Exhibit R-2, PB 2010 Navy RDT&E Budget Item Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 1319 - Research, Development, Test & Evaluation, Navy/BA 2 - Applied Research					R-1 ITEM NOMENCLATURE PE 0602131M MARINE CORPS LANDING FORCE TECHNOLOGY					
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	31.258	42.858	39.308						Continuing	Continuing
3001: MARINE CORPS LANDING FORCE TECHNOLOGY	31.258	42.858	39.308						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 (Jan 2007). 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. 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 and FORCEnet pillars. 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 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget	31.813	36.480	39.858	
Current BES/President's Budget	31.258	42.858	39.308	
Total Adjustments	-0.555	6.378	-0.550	
Congressional Program Reductions		-0.116		
Congressional Rescissions				
Total Congressional Increases		6.500		
Total Reprogrammings	-0.257			
SBIR/STTR Transfer	-0.298			
Program Adjustments			-0.574	
Rate/Misc Adjustments		-0.006	0.024	

Congressional Increase Details ($ in Millions)	FY 2008	FY 2009
Project: 9999, **HIGH POWER LIGHTWEIGHT ZINC-AIR BATTERY**	0.965	2.493
Project: 9999, **SURVIVABILITY PROGRAM**	1.447	0.000
Project: 9999, **WARFIGHTER RAPID AWARENESS PROCESSING TECHNOLOGY**	2.891	3.989

Change Summary Explanation

Technical: FY 2009 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 2010 preparation 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 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
3001: MARINE CORPS LANDING FORCE TECHNOLOGY	31.258	42.858	39.308						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 Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
COMMAND, CONTROL, COMMUNICATIONS, AND COMPUTERS (C4)	0.000	2.994	3.342	
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. In FY 2008, this effort was funded in the C4ISR activity within this PE. The increase in funding from FY 2008 to FY 2009 is due to this being the first year that C4 has been reported as a separate activity.				

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B. Accomplishments/Planned Program ($ in Millions)		**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
The FY 2009 to FY 2010 increase in funding results from the acceleration of efforts to complete and transition Adaptive Networking Technologies efforts. *FY 2009 Plans:* - Initiate development of C3 for the Distributed Operations Marine technologies. This includes development of technologies to allow small units to share Position and Location Information (PLI) in GPS-denied or restricted environments thereby enhancing current blue force situational awareness. - Initiate development of urban/restricted environment communications technologies. - Initiate 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. *FY 2010 Plans:* - Continue all efforts of FY 2009. - Complete Free Space Optical Communications Technologies and Adaptive Networking Technologies efforts. (Relates to C4ISR FY 2008 accomplishment of completed development of non-line-of-sight communications technologies). - Initiate Position Location Technologies.					
COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS, INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE (C4ISR) This activity provides technologies for secure, robust, self-forming, mobile communications networks (FORCEnet); distributed computing to support information dissemination to all echelons; and sensors, software and data processing to support formation of appropriate common picture. Emphasis for Marine Corps efforts includes power management, low detect ability, size and weight constraints, and interoperability within the joint environment.		4.232	0.000	0.000	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
The FY 2009 funding profile reflects both C4 and ISR efforts now being placed into new and separate activities within this PE. *FY 2008 Accomplishments:* - Continued development of information fusion technologies to allow automated construction of a common tactical picture from various sources of sensor data. (Transitions to ISR activity in FY 2009) - Continued development of low power consumption urban sensing technologies. (Transitions to ISR activity in FY 2009) - Continued development of tagging, tracking and locating technologies to monitor adversary movement. (Transitions to ISR activity in FY 2009) - Continued development of information on demand technologies to provide warfighter with the right information at the right time. (Transitions to ISR activity in FY 2009) - Continued development of urban sensing technologies to detect weapons at distance. (Transitions to ISR activity in FY 2009) - Continued development of adaptable enemy course of action engine to manipulate adversary decisions. (Transitions to ISR activity in FY 2009) - Completed development of conformal, broadband, UHF-VHF antennas. - Completed development of technology to provide position location in GPS restricted environments. - Completed development of non-line-of-sight communications technologies. - Initiated development of advanced tactical sensor technologies to improve unit awareness. (Transitions to ISR activity in FY 2009)				
FIREPOWER 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. The increase in funding from FY 2008 to FY 2009 reflects additional funding for expanded efforts in lightweight weapons and ammunition; exploration of infantry applications associated with emerging USMC requirements in lightening the load of the individual Marine; and a DoD directed integrated capability	2.180	4.273	3.618	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
