limited to, the following technologies: fuze, fire control, launch/ propulsion, lethality, and accuracy. ***FY 2014 Accomplishments:*** - Continued development of targeting and engagement technologies for distributed operations collaborative fires integration and demonstrations. - Continued design, development, prototyping and testing of lightweight technologies that provide individual Marines enhanced capabilities to detect and identify man-size targets out to at least the maximum effective range of their personal weapons during all conditions (daylight, limited visibility, & darkness) by integrating multiple capabilities into a single system.	8.795	9.205	9.365	-	9.365

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continued scalable effects conventional warhead concept development. - Continued improved mortar munition integration and demonstrations. - Continued Flight Control Kinematic Unit effort (effort renamed Flight Control Mortar). Design & develop technology that provides guidance, navigation, and controls (GNC) to 81mm mortar rounds to enable trajectory shaping in urban environment to precisely & accurately strike specific targets. - Continued Non-Magnetic Azimuth Sensing (NMAS previously identified as completed in PB 2011). - Continued development of Miniature Urban Missile, leveraging technology from MEMS, designation, guidance and control, and warhead design, to develop a shoulder launched missile capable of defeating a variety of targets. - Continued development of precision 60mm mortar system, to demonstrate increased precision, range, and lethality in a light mortar, providing indirect fire support through projectile flight trajectory shaping. - Completed Exploitation and Development (E&D) portion of Non-Magnetic Azimuth Sensing (NMAS), with transition of mature technologies to newly initiated PE 0602750N Azimuth and Inertial Micro-electromechanical System (MEMS) Navigation System (AIM) to develop low cost, precision, inertial navigation systems for use in highly accurate handheld targeting systems, shoulder launched missiles, and munitions. - Completed development, prototyping, and testing of lightweight technologies that provide individual Marine enhanced capabilities to detect and identify man-size targets out to maximum effective ranges of individual weapons during all visibility conditions (daylight, limited visibility, and darkness) by integrating multiple capabilities into a single system. - Initiated E&D portion of Awareness for Lightweight Engagements and Remote Targeting (ALERT) to develop large aperture, lightweight lens with enhanced fields of view. - Initiated E&D portion of Semi-Autonomous Fires Technology (SAFT) to develop semi-autonomous fire control systems for use in next generation remote weapons systems, to enhance performance and minimize gunner/ operator burden. - Initiated Weapons Spectral Signature Characterization and Mitigation (WSSCM) to develop pigments, dyes, and polymers to mitigate Short Wave Infrared (SWIR) signature for weapons systems applications. ***FY 2015 Plans:*** - Continued all efforts from FY2014, except those noted as completed. - Continue development of targeting and engagement technologies for distributed operations collaborative fires integration and demonstrations. - Continue design, development, prototyping and testing of lightweight technologies that provide individual Marines enhanced capabilities to detect and identify man-size targets out to at least the maximum effective					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
range of their personal weapons during all conditions (daylight, limited visibility, & darkness) by integrating multiple capabilities into a single system. - Continue E&D portion of Awareness for Lightweight Engagements and Remote Targeting (ALERT) to develop large aperture, lightweight lens with enhanced fields of view. - Continue E&D portion of Semi-Autonomous Fires Technology (SAFT) to develop semi-autonomous fire control systems for use in next generation remote weapons systems, to enhance performance and minimize gunner/ operator burden. - Complete scalable effects conventional warhead concept development. - Complete improved mortar munition integration and demonstrations. - Complete Flight Control Kinematic Unit effort (effort renamed Flight Control Mortar). Design & develop technology that provides guidance, navigation, and controls (GNC) to 81mm mortar rounds to enable trajectory shaping in urban environment to precisely & accurately strike specific targets. - Complete Non-Magnetic Azimuth Sensing (NMAS previously identified as completed in PB 2011) technology. - Complete development of Miniature Urban Missile, leveraging technology from MEMS, designation, guidance and control, and warhead design, to develop a shoulder launched missile capable of defeating a variety of targets. - Complete development of precision 60mm mortar system, to demonstrate increased precision, range, and lethality in a light mortar, providing indirect fire support through projectile flight trajectory shaping. - Complete Weapons Spectral Signature Characterization and Mitigation (WSSCM) to develop pigments, dyes, and polymers to mitigate Short Wave Infrared (SWIR) signature for weapons systems applications. - Initiate investigation of the scalability of variable effects conventional munitions, gun, and propulsion technologies for improving firepower effectiveness while increasing affordability and decreasing logistics burden in support of expeditionary warfare. - Initiate development of precision fires engagement technologies, to include trajectory shaped 81mm mortars, 83mm missiles, and smaller precision munitions.					
FY 2016 Base Plans: - Continue development of targeting and engagement technologies for distributed operations collaborative fires integration and demonstrations. - Continue design, development, prototyping and testing of lightweight technologies that provide individual Marines enhanced capabilities to detect and identify man-size targets out to at least the maximum effective range of their personal weapons during all conditions (daylight, limited visibility, & darkness) by integrating multiple capabilities into a single system.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continue E&D portion of Awareness for Lightweight Engagements and Remote Targeting (ALERT) to develop large aperture, lightweight lens with enhanced fields of view. - Continue E&D portion of Semi-Autonomous Fires Technology (SAF-T) to develop semi-autonomous fire control systems for use in next generation remote weapons systems, to enhance performance and minimize gunner/ operator burden. - Continue investigation of the scalability of variable effects conventional munitions, gun, and propulsion technologies for improving firepower effectiveness while increasing affordability and decreasing logistics burden in support of expeditionary warfare. - Continue development of precision fires engagement technologies, to include trajectory shaped 81mm mortars, 83mm missiles, and smaller precision munitions. - Initiate High-Reliability Dual Purpose Improved Conventional Munitions (DPICM) Replacement (HRDR) to integrate high-reliability sub-munitions fuzing technologies. ***FY 2016 OCO Plans:*** N/A					
Title: FORCE PROTECTION ***Description:*** This activity supports the Force Protection Thrust's Advanced Technology Demonstration efforts in the areas of individual Marine platforms, equipment and autonomous systems. This includes technologies to enable detection, neutralization, breaching, and clearing of explosive hazards from the beach exit to inland objectives. Efforts supported under Force Protection also include the demonstration of technologies such as Air Defense/Counter Rocket, Artillery, and Mortar (CRAM) and counter tactical surveillance and targeting, including pre-shot sniper detection, technologies in support of maneuver warfare, small unit distributed operations, and technologies for improved Personnel Protective Equipment for individual protection against blast, ballistic, and blunt impact threats. ***FY 2014 Accomplishments:*** - Continued development of technologies to defeat side/top attack and advanced fuze mines through signature reduction and advanced signature duplication. - Continued development of technologies to locate and defeat IEDs. - Continued development of technologies to defeat advanced mine fuzes (seismic, acoustic, and infrared). - Continued Anti-Tank Guided Missile (ATGM) effort to defeat ATGMs in complex urban environment. - Continued Warfighter modeling and simulation efforts for the Warfighter-as-a-System analysis approach and methodology combining survivability, mobility, and warfighter performance parameters.	9.233	9.595	9.838	-	9.838

