Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Navy										DATE: February 2012	
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602131M: *Marine Corps Lndg Force Tech*							
COST ($ in Millions)	**FY 2011**	**FY 2012**	**FY 2013 Base**	**FY 2013 OCO**	**FY 2013 Total**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Cost To Complete**	**Total Cost**
Total Program Element	42.131	44.745	46.528	-	46.528	47.207	48.251	49.116	50.086	Continuing	Continuing
3001: *Marine Corps Landing Force Tech*	42.131	44.745	46.528	-	46.528	47.207	48.251	49.116	50.086	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 (Sep 2011). 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). It provides the vision and key objectives for the essential science and technology efforts that will enable the continued supremacy of U.S. 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.

This PE is organized into nine activities which are represented as seven Expeditionary Warfighting Capability Areas, as well as Future Concepts, Technology Assessment and Roadmapping, and the Littoral Combat/Power Projection (LC/PP) FNC. The primary objective of this PE is to develop and demonstrate the technologies needed to meet the Marine Corps' unique responsibility of training and equipping the Marine Air/Ground Task Force (MAGTF) for Expeditionary Maneuver Warfare. In the post-September 11 world, irregular warfare (IW) has emerged as the dominant form of warfare confronting the United States, its allies and its partners; accordingly, this PE has been structured to account for distributed, long-duration operations, including unconventional warfare, counterterrorism, counterinsurgency, and stabilization and reconstruction operations. IW emphasizes the use of indirect, non-conventional methods and means to subvert, attrite, and exhaust an adversary, or render irrelevant, rather than defeat him through direct conventional military confrontation. IW in now institutionalized in the Marine Corps' planning, investment, and capability development. This PE provides the knowledge base to support Advanced Technology Development (6.3) and is the technology base for future expeditionary warfare capabilities. This PE supports the Expeditionary Force Development System of the Marine Corps Combat Development Command (MCCDC) and responds directly to the Marine Corps Science and Technology (S&T) process as well as supporting related Littoral and Expeditionary Maneuver Warfare capabilities developed by the Navy's Mission Capability Program. The Future Naval Capabilities (FNC) process is supported and funds are programmed accordingly. The FNC program explores and demonstrates technologies that enable Sea Strike, Sea Shield, Sea Basing, FORCEnet and Force Health Protection pillars, Space, Naval Expeditionary Maneuver Warfare and the Enterprise and Platform Enablers. The FNC program is composed of Enabling Capabilities (ECs) which develop and deliver quantifiable products (i.e., prototype systems, knowledge products, and technology improvements) in response to validated requirements for insertion into acquisition programs of record after meeting agreed upon exit criteria within five years. The core 6.2 program also supports Discovery and Invention (D&I) and Innovation and Transformation (I&T). Within the Naval Transformation Roadmap, this investment will achieve key transformational capabilities required by the Sea Power 21 Pillars, as well as enable Ship to Objective Maneuver (STOM), Persistent Intelligence, Surveillance and Reconnaissance and Overseas Contingency Operations (OCO).

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

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B. Program Change Summary ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Previous President's Budget	43.776	44.845	46.095	-	46.095
Current President's Budget	42.131	44.745	46.528	-	46.528
Total Adjustments	-1.645	-0.100	0.433	-	0.433
• Congressional General Reductions	-	-0.100			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.170	-			
• SBIR/STTR Transfer	-1.224	-			
• Program Adjustments	-	-	-0.072	-	-0.072
• Rate/Misc Adjustments	-	-	0.505	-	0.505
• Congressional General Reductions Adjustments	-0.251	-	-	-	-

Change Summary Explanation

Technical: FY 2010 and out reflects funding for a DoD directed integrated capability demonstration supporting the Protection of Ground Forces and Systems to meet the imposing security threats that challenge our Nation, and it may not be adequately postured to take advantage of key scientific and technological opportunities that offer breakthrough advantages to our warfighters. This broad, multi-year (through the FYDP) initiative will expand existing technology integration and increase/spur the application of more fundamental technologies to force and platform protection. The goal is multiple broad phased force protection applications and technologies, with off-ramps for fielding successes; therefore, funding associated with this DoD initiative is reflected throughout the PE.

In FY 2011 efforts continue in areas of technology that are ready for major, integrated technology demonstration. All technical work is being coordinated throughout DoD on these demonstrations. In areas such as vehicle technology demonstrations, the goal is to deliver multiple classes of advanced technology ground vehicle demonstrations leading to new classes of protective, efficient, ground vehicles.

Schedule: Not applicable.

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COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
3001: *Marine Corps Landing Force Tech*	42.131	44.745	46.528	-	46.528	47.207	48.251	49.116	50.086	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project is organized into nine activities which are represented as seven Expeditionary Warfighting Capability Areas, as well as Future Concepts; Technology Assessment and Roadmapping; and the Littoral Combat/Power Projection (LC/PP) FNC. The seven Expeditionary Warfighting Areas support the Discovery and Invention (D&I) and the Innovation and Transformation (I&T) investment. The LC/PP FNC supports the Exploitation and Deployment (E&D) investment.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
Title: FIREPOWER	4.162	4.535	4.780

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 2011 Accomplishments:

- Continued development of a concept for an insensitive munitions propulsion system to enable firing a shoulder launched rocket from an enclosed space.
- Continued investigation of the scalability of variable effects conventional munitions technology for improving firepower effectiveness while increasing affordability and decreasing logistics burden in support of expeditionary warfare.
- Continued development of collaborative fires coordination technologies.
- Continued development of precision fires engagement technologies, to include trajectory shaped 81mm mortars.
- Continued expanded efforts in lightweight weapons and ammunition (crew served weapons, small arms ammunition, and packaging), to include Caseless (CL) Ammunition. This includes priority USMC fires efforts in Micro-electromechanical Systems (MEMS) Safe and Arm (S&A), to develop a Military Standard (MilStd) 1316 compliant S&A for incorporation into developmental precision 81mm mortar munitions and MEMS Initiation Safety Device (ISD), to develop MilStd 1901A compliant igniters for current and developmental weapons propulsion systems as well as a Revolutionary Target Effects project, to develop conventional warhead concepts for breaching specific urban targets.
- Continued Targeting & Engagement and Precision Target Location efforts that include Non-Magnetic Azimuth Sensing (NMAS) Technology. NMAS will continue to develop various technologies to achieve higher performance than previously possible while decreasing size and weight.
- Continued design and development of lightweight technologies to provide individual Marines enhanced capabilities to detect and identify man-sized targets at least out to the maximum effective ranges of their individual weapons, during all conditions (daylight, limited visibility, & darkness), by integrating multiple optics capabilities into a single system.

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Completed development of eye-safe micro-pulse laser designator (MPLD) technology, pushing state of the art technology development to meet the program's low energy, designator and seeker objective capabilities. ***FY 2012 Plans:*** - Continue all efforts of FY 2011, less those noted as completed above. - Continue E&D portion of NMAS technology development to reduce size, weight and power (SWaP) while increasing performance. - Continue E&D portion of MPLD technology development, pushing state of the art technology development to meet the program's objective capabilities. - Complete D&I portion of Flight Controlled Mortar (81mm), having trajectory shaped flight path. - Initiate Hypervelocity Gun Propulsion project, to investigate hypervelocity gun technologies for Marine expeditionary weapons systems as possible artillery, tank main gun, and/or naval surface fire support replacement systems. - Initiate Semi-Autonomous Fires Technology. ***FY 2013 Plans:*** Narrative Clarification: FY 2012 Plans to initiate a Hypervelocity Gun Propulsion project have been delayed due to higher competing priorities. - Continue all efforts of FY 2012, less those noted as completed above. - Initiate Awareness for Lightweight Engagements and Remote Targeting (ALERT) to develop large aperture, lightweight lens with enhanced fields of view. - Complete D&I portion of Semi-Autonomous Fires Technology (SAFT).			
Title: FORCE PROTECTION	4.596	5.122	5.286
Description: This activity supports the Force Protection Thrust's applied research program. Technologies are being developed that focus on the following: Landmine avoidance, detection, and breaching/neutralization; Counter Improvised Explosive Devices; Counter Rocket, Artillery, Mortar, and Sniper; Technologies for improved protection for individuals including Marine Personnel Protective Equipment against blast, ballistic and blunt impact threats and in chemical, radiological, and biological environments; and physical installation and checkpoint security. Force Protection (FP) related technologies, including all MCM and counter Improvised Explosive Device (IED) related technology development are now reflected in this thrust area's submission. FY 2011 to FY 2012 increase results from implementation of a program for sensor fields development to identify and classify mine threats and accelerated efforts in personal protection - specifically modeling and simulation for ballistic fabric optimization and development. ***FY 2011 Accomplishments:***			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Continued development of technologies for stand-off detection and neutralization of mines, IEDs, and Unexploded Ordnance (UXO) (Transitioned from Maneuver activity). - Continued development of technologies to defeat side/top attack and advanced mine fuzes (seismic, acoustic, and infrared) through advanced signature reduction, duplication, and projection (Transitioned from Maneuver activity). - Continued spectral signature classification efforts for MCM applications (Transitioned from Maneuver activity). - Continued development of computational models to scale the effects of small-scale explosives tests to full-scale landmine explosions in order to study mine blast effects on advanced vehicle geometry. - Continued technology development programs to address force protection personal protective equipment capability gaps (Transitioned from Maneuver activity). - Continued development of technologies to defeat advanced mine fuzes (seismic, acoustic, and infrared) (Transitioned from Maneuver activity). - Continued studies of sensor fields to identify and classify mine threats. - Continued evaluation of active wideband double notch filters for a wide spur-free dynamic range in specific frequencies of interest to cover a variety of threats. - Continued an Explosive Hazard Defeat for IED Neutralization effort focused on applying passive infrared phenomenology understanding to a capability enabling defeat of PIR devices from significant stand-off distances. - Continued Counter Rockets, Artillery, Mortars, and Sniper efforts addressing indications and warnings for pre-shot sniper detection and enabling detection of sniper observation and targeting in advance of a ballistic event. - Continued technology development efforts to detect and defeat incoming rocket, artillery, and mortar threats via non-kinetic means. - Continued multi-spectral protection efforts against battlefield directed energy weapons. - Completed spectral signature classification efforts for neutralization confirmation. - Completed development of shape charge, safe and arm, and non-energetic launch and delivery technologies to support scalable explosive neutralization. (Relates to FY 2009 plan to continue development of technologies for stand-off detection and neutralization of mines, IEDs, and UXO). - Completed multi-material fiber level modeling and simulation for ballistic fabric optimization and development. (Relates to FY 2009 plan to continue technology development programs to address force protection personal protective equipment capability gaps). - Initiated studies of sensor fields to identify and classify mine threats (see FY 2012 narrative clarification).			
FY 2012 Plans: - Continue all efforts of FY 2011, less those noted as completed above. - Continue technology development programs to address force protection personal protective equipment capability gaps. (Transitioned from Maneuver activity).			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Continue a study regarding the feasibility of detecting and locating sniper weapons using the return of their unique radar signatures that was initiated in FY 2011 due to operational urgency. - Continue a study of automated human detection via spectral imaging during low-light level operation conditions (e.g. dusk/dawn/ moonlit/starlit night) that was initiated in FY 2011, due to operational urgency. - Continue the development of develop technologies that will detect and classify optics (sniper scopes, ccds, eyeball, etc) from a moving platform due from an effort that was initiated in FY 2011 due to an urgent operational need. - Continue the development of technologies that will detect Rocket Propelled Grenades (RPGs) and Anti-Tank Guided Missiles (ATGMs) prior to launch and countermeasures after launch from a new effort that was initiated in FY 2011 due to operational urgency. - Continue 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. Due to an urgent Naval operational need, this effort was initiated in FY 2011. - Continue a scientific study of laser technology readiness, performing technology roadmapping, and conducting system level simulations. This effort was initiated in FY 2011 due to an urgent operational need. This effort continues in FY 2012 and will assess the suitability of lasers on the battlefield and drive future HEL technology investment plans and support the acquisition process. - Complete the high-speed syntactic landmine detection algorithm development to support ground penetrating radars in FY 2011. This effort was planned for completion in FY 2010 but was delayed due to technical setbacks. - Complete development of shape charge, safe and arm, and non-energetic launch and delivery technologies to support scalable explosive neutralization (Relates to FY 2009 plan to continue development of technologies for stand-off detection and neutralization of mines, IEDs, and UXO). - Complete multi-material fiber level modeling and simulation for ballistic fabric optimization and development (Relates to FY 2009 plan to continue technology development programs to address force protection personal protective equipment capability gaps). - Initiate studies of sensor fields to identify and classify mine threats. This effort was planned for initiation in FY2011 but was delayed due to emerging higher priority requirements.			
FY 2013 Plans: - Continue all efforts of FY 2012, less those noted as completed above. - Continue studying automated human detection via spectral imaging during low-light level operation conditions (e.g. dusk/dawn/ moonlit/starlit night). - Continue to develop and demonstrate technologies that will detect RPGs and ATGMs prior to launch and countermeasures after launch.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Continue the study 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. - Continue the scientific study of laser technology readiness, performing technology roadmapping, threat vulnerability testing and conducting system level simulations to assess the suitability of lasers on the battlefield and to devise future HEL technology investment plans in support of the acquisition process. - Continue technology development programs to address force protection personal protective equipment capability gaps (Transitioned from Maneuver activity). - Complete studying the feasibility of detecting and locating sniper weapons using the return of their unique radar signatures. - Continue technology development programs that will detect and classify optics (sniper scopes, charge coupling devices, eyeballs, etc.) from a moving platform (Technologies will be identified in an earlier funded study).			
Title: FUTURE CONCEPTS, TECHNOLOGY ASSESSMENT, AND ROADMAPPING	1.077	1.337	1.343
Description: This activity supports the planning and integration of technology development efforts across the entire PE. In conjunction with the Concepts Based Capabilities System and the Marine Corps Warfighting Laboratory, unique and novel concepts for advanced warfighting are developed and validated. Effectiveness analyses are conducted to identify the synergistic effects that can be achieved through the integration of emerging technology with innovative tactics, doctrine, and techniques. Technology assessments are conducted to determine the supporting technologies that have the highest impact across the warfare areas, and warrant further investment within this PE. Technology Roadmapping is conducted to help identify opportunities to leverage technology development within the Department of the Navy and the Department of Defense, as well as, with the commercial sector and university communities. The resultant technology investment strategy is developed and used to guide out-year technology development efforts. The increase in Funding from FY2011 to FY2012 is due to the initiation of two new assessments: A Cargo Unmanned Aerial study focused on developmental technologies for expeditionary operations to include ground autonomous capabilities and an assessment of Unmanned Ground Systems Affordability, Experimentation and Rapid Prototyping Investments and roadmapping. ***FY 2011 Accomplishments:*** - Continued assessments in Lightening the Marine's Load and Enhancing the Capabilities of the Marine Corps Rifle Squad. - Continued assessments in Asymmetric / Irregular Warfare and Distributed Operations. - Continued new planning and integration of technology development efforts to meet imposing security threats that challenge our Nation.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Continued an assessment of the S&T impacts of Marine Corps' concept of force employment to meet the need for counterinsurgency and building partnership capacity. How the Marine Corps will support the National Defense Strategy (NDS) and multinational efforts in the Global War on Terrorism/Long War will have long-term S&T impacts. - Completed the assessment of the Distributed Operations S&T Strategic Focus Area and portfolios. - Completed the assessment of the DoD directed integrated capability demonstration supporting the DoD Protection of Ground Forces and Systems initiative as well Quadrennial Defense Review (QDR) impacts. The QDR is a legislatively-mandated review of Department of Defense strategy and priorities (Note: This includes an assessment of the S&T Expeditionary Operations impacts of Naval Operations Concept 2010 (NOC 10) which describes when, where and how U.S. Naval forces will contribute to enhancing security, preventing conflict and prevailing in war.) ***FY 2012 Plans:*** - Continue all efforts from FY 2011, less those noted as completed above. - Complete an assessment of the S&T impacts of Marine Corps' concept of force employment to meet the need for counterinsurgency and building partnership capacity. How the Marine Corps will support the National Defense Strategy (NDS) and multinational efforts in the Global War on Terrorism/Long War will have long-term S&T impacts. - Initiate a Cargo Unmanned Aerial study focused on Ship-to-Objective Maneuver (STOM) and developmental technologies for expeditionary operations to include ground autonomous capabilities. - Initiate an assessment of Unmanned Ground Systems Affordability, Experimentation and Rapid Prototyping Investments and formulate a USMC S&T future strategy. - Initiate an effort focused on the suitability of lasers on the battlefield and formulate future High Energy Laser technology investment plans that support the acquisition process. ***FY 2013 Plans:*** - Continue all efforts of FY 2012 less those noted as complete above. - Initiate an assessment of DoD-Wide programs to increase individual resiliency training throughout unit forming, training, deployment and post deployment phases. The objective is to provide the best skills and tools available to Marines and their leaders so that they can better cope with the challenges of combat and the rigor of life as a Marine both deployed and in garrison.			
Title: HUMAN PERFORMANCE, TRAINING AND EDUCATION ***Description:*** The Human Performance Training and Education thrust develops advanced training technology and technologies that enhance neural, cognitive and physical aspects of human performance including mental resilience, cognitive agility, expertise development and enhanced physical readiness in extreme combat environments. Also included are advanced technologies in customized training interventions, stress training and crisis decision making to support warfighter tactical decision-making, optimal physical conditioning and sustainment, modeling, simulation, range instrumentation, and synthetic environment generation.	4.497	4.535	4.825

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
FY 2011 Accomplishments: - Continued the development of foundational 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. - Continued development of training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition and expertise. - Continued additional Human Performance and Training efforts (Cognitive and physical enhancement, modeling and simulation, and virtual reality squad level training in support of Distributed Operations). - Continued additional efforts to incorporate effects of nutrition and functional fitness into models and simulations in the Distributed Operations Virtual Toolkit. - Continued Advanced Mobile Assessment and Field Readiness Technologies to improve the capability to assess situational awareness in the field and predict physical performance by developing mobile, rugged tools, algorithms, and models. - Continued a Mind-Body Integration Systems effort to improve team training by developing and validating Electroencephalogram (EEG) (and other physiological and performance measures) for use in assessing team performance, coordination, and cohesion in training environments. - Continued studies into next generation physical performance enhancement methodologies and technologies (enhanced warfighter psycho-physical performance). - Continued research to evaluate the feasibility of integrating augmented reality technologies into current and emerging training systems (Smart Tutoring Systems). - Continued evaluations of asymmetric distributed learning techniques for distributed operations, language, and cultural training. - Continued development of team training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise. - Continued development of team training/immersive approaches towards language and culture training that incorporate foundational learning theories and other advanced educational methods. - Initiated development of squad-level team training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise. - Initiated development of field team performance mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise.			
FY 2012 Plans: - Continue all efforts of FY 2011. - Continue research into acclimatization parameters to enhance warfighter performance. This effort initiated in FY 2011 due to urgent operational needs.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Complete research into distributed operations peak neural and cognitive performance. (Relates to the advanced technology efforts to demonstrate and evaluate mobile field technologies for assessing situational awareness and predicting readiness and performance initiated in FY 2012 and resourced in PE 0603640M). - Complete research into workload stress and performance, and brain dynamics of coordinated teams in immersive training. - Complete studies into next generation physical performance enhancement methodologies and technologies (Brain Dynamics of Coordinated Teams). - Complete research on biomarkers of heat stress and resilience. - Complete research to evaluate the feasibility of integrating augmented reality technologies into current and emerging training systems (expressive interacions in the virtual environment). - Initiate research into heat stress mitigations for the individual warfighter and develop intervention strategies to improve performance in hot environments. - Initiate research into distributed mobile architectures to support US Marine Corps training. - Initiate research into mobile field technologies for predicting readiness and performance.			
FY 2013 Plans: - Continue all efforts of FY 2012 less those noted as complete. - Continue research into heat stress mitigations for the individual warfighter and develop intervention strategies to improve performance in hot environments. - Continue research to improve nutritional optimization strategies for enhancing performance of warfighters. - Continue research into distributed mobile architectures to support US Marine Corps training. - Complete feasibility research into mobile field technologies for predicting readiness and performance. - Complete the development of foundational 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. - Complete additional Human Performance and Training efforts (Cognitive and physical enhancement, modeling and simulation, and virtual reality squad level training in support of Distributed Operations). - Complete additional efforts to incorporate effects of nutrition and functional fitness into models and simulations in the Distributed Operations Virtual Toolkit. - Complete Advanced Mobile Assessment and Field Readiness Technologies to improve the capability to assess situational awareness in the field and predict physical performance by developing mobile, rugged tools, algorithms, and models. - Complete a Mind-Body Integration Systems effort to improve team training by developing and validating Electroencephalogram (EEG) (and other physiological and performance measures) for use in assessing team performance, coordination, and cohesion in training environments.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Complete studies into next generation physical performance enhancement methodologies and technologies (enhanced warfighter psycho-physical performance). - Complete research to evaluate the feasibility of integrating augmented reality technologies into current and emerging training systems (Smart Tutoring Systems). - Complete research investigating the feasibility of identifying EEG markers of language learning and attentional flexibility, and incorporate into adaptive training protocols (Neuroadaptive Language Training). This effort was initiated in FY2010. - Complete evaluations of asymmetric distributed learning techniques for distributed operations, language, and cultural training. - Complete development of team training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise. - Complete development of team training/immersive approaches towards language and culture training that incorporate foundational learning theories and other advanced educational methods. - Complete development of squad-level team training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise. - Initiate research into cold tolerance biomarkers for the individual warfighter. - Initiate research into Acclimatization Strategies for Optimized Performance at Altitude, drawing on findings from previous research done in the field. - Initiate research into mobile brain imaging to enhance warfighter performance. - Initiate research into haptic solutions for immersive training environments. - Initiate research into skills retention technologies, advancing the Smart Tutoring System. - Initiate research into tools for distributed training (trend analysis).			
Title: INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR)	2.480	2.619	2.771
Description: This activity develops ISR technologies for applications in future intelligence, surveillance, and reconnaissance. Technologies being pursued enhance situational awareness, persistent surveillance, and tactical decision making through automated analysis of data and rapid integration of information and acquired knowledge. Specific technologies in this activity effectively present actionable information to decision-makers, especially those at the lower command levels. This includes biometrics for expeditionary operations, complete future automation of options and persistent surveillance in support of distributed operations.			
FY 2011 Accomplishments: N/A			
FY 2012 Plans:			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
N/A ***FY 2013 Plans:*** N/A			
Title: LITTORAL COMBAT/POWER PROJECTION ***Description:*** This activity funds the Marine Corps participation in the Future Naval Capabilities (FNC) program. It is aligned with the Sea Strike, Sea Shield, Sea Basing and FORCEnet and Expeditionary Maneuver Warfare (EMW) pillars as well as Force Health Protection and the Enterprise & Platform Enablers. It provides the capability for the demonstration and transition of technologies developed through the related Marine Corps S&T programs directly to an acquisition program of record. The funding profile reflects the alignment of the FNC program investments into ECs. Funding for each EC is aligned to a 6.2 or 6.3 Budget Activity (BA) as appropriate. The focus of the ECs within this PE will be on technology related to Urban, Asymmetric, Littoral and Expeditionary Operations. The related science and technology development is of the highest importance to Marine Corps operations in Iraq, Afghanistan and the OCO. The technologies associated with these gaps are being pursued as part of an overall effort that addresses Sea Strike, Sea Shield, Sea Basing and FORCEnet and Expeditionary Maneuver warfare Capability Gaps. Warfighter Capability Gaps are made up of ECs and supporting products. This activity includes support to the Urban, Asymmetric Operations-related EC's for IED's, Modular Scalable Effects Weapons, Advanced Naval Fires Technology, Dynamic Target Engagement, Position Location Information, Transparent Urban Structures, Hostile Fire Detection and Response, Lightweight Protective Systems, and Lightening the Load of Dismounted Combatants. ***FY 2011 Accomplishments:*** - Continued development and began transitioning EFV obstacle detection capability to EFV Direct Reporting Program Manager. - Continued development of integrated vehicle self-defense system to defeat incoming RPGs. - Continued transparent urban structure 'see thru the wall', image and mapping technologies development. - Continued development of an integrated company level Urban Sensor Suite. (Automated Control of Large Sensor Networks Transitions to PE 0602235N). - Continued detect and identify facilities technology development. (Transparent Urban Structures). - Continued decision aids technology development. - Continued indirect prototype technology development. (Modular Scalable Effects Weapon). - Continued development of Modular Scalable Effects weapons technologies. (Concurrent funding in PE 0603640M). - Continued development of counter Improvised Explosive Device (IED) technologies. (Concurrent funding in PE 0603640M). - Continued development of tactical urban breaching technologies. Due to required program necessities resourcing of continued development of tactical urban breaching technologies has been realigned to PE 0603640M. - Continued development of individual Warfighter protection technologies. (Concurrent funding in PE 0603640M).	9.800	9.925	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2013 Navy		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602131M: *Marine Corps Lndg Force Tech*	PROJECT 3001: *Marine Corps Landing Force Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Continued development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. (Concurrent funding in PE 0603640M and 0603236N). - Completed development of individual warfighter lightweight protective system technologies that will reduce body armor weight, improve survivability, and increase the mobility of the warfighter (concurrent funding provided by PE 0603640M). - Completed development and transition transparent urban structures technologies which will enable tactical units to detect, classify and discriminate between friendly and enemy personnel in urban structures, and to gather ground data to dynamically develop 3D models to map urban areas using an Unmanned Air Vehicle (UAV)/Unmanned Ground Vehicle (UGV)-based system. (Concurrent funding provided by PE 0603640M). - Initiated 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 incompatability, 3) providing Graphical User Interface (GUI)-based software for tradeoff analyses based on Military Operational Posture. (Concurrent funding provided by PE 0603064M and PR 0603236N).			
FY 2012 Plans: - Continue all efforts of FY 2011, less those noted as complete above. - Complete development of counter Improvised Explosive Device (IED) technologies. (Concurrent funding in PE 0603640M). - Complete development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. (Concurrent funding provided by PE 0603640M and 0603236N). - Initiate development of wide area surgical and persistent surveillence technologies. (Concurrent funding provided by PE 0602271N and PE 0603640M).			
FY 2013 Plans: - Continue all efforts of FY 2012, less those noted as complete above. - Continue development of wide area surgical and persistent surveillance technologies. (Concurrent funding provided by PE 0603640M). - Continue 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. (Concurrent funding provided by PE 0603640M). - Complete development and began transitioning Expeditionary Fighting Vehicle (EFV) obstacle detection capability to EFV Direct Reporting Program Manager (EFV POR terminated). - Complete development of integrated vehicle self-defense system to defeat incoming RPGs. - Complete transparent urban structure 'see thru the wall', image and mapping technologies development. - Complete development of an integrated company level Urban Sensor Suite. (Automated Control of Large Sensor Networks). - Complete detect and identify facilities technology development. (Transparent Urban Structures). - Complete decision aids technology development. (Transparent Urban Structures). - Complete indirect prototype technology development. (Modular Scalable Effects Weapon).			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Complete development of Modular Scalable Effects weapons technologies. - Complete development of counter Improvised Explosive Device (IED) technologies. - Complete development of tactical urban breaching technologies. - Complete development of individual Warfighter protection technologies. - Complete development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. - Initiate development of precision urban mortar attack technologies in FY11 due to operational contingencies. (Concurrent funding in PE 060640M). - Initiate development of fuel efficient Medium Tactical Vehicle Replacement (MTVR) technologies. (Concurrent funding in PE 0603640M). - Initiate development of the Ground Based Air Defense On-the-move high energy laser demonstrator. (Concurrent funding in PE 0603640M, PE 0602123N and PE 0603123N)			
Title: LOGISTICS	4.917	5.070	5.511
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. ***FY 2011 Accomplishments:*** - Continued advancement of high specific energy electrochemical capacitors to function as peak electric load-leveling buffers in advanced lightweight portable power applications. - Continued applications of advanced material surface treatments and coatings for reducing required maintenance and enhancing operational readiness of expeditionary warfare vehicles, machinery, and electrical systems (Note: This also includes development of alternative human load carrying concepts to lighten the load carried by the Marine and reduce structural damage to the human body). - Continued advancement of a solid oxide fuel cell capable of directly oxidizing liquid logistic fuels such as JP-8, thus eliminating the necessity for both reforming and sulfur removal pre-processing of the fuel. - Continued applied research toward producing a light weight device for converting hydrocarbon fuels to electrical energy. - Completed applied research in novel electrochemical capacitors for meeting the peak power requirements of USMC squad level equipment.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Completed applied research in novel electrochemical capacitors for meeting the peak power requirements of USMC squad level equipment. (Relates to FY 2008 accomplishment of continued analysis of Personal Power Network/Centralized Distributed Operations Power Generation System). - Completed the development of a micro-encapsulation approach for self healing primer paint coatings to minimize corrosion at paint damage locations. - Completed applied research toward the direct oxidation of JP-8 fuel, without prior reforming or sulfur removal, in a solid oxide fuel cell. - Initiated applied research toward an extremely high specific energy metal-air primary battery and research toward an advanced electrochemical ultracapacitor based on down-selection of prior research approaches. ***FY 2012 Plans:*** - Continue all efforts of FY 2011, less those noted as complete above. - Complete development of self lubricating coatings that will reduce maintenance expense and down time of systems and equipment. - Initiate development of water purification applied research focused toward small personal water purification devices. This includes previous work in an energy recovery system for enhancing the efficiency of small reverse osmosis water purification devices. - Initiate applied research into electrochemical methods of converting diverse hydrocarbon fuels to electrical energy. - Initiate applied research toward materials that will reduce or prevent wear and corrosion on systems and equipment. ***FY 2013 Plans:*** - Continue all efforts of FY 2012 less those noted as complete above. - Complete the development of a backpack that generates electric power from human motion. This effort was initiated in FY2009 (harnessing walking power).			
Title: MANEUVER	6.887	7.673	7.888
Description: The Maneuver thrust area focuses on the development, demonstration, and transition of technologies that will increase the warfighting capabilities and effectiveness of the Marine Air-Ground Task Force (MAGTF). 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. Special emphasis on survivability technologies for the defeat of small arms, IEDs, mine blast, and RPGs continue to be incorporated into this thrust area. Efforts also continue in the development of modeling and simulation tools that integrate many different physics based modeling systems with rigorous operational analysis simulations to accurately define a system's performance characteristics. These tools will aid in defining the trade space for emerging technologies and assist in providing the program manager insight and guidance into pursuing future technologies. Finally, this technology thrust area also seeks to develop technologies to enhance combat vehicle crewman effectiveness and situational			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013

awareness through the incorporation of advanced autonomous vehicle functions triggered directly by the cognitive state of the operator.

FY 2011 to FY 2012 funding increase is for initiation of programs to address maneuver capability gaps in survivability such as efforts to begin development of Advanced Blast Mitigation techniques and more effective Active Protection Systems; and to address gaps in mobility such as efforts to improve vehicle fuel efficiency through improvements in drive train and engine efficiencies and the development of alternative fuel capabilities to enhance tactical mobility in support of Distributed Operations.

FY 2011 Accomplishments:
- Continued lightweight Expeditionary Systems Materials (ESM) efforts to determine feasibility of scaling and producing candidate structural armor.
- Continued development of Advanced Interfaces and Ground Control technologies for combat vehicle crewmen (formerly Cognitive Assessment and Task Management (CATM) Augmented Cognition effort).
- Continued development of Advanced Electro-Magnetic Armor (AEMA) for ground vehicle survivability.
- Continued mobility enhancement development effort for current and future light and medium weight Marine Corps vehicle programs.
- Continued and completed development of materials to promote Combat Science and Technology Vehicle (CSTV) survivability.
- Continued efforts addressing survivability and technologies to mitigate acceleration and traumatic brain injuries to vehicle occupants to enhance tactical mobility.
- Continued efforts addressing advanced suspension systems with ride height adjustment capabilities, adjustable ride quality capabilities, rollover prevention, and load equalizing systems to enhance tactical mobility and survivability.
- Continued efforts addressing improvements in vehicle fuel efficiency by improvements in drive train efficiencies, engine efficiencies and alternative fuels capabilities to enhance tactical mobility.
- Continued technology development programs to address maneuver capability gaps in Survivability such as an Advanced Seat Technology effort to improve/increase occupant protection within the platform by reducing injury due to the effects of dynamic blast events and accidental vehicle rollover.
- Continued technology development programs to address maneuver capability gaps in Mobility such as a Vehicle Stability effort to improve/increase vehicle performance characteristics such as reducing vehicle rollover tendencies.
- Continued efforts in advanced perception and context-based reasoning 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 Survivability efforts in Advanced Blast Mitigation to develop solutions that mitigate injuries to vehicle occupants while reducing the weight burden thereby enhancing tactical mobility and survivability in support of Distributed Operations.
- Completed integration of CSTV capabilities.

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Completed development of fuel efficiency and battlefield power technologies for the CSTV and ground vehicles. ***FY 2012 Plans:*** - Continue all efforts of FY 2011. - Complete development of Advanced Interfaces and Ground Control technologies for combat vehicle crewmen (formerly Cognitive Assessment and Task Management (CATM) Augmented Cognition effort). - Initiate Survivability efforts in Advanced Blast Mitigation to develop solutions that mitigate injuries to vehicle occupants while reducing the weight burden, thereby enhancing tactical mobility and survivability. These efforts were delayed from FY 2011 due to a shift in program priorities which necessitated allocating the funds to the development of autonomous vehicle capabilities. - Initiate Advanced Mobility efforts in Future Fuel Alternatives and Advanced Propulsion and Suspension Technologies to improve vehicle fuel efficiency through improvements in drive train and engine efficiencies and alternative fuels capabilities to enhance tactical mobility. ***FY 2013 Plans:*** - Continue all efforts of FY 2012, less those noted as completed.			
Title: COMMAND, CONTROL, COMMUNICATIONS, AND COMPUTERS (C4) ***Description:*** This activity supports S&T investment in Command and Control and is focused in three main areas. (1) Implementing the FORCEnet concept. FORCEnet is the operational construct and architectural framework for naval warfare in the information age that integrates warriors, networks, command and control, and weapons into a networked, distributed, combat force that is scalable across all levels of conflict from the seabed to space and sea to land. The Marine Corps instantiation of FORCEnet is Marine Air Ground Task Force Command and Control (MAGTF C2), with technologies to exchange data and information with and among distributed tactical forces. (2) Developing decision support systems that enable warfighters to take advantage of the FORCEnet and MAGTF C2 and tactically extend Net-Enabled Command and Control (NECC) for shared situational awareness. (3) Providing effective combat identification of enemy combatants, friendly forces, and non-combatants. Activities in this activity provide technologies for secure, robust, self-forming, mobile communications networks distributed computing to support information dissemination to all echelons; and sensors, software and data processing to support formation of appropriate common picture. Marine Corps specific efforts include power management, low detect ability, size and weight constraints, and interoperability within the joint environment. ***FY 2011 Accomplishments:*** - Continued development of urban/restricted environment communications technologies. - Continued new efforts in Over-the-Horizon Communications, which include the development of an airborne software-defined communications, networking, Electronic Signals Intelligence (ELINT) and Electronic Warfare (EW) capability. - Continued Adaptable Antennas, Self-Adapting Radio Prototype and RF Technologies efforts.	3.715	3.929	4.124

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013
- Completed Adaptable Antennas Technologies, Field Programmable Gate Array Communications Architectures, and Information on Demand efforts. (Relates to FY 2009 plan to initiate new efforts in Over-the-Horizon Communications). - Initiated Cognitive Networking Technologies, Mobile Security Architecture Technologies, and Small Unit Blue Force tracking/ Position Location Information/Combat Identification Technologies efforts. ***FY 2012 Plans:*** - Continue all efforts of FY 2011, less those noted as completed above. - Complete RF Technologies, Adaptable Antennas and Info on Demand Technologies efforts. Other priorities shifted these completions from FY 2011. - Initiate Cognitive Networking and Trusted Computing Technology efforts. These technologies were planned for initiation in FY 2011 but will be delayed until FY 2012 due to unforeseen technical delays. ***FY 2013 Plans:*** - Continue all efforts of FY 2012, less those noted as completed above. - Complete Mobile Security Architecture, Small Unit Decision Aids, Position Location and Self-Adapting Radio Prototype efforts. These Small Unit C4 Technologies initiated in FY2009. - Initiate Dynamic Cosite Mitigation, Sensing Comms and Blue Force Tracking efforts.			
Accomplishments/Planned Programs Subtotals	42.131	44.745	46.528

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

Not applicable.

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 and Combating Terrorism. 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.