demonstration supporting the Protection of Ground Forces and Systems. This capability demonstration has been directed to be wide ranging and encompass technologies for: - Pre-detonation of IEDs, - Personal protection materials, - Personal power generation, - Micro power sources, and - Augmented reality The integrated demonstration will be a broad, multi-year thrust to both investigate technology integration as well as spur 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. Technologies being developed by the Firepower activity are central to the integrated demonstration program. The FY 2009 to FY 2010 decrease in funding results from delays due to obtaining programmatic milestone approvals in the Targeting and Engagement and Precision Target Location efforts. *FY 2008 Accomplishments:* - Continued development of a concept for an insensitive munition propulsion system to enable firing a shoulder launched rocket from an enclosed space. - Continued development of enhanced mortar munitions for more effective fire support. - Continued investigation of the scalability of variable effects conventional munitions technology for improving firepower effectiveness while increasing affordability and decreasing logistical burden in support of expeditionary warfare. - Continued development of collaborative fires coordination technologies. - Continued development of precision fires engagement technologies. *FY 2009 Plans:* - Continue all efforts of FY 2008.				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- Initiate and continue development of Distributed Operations Precision Engagement collaborative fires coordination technologies. - Initiate expanded efforts in lightweight weapons and ammunition (mortars, crew served weapons, ammunition and packaging). - Initiate Targeting & Engagement and Precision Target Location efforts that include Integrated Day/Night Sight Technology. - Initiate design and development of lightweight technologies that provide individual Marines enhanced capabilities to detect and identify man-size targets at least out to the maximum effective range of their personal weapons during all conditions (daylight, limited visibility, & darkness) by integrating multiple capabilities into a single system. *FY 2010 Plans:* - Continue all efforts of FY 2009.				
FORCE PROTECTION 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. Beginning in FY 2009, Mine Counter Measure (MCM) efforts are funded within this activity. 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 2009 reflects additional funding for a DoD directed integrated capability demonstration supporting the Protection of Ground Forces and Systems. This capability demonstration has been directed to be wide ranging and encompass technologies for: - Pre-detonation of IEDs, - Personal protection materials,	0.000	3.862	4.210	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- Personal power generation, - Micro power sources, and - Augmented reality The integrated demonstration will be a broad, multi-year thrust to both investigate technology integration as well as spur 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. Technologies being developed by the Force Protection activity are central to the integrated demonstration program. The FY 2009 to FY 2010 increase results from accelerating efforts required to complete a neutralization effort focused on applying passive infrared phenomenology understanding to a capability enabling rapid defeat of Passive InfraRed Sensor (PIR) devices from significant stand-off distances. *FY 2009 Plans:* The following efforts transitioned from the Maneuver activity: - Continue development of technologies for stand-off detection and neutralization of mines, IEDs, and UXO. - Continue development of technologies to defeat side/top attack and advanced mine fuzes (seismic, acoustic, and infrared) through advanced signature reduction, duplication, and projection. - Continue spectral signature classification efforts for MCM applications. - Continue 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. - Continue studies into mine signature classification. - Continue technology development programs to address force protection personal protective equipment capability gaps. - Complete development of studies into mine signature classification. - Complete development of modeling tools to accurately determine loading and fragmentation effects on targets from mine explosions.				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- Complete evaluation of low passive inter-modulation narrowband antennas and wideband antennas for potential use in detection methodologies. (Relates to Maneuver FY 2008 accomplishment of continued technologies for stand-off detection and neutralization). - Initiate studies of sensor fields to identify and classify mine threats. - Initiate 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. - Initiate 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. - Initiate 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. *FY 2010 Plans:* - Continue all efforts of FY 2009, less those noted as completed above. - Complete magnetic and seismic portion of development of technologies to defeat side/top attack and advanced mine fuzes. - Complete high-speed syntactic landmine detection algorithm development to support ground penetrating radars. (Relates to FY 2009 plan to continue development of technologies for stand-off detection and neutralization of mines, IEDs, and UXO). - Complete Neutralization effort focused on applying passive infrared phenomenology understanding to a capability enabling defeat of PIR devices from significant stand-off distances. - Complete vulnerability analysis of selected munitions and targets. (Relates to FY 2009 plan to initiate Counter Rockets, Artillery, Mortars, and Sniper efforts). -Initiate technology development efforts to detect and defeat incoming rocket, artillery, and mortar threats via non-kinetic means. - Initiate multi-spectral protection efforts against battlefield directed energy weapons.				
FUTURE CONCEPTS, TECHNOLOGY ASSESSMENT, AND ROADMAPPING	0.589	0.906	1.057	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
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 2009 reflects additional funding for new assessments in Asymmetric/Irregular Warfare and Distributed Operations; and a DoD directed integrated capability demonstration supporting the Protection of Ground Forces and Systems. This capability demonstration has been directed to be wide ranging and encompass technologies for: - Pre-detonation of IEDs, - Personal protection materials, - Personal power generation, - Micro power sources, and - Augmented reality The integrated demonstration will be a broad, multi-year thrust to both investigate technology integration as well as spur 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. *FY 2008 Accomplishments:* - Continued Technology Assessments associated with the Urban Asymmetric and Expeditionary Warfare Capability Gap. - Continued the integrated planning of concepts and technology development.				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- Continued development of the Expeditionary Maneuver Warfare Investment Strategy. - Continued Technology Assessments and Roadmapping within Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR); and Firepower Thrust Areas of the PE. - Continued Technology Assessment of the Combating Terrorism portfolio. - Completed implementation of S&T Management Information System. - Initiated assessment of the technical requirements of the Marine Corps Special Operations Command (MARSOC). *FY 2009 Plans:* - Continue all efforts from FY 2008, less those noted as completed above. - Continue assessment of the technical requirements of the MARSOC. - Initiate and continue assessments in Lightening the Marine's Load and Enhancing the Capabilities of the Marine Corps Rifle Squad. - Initiate assessments in Asymmetric / Irregular Warfare and Distributed Operations. - Initiate assessments of all new and emerging Counter Sniper Technologies. - Initiate new planning and integration of technology development efforts to meet imposing security threats that challenge our Nation. *FY 2010 Plans:* - Continue all efforts from FY 2009. - Complete the assessment of the technical requirements of the MARSOC. - Complete assessments of all new and emerging Counter Sniper Technologies. - Complete Technology Assessment of the Combating Terrorism portfolio. - Complete Technology Assessments associated with the Urban Asymmetric and Expeditionary Warfare Capability Gap. - Complete the integrated planning of concepts and technology development. - Complete development of the Expeditionary Maneuver Warfare Investment Strategy.				

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B. Accomplishments/Planned Program ($ in Millions)		**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
- Complete Technology Assessments and Roadmapping within Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR); and Firepower Thrust Areas of the PE. - Initiate 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 supports the National Defense Strategy (NDS) and multinational efforts in the Global War on Terrorism/Long War will have long-term S&T impacts.					
HUMAN PERFORMANCE, TRAINING AND EDUCATION This activity develops advanced training technology and technologies that enhance neural and cognitive aspects of human performance including cognitive task analysis, tactical decision-making, modeling, simulation, range instrumentation, and synthetic environment generation. The increase from FY 2008 to FY 2009 reflects additional funding for USMC priorities in cognitive and physical enhancement; modeling and simulation; virtual reality squad level training in support of Distributed Operations; and a DoD directed integrated capability demonstration supporting the Protection of Ground Forces and Systems. This capability demonstration has been directed to be wide ranging and encompass technologies for: - Pre-detonation of IEDs, - Personal protection materials, - Personal power generation, - Micro power sources, and - Augmented reality The integrated demonstration will be a broad, multi-year thrust to both investigate technology integration as well as spur 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. Technologies being developed by the Human Performance, Training and Education activity are central to the integrated demonstration program.		2.104	3.495	3.984	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
The FY 2009 to FY 2010 funding increase results from accelerated efforts to complete and transition research into distributed operations peak neural and cognitive performance. *FY 2008 Accomplishments:* - Continued evaluation and development of tools to support real-time cognitive and behavioral assessment (augmented cognition) and improvement of individuals and teams during operations and training. - Continued research in the area of team training task analyses and training effectiveness evaluation techniques to develop more effective training systems for Military Operations in Urban Terrain (MOUT). - Continued and completed research to develop metrics for improving an individual's operational performance in stressful urban environments including use for selection and recruiting to that mission specialty. - Continued research to evaluate the feasibility of integrating augmented reality technologies into current and emerging training systems. - Continued research on combat feeding and hydration. - Continued research on physiological correlates for the strategic corporal assessment. - Continued development into a Marine performance optimization model. - Continued the development of training effectiveness measures and techniques as applied to disparate, multi-platform, multi-mission team training. - Completed research on combat situation awareness and its effect on combat performance. - Initiated research into distributed operations peak neural and cognitive performance. - Initiated research into next generation survivability enhancement technologies. *FY 2009 Plans:* - Continue all efforts of FY 2008, less those noted as completed above. - Continue studies into next generation physical performance enhancement methodologies and technologies (Continues in PE 0603640M). - Complete evaluation of tools to support real-time cognitive and behavioral assessment (augmented cognition) and improvement of individuals and teams during training.				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- Complete research in the area of team training task analyses and training effectiveness evaluation techniques to develop more effective training systems for MOUT. - Initiate 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. - Initiate development of training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition and expertise. - Initiate additional Human Performance and Training efforts (Cognitive and physical enhancement, modeling and simulation, and virtual reality squad level training in support of Distributed Operations). - Initiate Distributed Operations training system investigations to perceptual skills enhancement that lead to enhanced cognition and decision making. - Initiate additional efforts to incorporate effects of nutrition and functional fitness into models and simulations in the Distributed Operations Virtual Toolkit. - Initiate 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. - Initiate 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. *FY 2010 Plans:* - Continue all efforts of FY 2009, less those noted as completed above. - Complete Distributed Operations training system investigations to perceptual skills enhancement that lead to enhanced cognition and decision making. - Complete research into distributed operations peak neural and cognitive performance. - Initiate evaluations of asymmetric distributed learning techniques for distributed operations, language, and cultural training. - Initiate development of team training mitigation strategies triggered by behavioral and neurophysiological markers of learning, cognition, and expertise.				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- Initiate development of team training/immersive approaches towards language and culture training that incorporate foundational learning theories and other advanced educational methods.				
INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR)	0.000	1.995	2.229	
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 complete future automation of options and persistent surveillance in support of distributed operations. In FY 2008, this effort was funded in the C4ISR activity within this PE. The increase in funding from FY 2008 to FY 2009 is due to this being the first year that ISR has been reported as a separate activity. The increases in funding from FY 2009 to FY 2010, are due to enhanced ISR Sensor Field efforts. *FY 2009 Plans:* The following efforts transitioned from the C4ISR activity: - Continue development of information fusion technologies to allow automated construction of a common tactical picture from various sources of sensor data. - Continue development of low power consumption urban sensing technologies. - Continue development of tagging, tracking and locating technologies to monitor adversary movement. - Continue development of information on demand technologies to provide warfighter with the right information at the right time. - Continue development of urban sensing technologies to detect weapons at distance. - Continue development of adaptable enemy course of action engine to manipulate adversary decisions. - Continue development of advanced tactical sensor technologies to improve unit awareness. - Initiate and continue development of distributed information architecture technologies. - Initiate and continue 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				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
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. - Initiate and continue development of a single integrated battlespace picture with tactical and strategic injects that begins to close the gap between ISR and C2. - Initiate and continue Actionable Intelligence for Expeditionary and Irregular Warfare effort which includes real-time methods for Identifying Human Networks. - Initiate tagging, tracking, and locating technologies development to address development of multi-INT track continuity. - Initiate development of advanced tactical nets to include additional phenomenologies and the netting of C2, Sensors and Analysis nodes. - Initiate efforts addressing “battlespace awareness” of human networks, improving the accuracy of classification decisions and enabling a human network predictive capability. Once a human network tensor 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 tensors. When combined, research into human network awareness, network classification and network prediction, will be a powerful tool for warfare against the irregular actor. *FY 2010 Plans:* - