Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Navy											DATE: April 2013	
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)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	43.901	46.528	47.334	-	47.334	48.251	49.116	50.086	50.987	Continuing	Continuing
3001: *Marine Corps Landing Force Tech*	0.000	43.901	46.528	47.334	-	47.334	48.251	49.116	50.086	50.987	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

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 is now institutionalized in 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 comprises 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). The Marine Corps Service Campaign Plan (MCSCP) is the lens through which USMC S&T priorities are acted upon to guide the future development of the Total Force.

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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 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total
Previous President's Budget	44.745	46.528	47.207	-	47.207
Current President's Budget	43.901	46.528	47.334	-	47.334
Total Adjustments	-0.844	0.000	0.127	-	0.127
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	0.243	0.000			
• SBIR/STTR Transfer	-1.087	0.000			
• Rate/Misc Adjustments	0.000	0.000	0.127	-	0.127

Change Summary Explanation

Technical: Not Applicable.

Schedule: Not Applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Navy			DATE: April 2013
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COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
3001: *Marine Corps Landing Force Tech*	0.000	43.901	46.528	47.334	-	47.334	48.251	49.116	50.086	50.987	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

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 2012	FY 2013	FY 2014
Title: FIREPOWER	4.430	4.780	4.854

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 2012 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.

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- 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. - Continued E&D portion of NMAS technology development to reduce size, weight and power (SWaP) while increasing performance. - Completed E&D portion of MPLD technology development, pushing state of the art technology development to meet the program's objective capabilities. - Completed D&I portion of Flight Controlled Mortar (81mm), having trajectory shaped flight path. - Initiated Hypervelocity Gun Propulsion project, to investigate hypervelocity gun technologies for Marine expeditionary weapon systems as possible artillery, tank main gun, and/or naval surface fire support replacement systems. - Initiated Semi-Autonomous Fires Technology. ***FY 2013 Plans:*** Narrative Clarification: - Initiate Hypervelocity Gun Propulsion (project was in FY12 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). ***FY 2014 Plans:*** - Continue all efforts of FY 2013, less those noted as completed above. - Initiate 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. - Initiate Caseless, Lightweight, Low-volume Round (CLLVR) to develop lightweight, small caliber ammunition for individual, crew served, and remotely mounted weapons. - Initiate Advanced Sensors Applications (ASA) to develop Short Wave Infrared (SWIR) imagers for guided munitions seekers. - Initiate Disruptive Energetic Materials (DEM) to exploit nano-energetics developments for significant enhancement of explosive yield per warhead mass and volume.			
Title: FORCE PROTECTION ***Description:*** This activity supports the Force Protection Thrust's applied research program. Technologies are being developed that focus on the following: Explosive Hazard avoidance, detection, breaching/neutralization, marking and analysis; Air Defense/ Counter Rocket, Artillery, and Mortars; Counter tactical surveillance and targeting, and technologies for improved protection for individuals including Marine Personnel Protective Equipment against blast, ballistic and blunt impact threats.	5.005	5.286	5.377

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
FY 2012 Accomplishments: - 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 Mine Counter Measure (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 studies of sensor fields to identify and classify mine threats. - Continued technology development programs to address force protection personal protective equipment capability gaps. (Transitioned from Maneuver activity). - Continued 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. - Continued 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. - Continued the development of technologies that will detect and classify optics (sniper scopes, ccds, eyeball, etc) from a moving platform from an effort that was initiated in FY 2011 due to an urgent operational need.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Continued 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. - 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. Due to an urgent Naval operational need, this effort was initiated in FY 2011. - Continued 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. - Completed multi-spectral protection efforts against battlefield directed energy weapons. - Completed the high-speed syntactic landmine detection algorithm development to support ground penetrating radars. This effort was planned for completion in FY 2010 but was delayed due to technical setbacks. - Completed development of shaped 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. 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. - Complete studying the feasibility of detecting and locating sniper weapons using the return of their unique radar signatures.			
FY 2014 Plans: - Continue all efforts of FY 2013, less those noted as completed above. - Complete spectral signature classification efforts for MCM applications (Transitioned from Maneuver activity). - Complete 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. - Complete technology development efforts to detect and defeat incoming rocket, artillery, and mortar threats via non-kinetic means. - Complete multi-spectral protection efforts against battlefield directed energy weapons.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Complete a study of automated human detection via spectral imaging during low-light level operation conditions (e.g. dusk/dawn/ moonlit/starlit night). - Complete the development of technologies that will detect and classify optics (sniper scopes, ccds, eyeball, etc.) from a moving platform. - Complete the development of technologies that will detect Rocket Propelled Grenades (RPGs) and Anti-Tank Guided Missiles (ATGMs) prior to launch, and countermeasures after launch. - Complete development of technologies to defeat advanced mine fuzes (seismic, acoustic, and infrared) (Transitioned from Maneuver activity). - Complete studies of sensor fields to identify and classify mine threats. - Complete 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. - Complete 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. - Complete development and demonstrate technologies that will detect RPGs and ATGMs prior to launch and countermeasures after launch. - Initiate a program to determine the feasibility to detect and neutralize anti-helicopter mine threat. - Initiate the refinement and improve current suite of advanced biomechanical instrumentation to assess potential reductions of Warfighter mobility and functionality caused by PPE systems. - Initiate the scientific investigation into an integrated PPE performance tool for assessing coordinated human and armor performance (mobility, back-face deformation, area of coverage, propensity for injury and mass).			
Title: FUTURE CONCEPTS, TECHNOLOGY ASSESSMENT, AND ROADMAPPING	1.265	1.343	1.368
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.			
FY 2012 Accomplishments: - Continued assessments in Lightening the Marine's Load and Enhancing the Capabilities of the Marine Corps Rifle Squad.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- 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. - Continued an assessment of the S&T impacts of the 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. - Initiated a Cargo Unmanned Aerial study focused on Ship-to-Objective Maneuver (STOM) and developmental technologies for expeditionary operations, to include ground autonomous capabilities. - Initiated an assessment of Unmanned Ground Systems Affordability, Experimentation and Rapid Prototyping Investments and formulating a USMC S&T future strategy. - Initiated an effort focused on the suitability of lasers on the battlefield and formulating 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.			
FY 2014 Plans: - Continue all efforts of FY 2013, less those noted as complete above. - Complete assessments in Lightening the Marine's Load and Enhancing the Capabilities of the Marine Corps Rifle Squad. - Complete assessments in Asymmetric/Irregular Warfare and Distributed Operations. - Complete an assessment of the S&T impacts of the 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. - Complete a Cargo Unmanned Aerial study focused on Ship-to-Objective Maneuver (STOM) and developmental technologies for expeditionary operations, to include ground autonomous capabilities. - Complete an assessment of Unmanned Ground Systems Affordability, Experimentation and Rapid Prototyping Investments and formulate a USMC S&T future strategy. - Complete 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.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Initiate a careful analysis of trends that can identify emerging changes in the security environment that are likely to have significant implications for U.S. ground forces. The output will be used to reduce risk and hedge against the surprises that will inevitably occur.			
Title: HUMAN PERFORMANCE, TRAINING AND EDUCATION	4.430	4.825	4.900
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: Warfighter Resilience; and Decision Making and Expertise Development. The funding aligned to Warfighter Resilience is focused on advanced training technology and technologies that enhance neural, cognitive and physical aspects of human performance including mental resilience, cognitive agility, and enhanced physical readiness in extreme combat environments. Those funds aligned to Expertise Development refer specifically to those technologies and training strategies that enhance learning methods and strategies that accelerate the development and improve the retention of skills in decision making, adaptability, team leadership, and resilience. Decision Making refers specifically to those technologies and training strategies that enable superior performance of critical decision making by enhancing perceptual and decision-making skills, situational awareness, and individual and team adaptability and coordination on decentralized, dynamic and dispersed battlefields.			
FY 2012 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 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.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- 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. - Continued development of squad-level team training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise. - Continued development of field team performance mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise. - Continued research into acclimatization parameters to enhance warfighter performance. This effort initiated in FY 2011 due to urgent operational needs. - Completed 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). - Completed research into workload stress and performance, and brain dynamics of coordinated teams in immersive training. - Completed studies into next generation physical performance enhancement methodologies and technologies (Brain Dynamics of Coordinated Teams). - Completed research on biomarkers of heat stress and resilience. - Completed research to evaluate the feasibility of integrating augmented reality technologies into current and emerging training systems (expressive interactions in the virtual environment). - Initiated research into heat stress mitigations for the individual warfighter to develop intervention strategies to improve performance in hot environments. - Initiated research into distributed mobile architectures to support US Marine Corps training. - Initiated research into mobile field technologies for predicting readiness and performance.			
FY 2013 Plans: - Continue all efforts of FY 2012 less those noted as complete. - 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.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- 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. - 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). ***FY 2014 Plans:*** - Complete research into acclimatization parameters to enhance warfighter performance. - Complete research into heat stress mitigations for the individual warfighter, and develop intervention strategies to improve performance in hot environments. - Complete research into distributed mobile architectures to support US Marine Corps training. - Complete research into mobile field technologies for predicting readiness and performance. - Complete research to improve nutritional optimization strategies for enhancing performance of warfighters. - Complete research into cold tolerance biomarkers for the individual warfighter.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Complete research into Acclimatization Strategies for Optimized Performance at Altitude, drawing on findings from previous research done in the field. - Complete research into mobile brain imaging to enhance warfighter performance. - Complete research into haptic solutions for immersive training environments. - Complete research into skills retention technologies, advancing the Smart Tutoring System. - Complete research into tools for distributed training (trend analysis). - Initiate research into a multi-modal framework for assessing stress resiliency; develop, test and evaluate non-contact, video and audio-based human response measures for use in detecting degree and type of stress for eventual integration into a resiliency training program. - Initiate research into the architecture for stress, performance, inoculation, resilience, and endurance (ASPIRE); development of an inductive framework of stressors, stress proneness, and stress resilience, while also building an actionable, deductive counterpart of these stress variables that will ultimately include an operational taxonomy of stress resilience components, combined with an integrated stress resilience framework. - Initiate research into methodologies for assessing training and for training adaptability, identifying key salient components of adaptive behavior for Warfighter tactical tasks; research into the development of a generalized framework for adaptive behavior that can be applied to any appropriate tactical task, and the creation of methodologies for training interventions that demonstrates the feasibility of using virtual training experiences to accelerate the development of adaptive decision-making expertise			
Title: INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR)	2.558	2.771	2.799
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 2012 Accomplishments:*** - Continued development of information fusion technologies to allow automated construction of a common tactical picture from various sources of sensor data. - Continued development of low power consumption urban sensing technologies. - Continued development of tagging, tracking and locating technologies to monitor adversary movement. - Continued development of information on demand technologies to provide the warfighter with the right information at the right time. - Continued development of urban sensing technologies to detect weapons at distance.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Continued development of advanced tactical sensor technologies to improve unit awareness. - Continued development of distributed information architecture technologies. - Continued development of a single, integrated, battlespace picture with tactical and strategic injections that begins to close the gap between ISR and C2. - Continued Actionable Intelligence for Expeditionary and Irregular Warfare effort which includes real-time methods for Identifying Human Networks. - Continued development of advanced tactical nets to include additional phenomenologies and the netting of C2, Sensors and Analysis nodes. - Continued efforts addressing "battlespace awareness" of human networks, improving the accuracy of classification decisions and enabling a human network predictive capability. Once a human network sensor can be defined and dynamically observed in a common feature space, predictive capabilities are realized. If one network is observed to be moving towards at risk behavior, a generalized force warning may be enabled addressing the threat associated with all networks with similar human network sensors. When combined, research into human network awareness, network classification and network prediction, will be a powerful tool for warfare against the irregular actor. - Continued development of adaptable enemy course of action engine to manipulate adversary decisions. - Continued 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. - Continued efforts to track entities of interest in a high clutter environment via geolocation of optical tags from a UAV platform. - Continued development of capabilities to integrate socio-cultural models of human behavior with the ability to forecast the processes of decision making through predictive forecasting models. - Continued development of approach to model and expose enemy networks, actions, and reactions through statistical models with techniques for probabilistic forecasting of behaviors of interest, with consideration for open source information and conventional intelligence data sources. - Continued development of sensors that provide near-real-time decision support to distributed operations by detecting specific interactions utilizing nanotechnology. - Continued efforts to derive high resolution models of human networks statistically, with associated behavior attributes. - Continued work on specific nanomaterial triggers and receptors. - Continued work on new optical taggants with improved producibility. - Continued work on influencing, disrupting, and stimulating behavior by fusing high resolution models of decisions with models of human networks. This includes work to provide an accurate decision tool to the warfighter that is relevant to irregular warfare, and development of tools to enable robust facial recognition in poor conditions and difficult environments. - Completed tagging, tracking, and locating technologies development to address development of multi-INT track continuity.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Completed the decision prediction, manipulation, stimulation and learning detection capability to add tools that enable the warfighter to operate inside the OODA loop of an irregular actor. The Observe, Orient, Decide, Act (OODA) Loop provides a standard description of decision making cycles that is widely understood and accepted throughout the U.S. military. - Initiated development of model based adversarial decision making stimulus and manipulation that will assist in the influence of decisions made by adversaries to our benefit. ***FY 2013 Plans:*** - Continue all efforts from FY 2012, less those noted as completed above. - Complete 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. - Initiate research in automated techniques to establish the reliability of data from human and machine sources. - Initiate technology development efforts required to enable a lightweight hyperspectral sensor capable of material characterization. - Initiate research on the development of networked, ultra low power, long life and smart ground sensors. - Initiate research to develop algorithms that can disambiguate complex network graphs containing millions of sparsely characterized nodes. ***FY 2014 Plans:*** - Continue all efforts from FY 2013, less those noted as completed above. - Complete development of urban sensing technologies to detect weapons at distance. - Complete development of advanced tactical sensor technologies to improve unit awareness. - Complete development of adaptable enemy course of action engine to manipulate adversary decisions. - Complete work on specific nanomaterial triggers and receptors. - Complete work on new optical taggants with improved producibility. - Complete Actionable Intelligence for Expeditionary and Irregular Warfare effort which includes real-time methods for Identifying Human Networks. - Complete efforts to track entities of interest in a high clutter environment via geolocation of optical tags from a UAV platform. - Initiate development of advanced analytics (data disambiguation, conditioning, fusion and dissemination) as a set of map reduce tasks that can run across a highly distributed data architecture. - Initiate development of own force decision aids based on imprecisely-specified multi-attribute utility theory - Initiate the development of automated workflow managers enabled by the semantic representation of tasks and reources			
Title: LITTORAL COMBAT/POWER PROJECTION	9.925	10.000	10.200

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014

Description: This activity addresses the applied research 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-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 program elements funding Navy FNC work. In previous submissions 7 Navy 6.2 PEs and 8 Navy 6.3 PEs funded FNC efforts.

FY 2012 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 development of Modular Scalable Effects weapons 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).
- Continued development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. (Concurrent funding in PE 0603640M and 0603236N).
- Continued 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; and 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).
- Completed development of counter Improvised Explosive Device (IED) technologies. (Concurrent funding in PE 0603640M).
- Completed development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. (Concurrent funding provided by PE 0603640M and 0603236N).

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Initiated 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. - 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). - 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 universal mortar attack technologies. (Concurrent funding in PE 060640M). ***FY 2014 Plans:*** - Continue all efforts of FY 2013, less those noted as complete above. - Complete 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; and 3) providing Graphical User Interface (GUI)-based software for tradeoff analyses based on Military Operational Posture. - Complete development of precision universal mortar attack technologies. (Concurrent funding in PE 0603640M).			
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.	4.953	5.511	5.615

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
FY 2012 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. - Continued 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. - Completed development of self lubricating coatings that will reduce maintenance expense and down time of systems and equipment. - Initiated 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. - Initiated applied research into electrochemical methods of converting diverse hydrocarbon fuels to electrical energy. - Initiated 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 FY 2009 (harnessing walking power).			
FY 2014 Plans: - Continue all efforts of FY 2013, less those noted as complete above. - Complete development of self lubricating coatings that will reduce maintenance expense and down time of systems and equipment. - Complete research on hydrodynamic particle separation technologies for enhancing the life of water purification technologies at the small scale. - Complete research on photocatalytic technologies for un-powered water purification at the small scale. - Complete development of adsorbed membrane coatings to provide enhanced fouling resistance in membrane-based water purification systems.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Initiate the development of logistics IT systems for optimizing the transportation of materiel across multiple intra and inter-theater connector vehicles (aka, TET). - Initiate development of high efficiency, rugged, and inexpensive solar photovoltaic energy harvesting technologies (aka, Solar Blanket). - Initiate development technologies to facilitate cargo transfer across intra-theater logistics connector vehicles, to include advanced material handling equipment as well as asset tracking and reporting technologies. - Initiate the development of advanced water location, harvesting, packaging, distribution, and quality monitoring systems to enable Marines to be fully self-sufficient for water resources on the battlefield.			
Title: MANEUVER	7.497	7.888	8.038
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 awareness through the incorporation of advanced autonomous vehicle functions triggered directly by the cognitive state of the operator.			
FY 2012 Accomplishments: - Continued lightweight Expeditionary Systems Materials (ESM) efforts to determine feasibility of scaling and producing candidate structural armor. - 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.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- 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). - Completed development of Advanced Interfaces and Ground Control technologies for combat vehicle crewmen (formerly Cognitive Assessment and Task Management (CATM) Augmented Cognition effort). - 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. 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. - Initiated 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.			
FY 2014 Plans: - Continue all efforts of FY 2013, less those noted as completed. - Initiate the development of autonomy technologies and system concepts that will enable unmanned ground vehicles (UGVs) to be used as autonomous logistic connector vehicles. - Initiate the development of fuel saving vehicle technologies, including advanced transmission, power train, and electrical power system technologies. - Initiate mobility technologies that enable improved vehicle agility and stability. - Initiate lightweight armor, material, and structural technologies that enable maneuver and survivability of small, light expeditionary platforms. - Initiate survivability technologies that enable defeat of all unitary and tandem RPG and select ATGM threats, and the demonstration of survivable vehicles. - Initiate non-GPS localization technologies such that autonomous vehicles can navigate in areas where satellite data is inaccessible.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Initiate the development of technologies that enable vehicle component modularity and reduce life cycle costs.			
Title: COMMAND, CONTROL, COMMUNICATIONS, AND COMPUTERS (C4)	3.838	4.124	4.183

Description: This activity supports S&T investment in Command and Control and is focused in three main areas: (1) Implementing the FORCEnet concept; (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; and (3) Providing effective combat identification of enemy combatants, friendly forces, and non-combatants. 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 from 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. Activities in this program area provide technologies for secure, robust, self-forming, mobile communications networks and distributed computing to support information dissemination to all echelons; and sensors, software and data processing to support formation of an appropriate common picture. Marine Corps specific efforts include power management, low detectability, size and weight constraints, and interoperability within the joint environment.

FY 2012 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.
- Continued Cognitive Networking Technologies, Mobile Security Architecture Technologies, and Small Unit Blue Force tracking/ Position Location Information/Combat Identification Technologies efforts.
- Completed RF Technologies, Adaptable Antennas and Info on Demand Technologies efforts. Other priorities shifted these completions from FY 2011.
- Initiated Cognitive Networking and Trusted Computing Technology efforts. These technologies were planned for initiation in FY 2011 but were 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 were initiated in FY 2009.
- Initiate Dynamic Cosite Mitigation, Sensing Comms and Blue Force Tracking efforts.

FY 2014 Plans:

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
- Continue all efforts of FY 2013, less those noted as completed above. - Complete Small Unit Blue Force tracking/Position Location Information/Combat Identification Technologies effort. - Complete Self-Adapting Radio Prototype efforts. - Initiate a meta-material antennas effort. - Initiate a distributed, Cyber Technology development effort.			
Accomplishments/Planned Programs Subtotals	43.901	46.528	47.334

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 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.