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continued the development of detecting and locating sniper weapons using the return of their unique radar signatures. - Continued the development of automated human detection via spectral imaging during low-light level operation conditions (e.g. dusk/dawn/moonlit/starlit night). - Continued fusion of technologies that will detect and classify optics (sniper scopes, ccds, eyeball, etc) from a moving platform. - Continued the demonstration of the feasibility of a deployable mission package consisting of technologies capable of screening multiple individuals rapidly over a wide area to detect, classify and track suicide bombers at relevant distances within a critical time frame for action. - Continued demonstration of laser technology readiness for battlefield employment. - Completed technology development programs to address force protection capability gaps. - Completed new Explosives Hazard Defeat to address the Suicide-Bomber threat. This effort will combine multiple sensor modalities, analysis algorithms, and data fusion to demonstrate high Pd, low FAR detection of suicide bombers from standoff distances from multiple aspect angles. - Completed the Urgent Theater Warfighting Requirement for countering Improvised Explosive Devices (IED) and vehicle bourne IED. - Completed high-power solid state source development for IED neutralization. - Completed vulnerability assessment of threat targeting sensors to directed energy. - Completed development and evaluation of landmine detection utilizing ground penetrating radar from an airborne platform. - Completed efforts to neutralize incoming rocket, artillery, and mortar threats via non-kinetic means. - Completed development and evaluation of landmine detection utilizing synthetic aperture radar from an airborne platform. - Completed to develop and demonstrate technologies that will detect RPGs and ATGMs prior to launch and countermeasures after launch. - Completed efforts to detect IEDs using radio frequency sources. - Initiated physics-based characterization of signatures of proud/buried targets/EH Indicators across the spectrum of applicable detection modalities using knowledge/investigation of target physics. - Initiated a program to demonstrate the fusion of multiple modes of detection of explosive hazards into a single system. - Initiated development of advance modular and scalable personal protective equipment utilizing advances in mobility/survivability modeling and simulation, materials, and bio-fidelic surrogates.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiated development of materials and helmet systems that absorb/dissipate blast shock waves.					
FY 2015 Plans: - Continued all efforts from FY2014, except those noted as completed. - Continue development of technologies to defeat side/top attack and advanced fuze mines through signature reduction and advanced signature duplication. - Continue development of technologies to locate and defeat IEDs. - Continue development of technologies to defeat advanced mine fuzes (seismic, acoustic, and infrared). - Continue Anti-Tank Guided Missile (ATGM) effort to defeat ATGMs in complex urban environment. - Continue Warfighter modeling and simulation efforts for the Warfighter-as-a-System analysis approach and methodology combining survivability, mobility, and warfighter performance parameters. - Continue demonstration of laser technology readiness for battlefield employment. - Continue physics-based characterization of signatures of proud/buried targets/explosive hazard indicators across the spectrum of applicable detection modalities using knowledge/investigation of target physics. - Continue a program to demonstrate the fusion of multiple modes of detection of explosive hazards into a single system. - Continue development of advance modular and scalable personal protective equipment utilizing advances in mobility/survivability modeling and simulation, materials, and bio-fidelic surrogates. - Continue development of materials and helmet systems that absorb/dissipate blast shock waves - Complete the demonstration of the feasibility of a deployable mission package consisting of technologies capable of screening multiple individuals rapidly over a wide area to detect, classify and track suicide bombers at relevant distances within a critical time frame for action. - Complete the development of detecting and locating sniper weapons using the return of their unique radar signatures. - Complete fusion of technologies that will detect and classify optics (sniper scopes, ccds, eyeball, etc) from a moving platform. - Complete the development of automated human detection via spectral imaging during low-light level operation conditions (e.g. dusk/dawn/moonlit/starlit night). - Initiate an integrated technology demonstration to develop a system of systems that addresses route reconnaissance and clearance for a MEU. - Initiate a project to develop organic technology solutions for the detection and clearance of explosive hazards and obstacles encountered by Marine Corps forces during amphibious operations.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate a project to investigate the detection and neutralization of explosive hazards in multiple, diverse, environments - Initiate a program to fuse multiple technologies that will detect and classify tactical surveillance and targeting threats before engagement from a moving platform. - Initiate projects to develop Personnel Protection Equipment (PPE) through novel Modular, Tailorable and scalable design concepts which increase survivability and operational suitability to the warfighter. - Initiate broad based material (ceramics, fiber and Fiber Re-Enforced Plastics) to demonstrate the possibility of significant weight reductions (greater than 50%) can be achieved.					
FY 2016 Base Plans: - Continue development of technologies to defeat side/top attack and advanced fuze mines through signature reduction and advanced signature duplication. - Continue development of technologies to locate and defeat IEDs. - Continue development of technologies to defeat advanced mine fuzes (seismic, acoustic, and infrared). - Continue an integrated technology demonstration to develop a system of systems that addresses route reconnaissance and clearance for a MEU. - Continue a project to develop organic technology solutions for the detection and clearance of explosive hazards and obstacles encountered by Marine Corps forces during amphibious operations. - Continue a project to investigate the detection and neutralization of explosive hazards in multiple, diverse, environments. - Continue physics-based characterization of signatures of proud/buried targets/explosive hazard indicators across the spectrum of applicable detection modalities using knowledge/investigation of target physics. - Continue a program to demonstrate the fusion of multiple modes of detection of explosive hazards into a single system. - Continue a program to fuse multiple technologies that will detect and classify tactical surveillance and targeting threats before engagement from a moving platform. - Continue Warfighter modeling and simulation efforts for the Warfighter-as-a-System analysis approach and methodology combining survivability, mobility, and warfighter performance parameters. - Continue demonstration of laser technology readiness for battlefield employment. - Continue development of advance modular and scalable personal protective equipment utilizing advances in mobility/survivability modeling and simulation, materials, and bio-fidelic surrogates. - Continue development of materials and helmet systems that absorb/dissipate blast shock waves					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continue projects to develop Personnel Protection Equipment (PPE) through novel Modular, Tailorable and scalable design concepts which increase survivability and operational suitability to the warfighter. - Continue broad based material (ceramics, fiber and Fiber Re-Enforced Plastics) to demonstrate the possibility of significant weight reductions (greater than 50%) can be achieved. - Complete Anti-Tank Guided Missile (ATGM) effort to defeat ATGMs in complex urban environment. -Initiate an advanced technology demonstration for modular mission packages for the detection, neutralization, marking and reporting of explosive hazards using multiple, existing vehicles in movement to contact and amphibious raid scenarios. - Initiate an advanced technology demonstration for autonomous vehicles in the detection, neutralization, marking and reporting of explosive hazards using multiple, existing vehicles in movement to contact and amphibious raid scenarios. - Initiate an advanced technology demonstration that detect and classify tactical surveillance and targeting threats before engagement from a moving platform. ***FY 2016 OCO Plans:*** N/A					
Title: HUMAN PERFORMANCE, TRAINING & EDUCATION	11.877	12.538	12.767	-	12.767
Description: This activity addresses the applied research effort of the Human Performance Training and Education thrust (HPT&E). The HPT&E thrust investment profile is directed at two technology investment areas, Warrior Resilience, and Decision Making and Expertise Development. The funding aligned to Warrior Resilience is focused on advanced training technologies and methodologies that enhance neural, cognitive, and physical readiness. Those funds aligned to Decision Making and Expertise Development refers to training and education technologies and methodologies that accelerate the development and improve the retention of skills in decision making, situation awareness, and individual and team adaptability and coordination on decentralized, dynamic and dispersed battlefields. ***FY 2014 Accomplishments:*** - Continued team immersive language and cultural learning in simulation environments. - Continued development of physical conditioning assessment and training optimization methods to improve warfighter performance (previous efforts related to physical conditioning impacts on combat readiness resourced by PE 0602131M). - Continued mobile field technologies for predicting readiness and performance into more advanced development and demonstration of utility.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continued development of technologies and methodologies for integrated mental skills resilience training (previous efforts neural mechanisms of mental skills resilience). - Completed development of "Warfighter as a System" modeling tools. (Effort renamed to Enhancing warfighter psycho-physical performance). - Completed development of adaptive experiential learning tools for Distributed Operations Training. (Effort renamed to Real-time adaptive training environments). - Completed evaluations and validations of applications geared towards peak neural and cognitive performance-in distributed operations. - Completed efforts to apply learning theories for language and culture training. - Completed development of early prototype systems for Human Performance and Training efforts (Cognitive and physical enhancement, modeling and simulation, and virtual reality and mixed reality squad level training in support of Distributed Operations). - Completed classroom/field testing of learning theories extended to complex tasks for a range of expertise levels; training mitigation strategies triggered by neurophysiological markers of learning, cognition and expertise; and principles of expertise development on a continuum of novice to expert. (Rename effort Algorithms Physiologically-derived to Promote Learning Efficiency (APPLE)). - Completed field evaluations of training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise. - Completed development of an autonomous robotic adversarial target system to extend simulation marksmanship training to live-fire ranges with the use of robotic targets (all-terrain, mobile, tactical, return fire) and integrate with simulation feedback and scoring for transition to Marine Corps Systems Command (PM-Training Systems). - Completed evaluation of neurological symptoms of performance at altitude to reduce the incidences of acute mountain sickness (AMS). - Completed development and demonstrate immersive training communication analysis systems to support instructor assessment of infantry units. - Completed development of sleep deprivation mitigations (phase II) to enhance warfighter performance during extended operations (initial phase completed in FY10). - Completed development of technologies supporting peak cognitive performance of warfighters. - Completed the demonstration of the utility of using Tyrosine supplementation for reducing stress in irregular warfare, asymmetric environments. - Completed the development of the utility of analyzing neural mechanisms for affecting mental skills resilience. - Completed the development of Integrated Models for Warfighter Performance Enhancement.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Completed development of applied training technologies for Squad Immersive Training Environments (SITE). - Completed the demonstration of the utility of Integrated Learning Management System (LMS). - Completed the assessment and validation of an injury prevention methodology for use in-theater (CoRE). - Completed effectiveness and validation studies of Advanced Mobile Field Assessment and Readiness Technologies to improve the capability to assess situational awareness in the field and predict physical performance by developing mobile and rugged tools, algorithms, and models. - Completed research into heat stress mitigations for the individual Warfighter, and develop intervention strategies to improve performance in hot environments. - Initiated the development of small-unit training for adaptability and resiliency in decision making (STAR-DM), to enhance the Marine Air Ground Task Force's capabilities by training and equipping small-unit leaders to handle the demanding complexities and possess the adaptive mindset necessary to operate across the spectrum of conflict; empowering our strategic corporals as well as all of our junior leaders to fight, operate, and win in this challenging security environment. - Initiated the development of rapid auto cognitive task analysis (AutoCTA), to address the problems associated with accurately determining training system requirements, to develop a standardized, theory driven and JCIDS aligned, rapid CTA technique for extracting knowledge from experts and efficiently modeling tasks. - Initiated development of technology to improve the transfer and maintenance of resilience training in the Marine Corps, to include measures of climate for Warfighter resilience, and small unit leader and team member training to enhance climate resilience, social support, and relapse prevention modules for deployment.					
FY 2015 Plans: - Continued all efforts from FY2014, except those noted as completed. - Continue the development of small-unit training for adaptability and resiliency in decision making (SUDM), to enhance the Marine Air Ground Task Force's capabilities by training and equipping small-unit leaders to handle the demanding complexities and possess the adaptive mindset necessary to operate across the spectrum of conflict; empowering our strategic corporals as well as all of our junior leaders to fight, operate, and win in this challenging security environment. (previous efforts related to SUDM resourced by PE 0602131M). - Complete team immersive language and cultural learning in simulation environments. - Complete development of physical conditioning assessment and training optimization methods to improve warfighter performance (previous efforts related to physical conditioning impacts on combat readiness resourced by PE 0602131M). - Complete mobile field technologies for predicting readiness and performance into more advanced development and demonstration of utility.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Complete development of technologies and methodologies for integrated mental skills resilience training (previous efforts neural mechanisms of mental skills resilience). - Complete the development of rapid auto cognitive task analysis(AutoCTA), to address the problems associated with accurately determining training system requirements, to develop a standardized, theory driven and JCIDS aligned, rapid CTA technique for extracting knowledge from experts and efficiently modeling tasks. - Complete development of technology to improve the transfer and maintenance of resilience training in the Marine Corps, to include measures of climate for Warfighter resilience, and small unit leader and team member training to enhance climate resilience, social support, and relapse prevention modules for deployment. - Complete development of better enhanced simulation and training (BEST) by applying a dynamic tailoring framework to create adaptive training. This effort initiated in FY 2014 due to urgent operational requirements. - Initiate design and development of a Marine augmented classroom environment (ACE) that will enhance instructors' teaching performance and student learning outcomes. This effort initiated in FY 2014 due to operational requirements. - Initiate design and development of a test-bed and conduct The Basic School evaluation to test the efficacy of simulation based training in that curriculum. This effort initiated in FY 2014 due to urgent operational requirements. - Initiate development and demonstrate an agent-based surrogate instructor development environment (ASIDE) to allow USMC to field small-team focused intelligent training solutions. This effort initiated in FY 2014 due to operational requirements. - Initiate development of training to optimize the use of resilience skills (TOURS), specifically develop and iterate training modules for relapse prevention, deployable refresher training, supports for transfer climate and social support for small unit leaders. This effort initiated in FY 2014 due to operational requirements. - Initiate development of an individualized fatigue countermeasure training tool for Marines that will provide increased fatigue resilience training effectiveness, improved fatigue management and reduced fatigue-related operational errors. This effort initiated in FY 2014 due to operational requirements. - Initiate development of a master instructor development system (MIND) which will provide measurement framework to support the development of master instructors by creating a developmental model of instructor mastery. This effort initiated in FY 2014 due to operational requirements. - Initiate design and development of methods for establishing optimal training intervals for the Marine Corps Martial Arts Program (MCMAP) for improvement in physical performance and warrior mindset. This effort initiated in FY 2014 due to operational requirements.					
FY 2016 Base Plans:					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continue the development of small-unit training for adaptability and resiliency in decision making (SUDM), to enhance the Marine Air Ground Task Force's capabilities by training and equipping small-unit leaders to handle the demanding complexities and possess the adaptive mindset necessary to operate across the spectrum of conflict; empowering our strategic corporals as well as all of our junior leaders to fight, operate, and win in this challenging security environment(previous efforts related to SUDM resourced by PE 0602131M). - Continue development of a master instructor development system (MIND) which will provide measurement framework to support the development of master instructors by creating a developmental model of instructor mastery. - Continue design and development of a test-bed and conduct The Basic School evaluation to test the efficacy of simulation based training in that curriculum. - Continue development and demonstrate an agent-based surrogate instructor development environment (ASIDE) to allow USMC to field small-team focused intelligent training solutions. This effort initiated in FY 2013 due to operational requirements. - Continue development of an individualized fatigue countermeasure training tool for Marines that will provide increased fatigue resilience training effectiveness, improved fatigue management and reduced fatigue-related operational errors. - Continue design and development of a Marine augmented classroom environment (ACE) that will enhance instructors' teaching performance and student learning outcomes. - Complete the development of training to optimize the use of resilience skills (TOURS), specifically develop and iterate training modules for relapse prevention, deployable refresher training, supports for transfer climate and social support for small unit leaders. - Complete design and development of methods for establishing optimal training intervals for the Marine Corps Martial Arts Program (MCMAP) for improvement in physical performance and warrior mindset. - Initiate the development of measures of training effectiveness that connect training tasks with measures of performance under various stressors. ***FY 2016 OCO Plans:*** N/A					
Title: INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR) ***Description:*** 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	4.439	4.650	4.730	-	4.730

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
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 3D 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. ***FY 2014 Accomplishments:*** - Continued all efforts from FY2013, except those noted as completed. - Continued development of advanced tactical sensor nets that localize mobile detection of threats in a complex environment. - Continued development and demonstration of measurement and signature intelligence data management and integration capability. - Continued efforts to refine enemy course of action prediction software to adapt to stimuli. - Continued new Actionable Intelligence for Expeditionary and Irregular Warfare efforts which include Human Network Decision Modeling and the fusion across modeling approaches to increase prediction accuracy. - Continued development of tactical sensor nets with organic unattended multi-level security processing and information dissemination. - Continued new Relevant and Situational Information on Demand such as Identity Dominance Enabled by an Integrated Biometric/Tag Track and Locate (TTL) Capability, providing human tracking algorithms based on models of biometric (face, voice and soft) and TTL (optical taggant) capabilities and modeling a biometric/optical taggant system relevant to human tracking across an urban 5 km x 2 km area. - Continued tagging, tracking, and locating efforts to demonstrate a system that will automatically translate large amounts of wide area surveillance data into tracks, useful to expose entity to entity associations; build urban context, as well as detect events and anomalies; and associate objects, tasks, locations and events for creating actionable intelligence. - Continued efforts to develop methods and techniques for investigating open source information on the Internet to form a human terrain map indicating space and time features to aid network identification and prediction of enemy activity. - Continued efforts to incorporate social models for human decision making with statistical models. - Continued efforts to extend the utility of track classification algorithms to sparse data. - Continued efforts to automatically fuse data across all identifiers (TTL, biometrics, symbols) based on similarity measures.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continued efforts to show entity tracking using disparate ground and air sensors and tools that automatically compute latent area atmospheric measures. - Continued development of model based own force decision tools based on adversarial decision making models. - Continued development of an active layered sensing capability. - Continued research to develop more audio exploitation algorithms that can be used on audio files with a low signal to noise. - Continued technology development required to enable tactical UAS on-board processing of terabytes of data in real time. - Continued development of a user composable search and display capability enabled by map reduce technology. - Continue research on the development of automated data tagging algorithms that enable connected graphs of structured and unstructured data. - Completed new Sensor Fields efforts such as Nanotechnology Enabled Witness Fields, development of sensors that provide near real time decision support to distributed operations by detecting specific interactions, and nanotechnology efforts which offer the potential to revolutionize tactical sensors. To enable this capability, nanomaterials that change state in the presence of another nanomaterial will be developed. - Completed algorithm development for base classification on context, similarity to clutter, and nearness to suspicion. - Completed integration and demonstration of naval tactical warfighting applications and network connectivity. - Completed tagging, tracking, and locating efforts to demonstrate the effectiveness of tactically relevant tag readers which support track classification algorithms. - Initiated the development of a workflow manager capable of cloud service discovery and configuration.					
FY 2015 Plans: - Continue new Actionable Intelligence for Expeditionary and Irregular Warfare efforts which include Human Network Decision Modeling and the fusion across modeling approaches to increase prediction accuracy. - Continue the development of a workflow manager capable of cloud service discovery and configuration. - Continue research on the development of automated data tagging algorithms that enable connected graphs of structured and unstructured data. - Continue technology development required to enable tactical UAS on-board processing of terabytes of data in real time. - Continue development of a user composable search and display capability enabled by map reduce technology.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continue Tagging, Tracking, and Locating efforts to demonstrate a system that will automatically translate large amounts of wide area surveillance data into tracks, useful to expose entity to entity associations; build urban context, as well as detect events and anomalies; and associate objects, tasks, locations and events for creating actionable intelligence. - Complete development of advanced tactical sensor nets that localize mobile detection of threats in a complex environment. - Complete development and demonstration of measurement and signature intelligence data management and integration capability. - Complete efforts to refine enemy course of action prediction software to adapt to stimuli. - Complete development of tactical sensor nets with organic unattended multi-level security processing and information dissemination. - Complete new Relevant and Situational Information on Demand such as Identity Dominance Enabled by an Integrated Biometric/Tag Track and Locate (TTL) Capability, providing human tracking algorithms based on models of biometric (face, voice and soft) and TTL (optical taggant) capabilities and modeling a biometric/optical taggant system relevant to human tracking across an urban 5 km x 2 km area. - Complete efforts to develop methods and techniques for investigating open source information on the Internet to form a human terrain map indicating space and time features to aid network identification and prediction of enemy activity. - Complete efforts to incorporate social models for human decision making with statistical models. - Complete efforts to extend the utility of track classification algorithms to sparse data. - Complete efforts to automatically fuse data across all identifiers (TTL, biometrics, symbols) based on similarity measures. - Complete efforts to show entity tracking using disparate ground and air sensors and tools that automatically compute latent area atmospheric measures. - Complete development of model based own force decision tools based on adversarial decision making models. - Complete development of an active layered sensing capability. - Complete research to develop more audio exploitation algorithms that can be used on audio files with a low signal to noise. - Initiate research to develop concept based information retrieval from unstructured data sources based on structured grammars or intensity vectors. - Initiate research to develop a capacity to run tracklett fusion, track analysis and data to track or track to track correlation as a distributed service run as a map-reduce job, both forensically and in real time.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate research to develop a prototype system capable of maintaining the entity models needed for entity co referencing during real time natural language processing workflows. - Initiate research on the development of a capability to automate the extraction of video events relevant to mission information needs in real time on power efficient hardware. - Initiate research on implementing orchestrated advanced analytics running across cloud and non-cloud based architectures. ***FY 2016 Base Plans:*** - Continue research on the development of automated data tagging algorithms that enable connected graphs of structured and unstructured data. - Continue technology development required to enable tactical UAS on-board processing of terabytes of data in real time. - Continue development of a user composable search and display capability enabled by map reduce technology. - Continue research to develop a capacity to run tracklett fusion, track analysis and data to track or track to track correlation as a distributed service run as a map-reduce job, both forensically and in real time. - Continue research to develop a prototype system capable of maintaining the entity models needed for entity co referencing during real time natural language processing workflows. - Continue research on the development of a capability to automate the extraction of video events relevant to mission information needs in real time on power efficient hardware. - Continue research on implementing orchestrated advanced analytics running across cloud and non-cloud based architectures. - Complete new Actionable Intelligence for Expeditionary and Irregular Warfare efforts which include Human Network Decision Modeling and the fusion across modeling approaches to increase prediction accuracy. - Complete the development of a workflow manager capable of cloud service discovery and configuration. - Complete Tagging, Tracking, and Locating efforts to demonstrate a system that will automatically translate large amounts of wide area surveillance data into tracks, useful to expose entity to entity associations; build urban context, as well as detect events and anomalies; and associate objects, tasks, locations and events for creating actionable intelligence. - Complete research to develop concept based information retrieval from unstructured data sources based on structured grammars or intensity vectors. - Initiate project to improve the enterprise recognition of critical tactical information relevant to real-time mission execution.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate project to demonstrate the feasibility of analytic populated big data architectures to populate and maintain a global knowledge environment relevant to rapid turn amphibious mission planning. - Initiate project to tie feature modeling to decision support systems. - Initiate project to optimize the collection planning process through automation by automatically generating sensor plans, automating the production of information products, and delivering the most relevant information to the warfighters to enable rapid response in an evolving intelligence environment. - Initiate project to develop a capability to automatically deliver mission relevant information to an agile tactical unit based on mission ontologies, user preferences and high level descriptions of information needs. - Initiate research on technologies needed to tailor information delivery to warfighters based on mission context and user preferences. - Initiate project to develop a set of video analytic classifiers (entity, behavior, and scene) that can run in a power efficient manner in embedded hardware. - Initiate project to develop a capability that will track and enhance mission readiness enabled by a dynamic machine understanding of mission information needs, a matured sensor optimization ability and operations research applied to course of action analysis. - Initiate project to improve expeditionary force capabilities to discover and process data across integrated cross domain systems. - Initiate project to enable the synchronized planning and management and ISR assets given a set of disparate mission information requirements. - Initiate project to enhance the extraction of target quality information from unregistered unstructured images and imagery. - Initiate effort to automate the design and conduct of use cases relevant to tactical information requirements. ***FY 2016 OCO Plans:*** N/A					
Title: LITTORAL COMBAT/POWER PROJECTION (LC/PP) ***Description:*** This activity addresses the advanced technology development associated with associated with the Marine Corps participation in the Department of the Navy's (DoN) Science and Technology Future Naval Capabilities (FNC) Program. The FNC Program represents the requirements-driven, delivery-oriented portion of the DoN Science and Technology (S&T) portfolio. FNC investments respond to Naval S&T Gaps that are generated by the Navy and Marine Corps after receiving input from Naval Research Enterprise (NRE) stakeholders. The funding is aligned with the Naval challenges associated with projecting power despite anti-	18.988	19.368	19.755	-	19.755

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
access and area denial, specifically the Sea Shield, Power and Energy, FORCEnet, and the Naval Expeditionary Maneuver Warfare warfighting capability gaps. The funding profile reflects the alignment of the FNC program investments into Enabling Capabilities (ECs); ECs respond to priority Naval warfighting capability gaps. Funding for each EC is aligned to a 6.2 or 6.3 Budget Activity (BA) as appropriate. Concurrent funding for Naval expeditionary warfare capability ECs is also provided from Navy PE0602750N and PE0603673N. Both of the Navy PE's were included in the FY 2013 President's Budget Request and are now the only Navy program elements funding Navy FNC work. In previous submissions 7 Navy 6.2 PEs and 8 Navy 6.3 PEs funded FNC efforts. ***FY 2014 Accomplishments:*** - Continued development of modular scalable effects prototype weapon. (Concurrent funding from PE 0602131M). - Continued development of tactical urban breaching technologies. - Continued development of counter improvised explosive devices technologies. (Concurrent funding from PE 0602131M). - Continued development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. (Concurrent funding in PE 0602131M; funding will also be provided by PE 0603236N in FY 2010). - Continued development of technologies to lighten the load of warfighters by 1) reducing the weight of and improving the capability of the day/night weapon sight, 2) eliminating battery incompatibility, and 3) providing Graphical User Interface (GUI-based) software for tradeoff analyses based on Military Operational Posture. (Previous FY10 effort resourced by PE 0602236N and PE 0603236N. Concurrent FY11 funding provided by PE 0602131M and PE 0603236N). - Continued development of wide area surgical and persistent surveillance technologies. (Concurrent funding in PE 0602271N and PE 0602131M). - Continued development of the Ground Based Air Defense On-the-move high energy laser demonstrator. (Concurrent funding in PE0602750N and PE0603673N). - Completed development of fuel efficient Medium Tactical Vehicle Replacement (MTVR) technologies. (Concurrent funding in PE 0602131M). - Completed development of precision urban mortar attack technologies. (Concurrent funding in PE 0602131M). - Completed development of technologies to lighten-the-load of warfighters by 1) reducing the weight and improving the capability of the day/night weapon sight 2) eliminating battery incompatibility, 3) providing Graphical User Interface (GUI)-based software for tradeoff analyses based on Military Operational Posture.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Completed development of precision universal mortar attack technologies. (Concurrent funding in PE 0602131M).					
FY 2015 Plans: - Continued all efforts from FY 2014, except those noted as completed. - Continue development of wide area surgical and persistent surveillance technologies. (Concurrent funding in PE 0602131M). - Continue development of the Ground Based Air Defense On-the-move high energy laser demonstrator. (Concurrent funding in PE 0602131M.) - Continue development of modular scalable effects prototype weapon. (Concurrent funding from PE 0602131M). - Continue development of tactical urban breaching technologies. - Continue development of counter improvised explosive devices technologies. (Concurrent funding from PE 0602131M). - Continue development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. (Concurrent funding in PE 0602131M; funding will also be provided by PE 0603236N in FY 2010). - Continue development of technologies to lighten the load of warfighters by 1) reducing the weight of and improving the capability of the day/night weapon sight, 2) eliminating battery incompatibility, and 3) providing Graphical User Interface (GUI-based) software for tradeoff analyses based on Military Operational Posture. (Previous FY10 effort resourced by PE 0602236N and PE 0603236N. Concurrent FY11 funding provided by PE 0602131M and PE 0603236N). - Continue development of precision urban mortar attack technologies in FY11 due to operation contingencies. (Concurrent funding in PE 0602131M). - Complete development of fuel efficient Medium Tactical Vehicle Replacement (MTVR) technologies. (Concurrent funding in PE 0602131M). - Initiate development of an azimuth and inertial navigation system. (Effort was previously funded by PE 0602750N and PE 0603673N; concurrent funding in PE 0602131M.) - Initiate development of spectral and reconnaissance imagery for tactical exploitation (SPRITE). (Previous and follow-on funding provided by PE 0602750N and PE 0603673N; concurrent funding in PE 0602131M.) - Initiate development of Target Processing Center (TPC) sensor correlation and fusion technology; specifically, context fusion, and radar fusion and false track mitigation. (Concurrent funding in PE 0602131M.)					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate development of technologies to enable the exchange of actionable information at the tactical edge; specifically, actionable information tactical applications, data conditioning and network adaptive communication services. (Effort was previously funded by PE 0602750N and PE 0603673N; concurrent funding in PE 0603640M.)					
FY 2016 Base Plans: - Continue development of wide area surgical and persistent surveillance technologies (WASPS). (Concurrent funding provided PE 0602131M.) This EC remains on schedule and will demonstrate a high-resolution, megapixel infrared payload as well as an integrated electro-optic, synthetic aperture radar and communications payload on an unmanned aerial vehicle to provide enhanced ISR capabilities over large areas. - Continue development of an azimuth and inertial navigation system (MEMS). (Concurrent funding in PE 0602131M). This EC remains on schedule and will demonstrate a handheld MEMS inertial navigation system. - Continue development of spectral and reconnaissance imagery for tactical exploitation (SPRITE). (Concurrent funding in PE 0602131M). This EC remains on schedule and will demonstrate (1) a hyper-spectral sensor (transition to Navy) and (2) a wide area reconnaissance sensor (transition to Marine Corps) on an unmanned aerial system to autonomously detect threats over a 16 km2 area. - Continue development of Target Processing Center (TPC) sensor correlation and fusion technology. (Concurrent funding in PE 0602131M). This EC remains on schedule and will demonstrate analytic software applications which link intelligence, surveillance and reconnaissance (ISR) systems to Marine Corps and Navy intelligence analysts to enable collaborative enterprise search, content discovery, collaboration, and workflow management. - Continue development of technologies to enable the exchange of actionable information at the tactical edge (EAITE). (Concurrent funding in PE 0602131M) This EC remains on schedule and will demonstrate autonomous dissemination of intelligence products to dispersed warfighters over the range of military operations (ROMO)to increase situational awareness and operational tempo. - Continue development of the Ground Based Air Defense On-the-move high energy laser demonstrator (GBAD). (Concurrent funding in PE 0602131M). This EC remains on schedule and will demonstrate an integrated high energy laser-radar system capable of performing soft and hard kills of unmanned aerial system (UAS) to prevent reconnaissance, surveillance, targeting and acquisition of friendly expeditionary forces. - Complete development of modular scalable effects prototype weapon. - Complete development of tactical urban breaching technologies. - Complete development of counter improvised explosive devices technologies.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Complete development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. - Complete development of technologies to lighten the load of warfighters by 1) reducing the weight of and improving the capability of the day/night weapon sight, 2) eliminating battery incompatibility, and 3) providing Graphical User Interface (GUI-based) software for tradeoff analyses based on Military Operational Posture. ***FY 2016 OCO Plans:*** N/A					
Title: LOGISTICS ***Description:*** This activity supports Marine Corps Expeditionary Logistics which is the practical discipline and real world application of the deployment, sustainment, reconstitution, and re-deployment of forces engaged in expeditionary operations. Expeditionary Logistics replaces mass with assured knowledge and speed, is equally capable ashore or afloat in austere environments, and is fully scalable to meet uncertain requirements. Expeditionary Logistics logically divides into five pillars: deployment support, force closure, sustainment, reconstitution/redeployment, and command and control. These pillars are thoroughly integrated and perpetually related in execution. The FY 2014 to FY 2015 decrease in the Logistics Thrust Activity is due to a reduction in the scope and size of anti-fouling and non-fouling water purification components to enable enduring performance of small water purification systems. The FY 2015 to FY 2016 increase in the Logistics Thrust Activity is due to the initiation of the intelligent microgrid systems effort in support of Expeditionary Force-21. ***FY 2014 Accomplishments:*** - Continued exploring the development of portable fuel cell technologies capable of providing Power in the 100 Watt to 500 Watt power range. - Continued efforts to develop a micro turbine generator capable of 100W average power. - Continued research into developing a replaceable electrode battery power source that consists of a metallic structure that is consumed during power generation and then easily replaced with a new metallic component that restores a full charge. (Realigned from PE 0602131M). - Continued analysis of material alternatives for automated vehicle health monitoring and reporting.	13.034	11.298	13.635	-	13.635

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continued development of a backpack that prevents oscillatory and transient peak loading forces from causing skeletal injury while enhancing human mobility with heavy loads. - Continued development of advanced lightweight fuel to energy conversion concepts. This includes development of power management electronics for reducing power requirements for military radios. - Continued demonstration of advanced concepts for mobile infrastructure. - Continued integration and demonstration of electrochemical ultracapacitors into hybrid electric power systems. - Continued efforts to improve advanced electrical power generation from fuel cells and renewable sources as well as to improve the efficiency of conventional generation via hybridization and smart-grid technologies. - Continued integration and demonstration of advanced materials to reduce maintenance into selected vehicle and machinery components. - Continued the development of robotic systems to facilitate the packaging and handling of logistic supplies. - Initiated a field demonstration of renewable energy devices and deployable equipment showing fewer liabilities when delivering expensive fuel, thereby lowering Marine Corps operational costs.					
FY 2015 Plans: - Continued all efforts from FY 2014, except those noted as completed. - Continue exploring the development of portable fuel cell technologies capable of providing Power in the 100 Watt to 500 Watt power range. - Continue analysis of material alternatives for automated vehicle health monitoring and reporting. - Continue demonstration of advanced concepts for mobile infrastructure. - Continue integration and demonstration of electrochemical ultracapacitors into hybrid electric power systems. - Continue efforts to improve advanced electrical power generation from fuel cells and renewable sources as well as to improve the efficiency of conventional generation via hybridization and smart-grid technologies. - Continue integration and demonstration of advanced materials to reduce maintenance into selected vehicle and machinery components. - Continue the development of robotic systems to facilitate the packaging and handling of logistic supplies. - Continue a field demonstration of renewable energy devices and deployable equipment showing fewer liabilities when delivering expensive fuel, thereby lowering Marine Corps operational costs. - Complete efforts to develop a micro turbine generator capable of 100W average power. - Complete research into developing a replaceable electrode battery power source that consists of a metallic structure that is consumed during power generation and then easily replaced with a new metallic component that restores a full charge. (Realigned from PE 0602131M).					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Complete development of a backpack that prevents oscillatory and transient peak loading forces from causing skeletal injury while enhancing human mobility with heavy loads. - Complete development of advanced lightweight fuel to energy conversion concepts. This includes development of power management electronics for reducing power requirements for military radios. - Initiate operations research and analysis efforts to enhance seabased expeditionary supply chain concepts and technologies. (Some analyses fall under PE0602131M, while more mature efforts fall under PE0603640M) - Initiate development of alternative (non-electrochemical) energy storage technologies for hybrid power system load management. - Initiate development of low energy desalination technologies to allow for efficient salt-water purification at the small/individual scale. - Initiate the development of anti-fouling and non-fouling water purification components to enable enduring performance of small water purification systems. - Initiate the development of real-time water quality monitoring systems for use with small scale water purification systems. - Initiate the development of efficient water packaging and distribution technologies.					
FY 2016 Base Plans: - Continue analysis of material alternatives for automated vehicle health monitoring and reporting. - Continue demonstration of advanced concepts for mobile infrastructure. - Continue integration and demonstration of advanced materials to reduce maintenance into selected vehicle and machinery components. - Continue the development of robotic systems to facilitate the packaging and handling of logistic supplies. - Continue efforts to improve advanced electrical power generation from fuel cells and renewable sources as well as to improve the efficiency of conventional generation via hybridization and smart-grid technologies. - Continue operations research and analysis efforts to enhance seabased expeditionary supply chain concepts and technologies. (Some analyses fall under PE0602131M, while more mature efforts fall under PE0603640M) - Continue development of low energy desalination technologies to allow for efficient salt-water purification at the small/individual scale. - Continue the development of anti-fouling and non-fouling water purification components to enable enduring performance of small water purification systems. - Continue the development of real-time water quality monitoring systems for use with small scale water purification systems.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continue development of alternative (non-electrochemical) energy storage technologies for hybrid power system load management. - Continue a field demonstration of renewable energy devices and deployable equipment showing fewer liabilities when delivering expensive fuel, thereby lowering Marine Corps operational costs. - Continue the development of efficient water packaging and distribution technologies. - Complete exploring the development of portable fuel cell technologies capable of providing Power in the 100 Watt to 500 Watt power range. - Complete integration and demonstration of electrochemical ultracapacitors into hybrid electric power systems. - Initiate development of infrastructureless In-Transit Visibility (ITV) technologies to enable asset tagging, tracking, locating, and monitoring anywhere in the expeditionary supply chain. - Initiate the development of modular thermoacoustic systems capable of acting as power generation or heat-pump devices. - Initiate the development of alpha-particle semiconductors to harness energy from alpha-emitting materials and create ultra-high energy density nuclear batteries. - Initiate the development of ultra-high efficiency piezoelectric devices. - Initiate the development of intelligent microgrid systems for the expeditionary unit. ***FY 2016 OCO Plans:*** N/A					
Title: MANEUVER ***Description:*** The Maneuver Thrust Technology Area focuses on the development, demonstration, and transition of technologies that will increase the warfighting capabilities and effectiveness of current and future Marine Corps maneuver systems. This Thrust aims at capturing emerging and "leap ahead" technologies in the areas of mobility, materials, propulsion, survivability, durability, signature reduction, modularity, and unmanned systems. Beginning in FY 2009, Mine Countermeasures (MCM) efforts are funded under the Force Protection activity. Presently, MCM supports and enhances the maneuver and force protection Marine landing forces with the development of technologies to enable detection, neutralization, breaching, and clearing of mines, Improvised Explosive Devices (IEDs), and unexploded ordnance from the beach exit to inland objectives. MAGTF MCM is a functional component of Naval Expeditionary Maneuver Warfare and includes Ship to Objective Maneuver (STOM), Expeditionary Operations from a Sea Base, sustained Operations Ashore, Urban and Asymmetric Operations, and OOTW.	14.259	12.685	14.986	-	14.986

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
The FY 2014 to FY 2015 decrease in the Maneuver Thrust Activity is due to a reduction in scope of development of a vehicle demonstrator that focuses on enhanced crew survivability. The FY 2015 to FY 2016 increase in the Maneuver Thrust Activity is due to increased cost associated with development of a vehicle demonstrator that focuses on enhanced crew survivability. ***FY 2014 Accomplishments:*** - Continued Advanced Electromagnetic Armor technology development efforts. - Continued development of fuel efficiency and battlefield power systems for improved performance. - Continued development of a Combat S&T Vehicle demonstrator to enhance crew survivability and vehicle fuel efficiency. - Continued survivability improvements and technologies to mitigate acceleration and traumatic brain injuries to occupants to enhance tactical mobility and survivability. - Continued advanced suspension systems development with ride height adjustment, ride quality adjustment, rollover prevention, and load equalizing systems for USMC tactical wheeled platforms to enhance tactical mobility in support of Distributed Operations. - Continued a Survivability/ Active Protection Systems Improvement effort to increase effectiveness of defeat (Pdefeat) of shoulder launched RPG type threats and ATGM threats on light platforms utilizing non-kinetic kill technologies. - Continued new mobility efforts for On-Board Vehicle Power to increase mobile exportable power for Diesel Electric Propulsion Concepts and a Fuels effort to investigate future fuel alternatives for internal combustion engines to include Fischer-Tropsch and coal gasification processes for use in military tactical wheeled vehicles. - Continued Maneuver Enabling Technologies such as Vehicle Stabilization to improve vehicle suspension and control technologies to stabilize the platforms themselves to improve ride quality, shoot on the move capability and human systems integration. - Continued studies to identify technology development plans to close identified force protection capability gaps. - Continued a Vehicle Demonstrator program to design and fabricate an Integrated Power Demonstrator platform capable of producing the power needs for mobility and survivability concept demonstrations. - Continued efforts evaluating the current ground fleet platforms for their mobility and control capabilities as they relate to potential inclusion of an autonomous vehicle capability that will provide mobility and logistics support to the dismounted Marine during Enhanced Company Operations (ECO).					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continued efforts to demonstrate Integrated Armor Solutions that provide lighter weight armor materials with enhanced protection to vehicle occupants thereby enhancing tactical Mobility and Survivability in support of Distributed Operations. - Continued programs to address and enhance maneuver capability gaps in mobility such as efforts, transitioned from 6.2, aimed at the development of an autonomous vehicle capability that will provide mobility and logistics support to the dismounted Marine during Enhanced Company Operations (ECO). - Initiated the development of autonomy technologies and system concepts that will enable unmanned ground vehicles (UGVs) to be used as autonomous logistic connector vehicles. - Initiated the development of fuel saving vehicle technologies, including advanced transmission, power train, and electrical power system technologies. - Initiated mobility technologies that enable improved vehicle/warfighter agility and stability. - Initiated lightweight armor, material, and structural technologies that enable maneuver and survivability of small, light expeditionary platforms. - Initiated survivability technologies that enable defeat of all unitary and tandem RPG and select ATGM threats, and the demonstration of survivable vehicles. - Initiated the development of technologies that enable vehicle component modularity and reduce life cycle costs.					
FY 2015 Plans: - Continued all efforts from FY2014, except those noted as completed. - Continue advanced electromagnetic armor technology development efforts. - Continue development of fuel efficiency and battlefield power systems for improved performance. - Continue survivability improvements and technologies to mitigate acceleration and traumatic brain injuries to occupants to enhance tactical mobility and survivability. - Continue advanced suspension systems development with ride height adjustment, ride quality adjustment, rollover prevention, and load equalizing systems for USMC tactical wheeled platforms to enhance tactical mobility in support of Distributed Operations. - Continue a survivability/ active protection systems improvement effort to increase effectiveness of defeat (Pdefeat) of shoulder launched RPG type threats and ATGM threats on light platforms utilizing non-kinetic kill technologies. - Continue efforts evaluating the current ground fleet platforms for their mobility and control capabilities as they relate to inclusion of an autonomous vehicle capability that will provide support to the dismounted Marine during Enhanced Company Operations (ECO).					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continue efforts to demonstrate integrated armor solutions that provide lighter weight armor materials with enhanced protection to vehicle occupants thereby enhancing tactical mobility and survivability. - Continue programs to address and enhance maneuver capability gaps in mobility such as efforts, transitioned from 6.2, aimed at the development of an autonomous vehicle capability that will provide mobility and logistics support to the dismounted Marine during Enhanced Company Operations (ECO). - Continue the development of autonomy technologies and system concepts that will enable unmanned ground vehicles (UGVs) to be used as autonomous logistic connector vehicles. - Continue the development of fuel saving vehicle technologies, including advanced transmission, power train, and electrical power system technologies. - Continue mobility technologies that enable improved vehicle/warfighter agility and stability. - Continue lightweight armor, material, and structural technologies that enable maneuver and survivability of small, light expeditionary platforms. - Continue survivability technologies that enable defeat of all unitary and tandem RPG and select ATGM threats, and the demonstration of survivable vehicles. - Continue the development of technologies that enable vehicle component modularity and reduce life cycle costs. - Continue development of a Combat S&T Vehicle demonstrator to enhance crew survivability and vehicle fuel efficiency. - Continue new mobility efforts for On-Board Vehicle Power to increase mobile exportable power for Diesel Electric Propulsion Concepts and a Fuels effort to investigate future fuel alternatives for internal combustion engines to include Fischer-Tropsch and coal gasification processes for use in military tactical wheeled vehicles. - Continue Maneuver Enabling Technologies such as Vehicle Stabilization to improve vehicle suspension and control technologies to stabilize the platforms themselves to improve ride quality, shoot on the move capability and human systems integration. - Continue studies to identify technology development plans to close identified force protection capability gaps. - Continue a Vehicle Demonstrator program to design and fabricate an Integrated Power Demonstrator platform capable of producing the power needs for mobility and survivability concept demonstrations. - Initiate development of a vehicle demonstrator that focuses on enhanced crew survivability. - Initiate the development of autonomous perception technologies to enable operations under adverse atmospheric conditions.					
FY 2016 Base Plans: - Continue all efforts of FY 2015, less those noted as completed above.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continue advanced electromagnetic armor technology development efforts. - Continue development of fuel efficiency and battlefield power systems for improved performance. - Continue development of a Combat S&T Vehicle demonstrator to enhance crew survivability and vehicle fuel efficiency. - Continue new mobility efforts for On-Board Vehicle Power to increase mobile exportable power for Diesel Electric Propulsion Concepts and a Fuels effort to investigate future fuel alternatives for internal combustion engines to include Fischer-Tropsch and coal gasification processes for use in military tactical wheeled vehicles. - Continue survivability improvements and technologies to mitigate acceleration and traumatic brain injuries to occupants to enhance tactical mobility and survivability. - Continue advanced suspension systems development with ride height adjustment, ride quality adjustment, rollover prevention, and load equalizing systems for USMC tactical wheeled platforms to enhance tactical mobility in support of Distributed Operations. - Continue a survivability/ active protection systems improvement effort to increase effectiveness of defeat (Pdefeat) of shoulder launched RPG type threats and ATGM threats on light platforms utilizing non-kinetic kill technologies. - Continue efforts evaluating the current ground fleet platforms for their mobility and control capabilities as they relate to inclusion of an autonomous vehicle capability that will provide support to the dismounted Marine during Enhanced Company Operations (ECO). - Continue efforts to demonstrate integrated armor solutions that provide lighter weight armor materials with enhanced protection to vehicle occupants thereby enhancing tactical mobility and survivability. - Continue programs to address and enhance maneuver capability gaps in mobility such as efforts, transitioned from 6.2, aimed at the development of an autonomous vehicle capability that will provide mobility and logistics support to the dismounted Marine during Enhanced Company Operations (ECO). - Continue the development of autonomy technologies and system concepts that will enable unmanned ground vehicles (UGVs) to be used as autonomous logistic connector vehicles. - Continue the development of fuel saving vehicle technologies, including advanced transmission, power train, and electrical power system technologies. - Continue mobility technologies that enable improved vehicle/warfighter agility and stability. - Continue lightweight armor, material, and structural technologies that enable maneuver and survivability of small, light expeditionary platforms. - Continue survivability technologies that enable defeat of all unitary and tandem RPG and select ATGM threats, and the demonstration of survivable vehicles.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Continue the development of technologies that enable vehicle component modularity and reduce life cycle costs. - Continue Maneuver Enabling Technologies such as Vehicle Stabilization to improve vehicle suspension and control technologies to stabilize the platforms themselves to improve ride quality, shoot on the move capability and human systems integration. - Continue a Vehicle Demonstrator program to design and fabricate an Integrated Power Demonstrator platform capable of producing the power needs for mobility and survivability concept demonstrations. - Continue studies to identify technology development plans to close identified force protection capability gaps. - Continue development of a vehicle demonstrator that focuses on enhanced crew survivability. - Continue the development of autonomous perception technologies to enable operations under adverse atmospheric conditions. ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	86.606	85.605	91.450	-	91.450

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

The primary objective of this PE is the development of technologies to meet unique Marine Corps needs in conducting Expeditionary Maneuver Warfare. The program consists of a collection of projects categorized by critical warfighting function. Individual project metrics reflect the technical goals of each specific project. Typical metrics include the advancement of related Technology Readiness Levels, the degree to which project investments are leveraged with other performers, reduction in life cycle cost upon application of the technology, and the identification of opportunities to transition technology to higher categories of development.

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COST ($ in Millions)	Prior Years	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
2297: *Futures Directorate*	-	42.166	42.715	46.112	-	46.112	47.061	47.743	47.443	48.392	Continuing	Continuing

A. Mission Description and Budget Item Justification

During FY 2013, due to an internal Marine Corps reorganization (Marine Administrative Message (MARADMIN) 177/13), the Marine Corps Warfighting Laboratory (MCWL) was incorporated into the establishment of a broader Futures Directorate (FD). Therefore, to accurately reflect enhanced synergy within the Deputy Commandant, Combat Development and Integration (DC, CD&I), this project, 2297 (MCWL), was renamed FD.

As part of the DC, CD&I, the mission of the FD is to identify plausible future security environments and develop and explore warfighting concepts and Concepts of Operations (CONOPS). It does this in order to identify potential future capability gaps and opportunities in order to inform future force development. FD executes its' mission through three divisions:

Futures Assessment Division's (FAD's) mission is to: research, examine, and describe plausible future security environments 15 to 30 years into the future. Knowledge of these future security environments will provide an estimate of possible future threats, challenges, and opportunities, to include: the rise of possible partners and adversaries, emerging disruptive technologies, and likely sources of conflict. This work is largely accomplished through research, seminar participation, and coordination with various experts in academia, the intelligence community, and think tanks.

Emergent Force Development's (EFD's) mission is to: explore select future security environments, emerging warfighting opportunities and challenges in order to guide development of Marine Corps Service concepts and CONOPS. EFD is responsible for the production of formally published concepts, CONOPS, and options for future force organization and posture that describe how the Marine Corps will operate and fight.

MCWL's mission is to: explore and analyze Marine Corps service concepts using an integrated combination of research, modeling and simulation, wargaming, live force experimentation, science and technology (S&T) discovery, assessment and integration, and analysis in order to better understand how these concepts expose gaps and create opportunities for future force development.

FD uses the following competencies to accomplish its mission:

Wargames are conducted to frame emerging warfighting concepts, establish the Joint context for the Marine Corps Force Development System, and establish priorities for development of experimental and non-experimental capabilities.

Modeling and Simulation (M&S)-based events allow the FD to examine capabilities with larger scale venues and forces than is practical with live forces at lower cost in terms of funding and in terms of operating force personnel and equipment. M&S also enables assessment of proposed capabilities before making investments in costly concept demonstrator technologies required in live force experiments.

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Live force experimentation permits exploration of prototype and surrogate technologies, as well as Tactics, Techniques, and Procedures (TTPs), in order to better refine equipment requirements and to identify Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF) initiatives needed to produce future capabilities. Experimentation encompasses inquiries into multiple warfighting areas, including: Combat Service Support (CSS) and Force Protection; Command, Control, Communications, and Computers (C4); Intelligence, Surveillance, and Reconnaissance (ISR); Fires, Targeting, and Maneuver; and Warfighting Excellence.

Technology investigations, investments, and assessments are conducted to identify, modify where appropriate, and evaluate technological capabilities that support advanced warfighting concepts, and to explore the military utility of promising new commercial or government technologies in support of urgent and compelling needs. MCWL's S&T Division will investigate the relevance to Expeditionary Force 21 (EF21) capabilities and gaps of advanced technologies according to the following EF21 derived Thrust Areas: C4ISR, Autonomy and Robotics, Marine Air-Ground Task Force (MAGTF) Fires, Maneuver, Expeditionary Logistics (to include Expeditionary Energy), Expeditionary Medicine, Cyber and Electronic Warfare (EW), and Force Protection.

DC, CD&I is designated as the United States Marine Corps (USMC) Advocate for S&T. As Director FD, the Commanding General (CG) of the MCWL is the DC, CD&I designated Proponent of USMC S&T and serves as the USMC Executive Agent for Marine Corps S&T.

The 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.

The current Futures Directorate Campaign Plan (FDCP) addresses how the Naval Services must reshape their capabilities in order to meet the concepts and CONOPS called for in the Secretary of the Navy's "Cooperative Strategy 21" and the Marine Corps' follow-on "Expeditionary Force 21 (EF21)" concept. The FD was created in 2013 to be the organization within the Marine Corps with the unique mission of anticipating future operating environments, determining the demands they will place on our naval services, and informing the capabilities development process on how to operate and maintain the tactical advantage in these environments. In doing so, the FD makes recommendations to Marine Corps advocates and proponents so that they may more cohesively and logically structure the future Navy and Marine Corps team. FD will pursue exploration of concepts that support flexible and sustainable MAGTFs employing distributed tactical formations across the range of military operations. FD will also examine future enhancements in training, organization, and equipment for immediate crisis response.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: COMBAT SERVICE SUPPORT (CSS) AND FORCE PROTECTION	5.743	7.773	7.788	-	7.788
Description: This activity includes FD/MCWL CSS and force protection experimentation efforts including assessment of equipment, new TTPs, training programs, and proposed organizational changes associated with enhanced capabilities. Although this category covers several small (less than $500K per FY) efforts being pursued by FD/MCWL, most programs listed below are considered major (valued at $500K or more) or have near real-time operational impact. Investments in this activity will be conducted under the Thrust Areas of Expeditionary Logistics, Force Protection, and Autonomy and Robotics.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
The FY 2014 decrease in category funding is mainly due to a reduced contribution to the MCWL-Defense Advanced Research Projects Agency (DARPA) legged robot effort, in addition to reductions in assessment of technologies that reduce the demand required to support the MAGTF. FY 2014 to FY 2015 increases are mainly attributable to an increased emphasis on providing enhanced medical care over a distributed battlefield. Other increases are due to expanded efforts in unmanned ground logistics delivery technologies. ***FY 2014 Accomplishments:*** - Continued to develop and experiment with bio-sciences (medical) technologies. - Continued assessment of unmanned ground logistics delivery technologies that support infantry small unit operations. - Continued a MCWL-DARPA partnership for the development and demonstration of a MCWL centric legged robot in an effort to "Lighten the Load" of individual Marines. - Continued research and assessment of technologies that reduce the demand required to support the MAGTF. - Completed assessment of technologies for sustainment of tactical level units from the sea-base. - Completed testing and evaluation of blast sensors that may improve the medical treatment for potential Traumatic Brain Injury casualties. - Initiated development and assessment of counter-unmanned aerial systems (UAS) and unmanned ground vehicle (UGV) systems and TTPs. - Initiated testing and assessment of logistics enablers in support of EF21 experimentation. ***FY 2015 Plans:*** - Continue all efforts of FY 2014, less those noted as complete above. - Initiate assessment and experimentation with technologies that provide enhanced medical care over a distributed battlefield, to include "virtual" care and the use of autonomous systems in support of medical evacuation over ground, surface (water), or air. - Initiate evaluation and assessment of emerging technologies that support energy demand reduction. - Initiate investigation and assessment of logistics related emerging autonomous and robotic technologies and capabilities that further enhance current Programs of Record (PORs) and influence future planning and decision making. - Initiate evaluation and experimentation with technologies that can identify, neutralize, or destroy unmanned systems (aerial, ground, or surface). ***FY 2016 Base Plans:*** - Continue all efforts of FY 2015.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Complete a MCWL-DARPA partnership for the development and demonstration of a MCWL centric legged robot in an effort to "Lighten the Load" of individual Marines. - Initiate research and assessment of advanced manufacturing techniques to determine military utility in expeditionary environments. - Initiate assessment and experimentation to understand the relevance of autonomy to ship to shore surface connectors. - Initiate assessments and experimentation with advanced technologies to enable standoff detection of improvised explosive devices. ***FY 2016 OCO Plans:*** N/A					
Title: COMMAND, CONTROL, COMMUNICATIONS, AND COMPUTERS (C4) ***Description:*** This activity encompasses all FD/MCWL C4 related experimentation efforts including assessment of equipment, new TTPs, training programs, and proposed organizational changes associated with enhanced C4 capabilities. Although this category covers several small (less than $500K per FY) efforts being pursued by FD/MCWL, most programs listed below are considered major (valued at $500K or more) or have near real-time operational impact. Investments in this activity will be conducted under the Thrust Areas of C4ISR and Cyber/ EW. The FY 2014 increase in category funding is mainly due to expanded development, testing, and assessment of a configurable L-class shipping C2 suite and integrated C2 application enhancements pursued in support of EF21 experimenation. FY 2014 to FY 2015 decreases also reflect these adjustments, as costs were modified, resulting in a cost savings in FY 2015. FY 2015 to FY 2016 increases also support EF21, with development and testing of a configurable C2 suite that enhances operations from aviation platforms and evaluation and experimentation with emerging technologies that support future maritime C2 capabilities. ***FY 2014 Accomplishments:*** - Continued development and assessment of a MAGTF network management system. - Completed C4 extended user assessments of selected prototype technologies in support of forces engaged in Operation Enduring Freedom (OEF). - Completed assessment of enhanced MAGTF communications concept demonstrators.	11.957	9.103	12.100	-	12.100

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Completed development and assessment of Internally Transportable Vehicle (ITV) based C4 concept demonstrator. - Completed investigation and assessment of a MAGTF Command and Control (C2) architecture and an integrated C2 application in support of the Enhanced MAGTF Operations (EMO) concept. - Initiated development and assessment of a configurable C2 suite that enables operations from alternate seabased platforms in support of EF21 experimentation. - Initiated development and assessment of a configurable C2 suite that enhances operations from L-Class shipping in support of EF21 experimentation. - Initiated a follow-on effort to continue test and evaluation of an integrated C2 application in support of EF21 experimentation.					
FY 2015 Plans: - Continued all efforts of FY 2014, less those noted as completed above. - Initiate development and assessment of systems that permit UAS operations in a global positioning system (GPS) denied environment. - Initiate development and assessment of a configurable C2 suite that enhances operations from aviation platforms in support of EF21 experimentation. - Initiate investigations and assessment of technologies that support C2 enablers for shore deployed MAGTF elements that is platform agnostic and capable of deployment from the sea, air, or ground. - Initiate evaluation and experimentation with emerging technologies that support future maritime C2 capabilities/ EF21. - Initiate development and assessment of technologies that support a maritime Fly-In Command Element (FICE) capable of operating from the sea-base during the conduct of immediate crisis response operations.					
FY 2016 Base Plans: - Continue all efforts of FY 2015. - Complete development and assessment of a configurable C2 suite that enables operations from alternate seabased platforms in support of EF21 experimentation. - Complete development and assessment of a configurable C2 suite that enhances operations from L-Class shipping in support of EF21 experimentation. - Complete development and assessment of technologies that support a maritime FICE capable of operating from the sea-base during the conduct of immediate crisis response operations.					

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate assessment and experimentation with integration and interoperability of software applications to increase the situational awareness, lethality, and survivability of distributed tactical ground formations. ***FY 2016 OCO Plans:*** N/A					
Title: FIRES, TARGETING, AND MANEUVER	4.409	2.843	2.173	-	2.173
Description: This activity includes FD/MCWL experimentation efforts in the areas of fires, targeting, and maneuver including assessment of equipment, new TTPs, training programs, and proposed organizational changes associated with enhanced capabilities. Although this category covers several small (less than $500K per FY) efforts being pursued by FD/MCWL, most programs listed below are considered major (valued at $500K or more) or have near real-time operational impact. Investments in this activity will be conducted under the Thrust Areas of MAGTF Fires, Maneuver, and Autonomy and Robotics. The FY 2014 to FY 2015 decrease in category funding is mainly due to a reduced contribution to development and assessment of weaponized unmanned ground robotic systems and ship-to-shore connectors. These contributions continue to be reduced in FY 2016. ***FY 2014 Accomplishments:*** - Continued development and assessment of weaponized unmanned ground robotic systems. - Completed investigation, development, and testing of concept demonstrator technologies and TTPs for enhanced fire support and fire support coordination associated with the EMO concept. - Initiated development of technologies that enhance the utility of autonomous systems. - Initiated test and assessment of future ship to shore connectors that support EF21. ***FY 2015 Plans:*** - Continue all efforts from FY 2014, less those noted as completed above. - Initiate investigation of innovative technologies to enhance squad-level capabilities. - Initiate evaluation and assessment of both airborne and ground weaponized autonomous/semi-autonomous "man-in-the-loop" systems. ***FY 2016 Base Plans:*** - Continue all efforts of FY 2015. - Complete test and assessment of future ship to shore connectors that support EF21.					

Exhibit R-2A, RDT&E Project Justification: PB 2016 Navy		Date: February 2015
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)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate assessment and experimentation into the utility of robotic systems as platforms to support target acquisition and designation. - Initiate research and assessment of the expeditionary utility of autonomous swarming technologies for unmanned air and ground systems. ***FY 2016 OCO Plans:*** N/A					
Title: INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR) ***Description:*** This activity includes FD/MCWL ISR related experimentation efforts including assessment of equipment, new TTPs, training programs, and proposed organizational changes associated with enhanced ISR capabilities. Although this category covers several small (less than $500K per FY) efforts being pursued by FD/MCWL, most programs listed below are considered major (valued at $500K or more) or have near real-time operational impact. Investments in this activity will be conducted under the Thrust Areas of C4ISR and Autonomy and Robotics. The FY 2014 decrease in category funding is mainly due to a reduced level of investment in technologies that integrate MAGTF level C4 ISR network abilities. This level of support continues to decrease from FY 2014 to FY 2015. However, in FY 2016 similar, refocused efforts re-emerge with the development and assessment of seabased and landing force ISR capabilities that enable EF21 experimentation. ***FY 2014 Accomplishments:*** - Continued additional Improvised Explosive Device (IED) investigations into promising detect and neutralize technologies. - Completed assessment of integrated MAGTF level C4 ISR network in support of EMO efforts. - Initiated development and assessment of seabased and landing force ISR capabilities that enable EF21 experimentation. - Initiated development and assessment of counter-UAS and UGV systems and TTPs. ***FY 2015 Plans:*** - Continue all efforts of FY 2014, less those noted as completed above. - Complete IED investigations into promising detect and neutralize technologies. - Initiate development and assessment of enhanced UAS sensor packages.	2.187	1.854	3.279	-	3.279

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate examination and assessment of technologies that support future employment of UAS operations from sea-based platforms. ***FY 2016 Base Plans:*** - Continue all efforts of FY 2015, less those noted as complete above. - Initiate development, integration, and assessment of technologies to fuse multiple sensor payloads into a single user interface to enable utility for tactical operators. ***FY 2016 OCO Plans:*** N/A					
Title: FUTURES DIRECTORATE (FD) / MARINE CORPS WARFIGHTING LABORATORY (MCWL) OPERATIONS (SUPPORT) ***Description:*** FD/MCWL Operations (Support) efforts include overall FD/MCWL experimentation doctrine, planning, analysis, data collection, as well as technology transition tracking efforts. Although this category covers several small (less than $500K per FY) efforts being pursued by FD/MCWL, most programs listed below are considered major (valued at $500K or more) or have near real-time operational impact. The FY 2014 decrease in category funding is mainly due to reduced levels of investment in experimentation technical and managerial support as well as results synthesis and DOTMLPF recommendation support. These reductions were made available due to capitalizing on untapped resources. Program investments were then re-reviewed, assessed, and adjusted, resulting in overall level normalization in FY 2015 and beyond. ***FY 2014 Accomplishments:*** - Continued to synthesize results and lessons learned into proposed DOTMLPF recommendations for the Marine Corps. - Continued to provide technical, strategic, and managerial support to Marine Corps experimentation. - Continued to provide overall analysis and reporting of experimentation efforts, analytical assistance during experiment design, and maintenance of an ad-hoc analysis capability. ***FY 2015 Plans:*** - Continue all efforts of FY 2014. - Initiate deliberate broad-based commercial technology forecasting in support of experimentation long-range planning and combat development.	10.287	11.658	11.882	-	11.882

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
- Initiate technical, strategic, and managerial support for operations with advanced technology utilizing autonomy, robotics, and cyber capabilities. ***FY 2016 Base Plans:*** - Continue all efforts of FY 2015. ***FY 2016 OCO Plans:*** N/A					
Title: WARFIGHTING EXCELLENCE ***Description:*** This activity includes FD/MCWL 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 FD/MCWL service experimentation in areas that impact multiple warfighting functions. Although this category covers several small (less than $500K per FY) efforts being pursued by FD/MCWL, most programs listed below are considered major (valued at $500K or more) or have near-real-time operational impact. The FY 2014 to FY 2015 increase in category funding is mainly due to increased focus on M&S-based hardware, software, and training capabilities that support planning/experimentation processes, as well as investments to improve Wargaming abilities. ***FY 2014 Accomplishments:*** - Continued executive agent responsibilities for the Marine Corps Title Ten (X) Wargame, Expeditionary Warrior, as well as the Joint and other service Title X programs, such as the United States Army's Unified Quest, the Air Force's Unified Engagement and Futures wargame, and the Navy Global wargame. Title X war games address future capabilities in the context of Title X readiness responsibilities. - Continued management and oversight of non-Title X Wargaming, including the highly visible Office of the Secretary of Defense Net Assessment Transformation War Game series and the Special Operations Command wargaming series. - Continued to support the core Center for Emerging Threats and Opportunities (CETO) mission to: provide broad-based technical and analytical support for Marine Corps combat development and experimentation programs at the component, Service, and Joint levels. This support includes the full spectrum of combat development-related missions and tasks to include the assessment of plausible future security environments and the identification of future threats, adversaries, opportunities, technologies, strategic settings, and associated	7.583	9.484	8.890	-	8.890

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
geographic, environmental, economic, and demographic conditions in order to inform the development of innovative warfighting concepts, CONOPS, and capabilities across the DOTMLPF spectrum. Serve as a catalyst to stimulate thought and debate on issues of importance to the Marine Corps. - Continued funding contributions to Joint Concept Technology Demonstrations (JCTDs) and Advanced Concept Technology Demonstrations (ACTDs). Both JCTDs and ACTDs are intended to rapidly field needed capabilities by using emergent mature technologies matched with innovative operational concepts. - Completed experimentation of simulation based training technologies to enhance individual and small unit combat task proficiency and decision making. ***FY 2015 Plans:*** - Continue all efforts of FY 2014, less those noted as completed above. - Initiate development and assessment of modeling and simulation hardware, software, and training capabilities that support planning/experimentation processes. ***FY 2016 Base Plans:*** - Continue all efforts of FY 2015. ***FY 2016 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	42.166	42.715	46.112	-	46.112

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

The primary objective of this PE is the development, demonstration, and assessment of technologies that represent capabilities to meet unique Marine Corps needs in conducting Expeditionary Maneuver Warfare in the future. The program consists of a collection of projects categorized by critical warfighting function. Individual project metrics reflect the technical goals of each specific project. Typical metrics include the advancement of related Technology Readiness Levels, the degree to which project investments are leveraged with other performers, reduction in life cycle cost upon application of the technology, and the identification of opportunities to transition technology to higher categories of development.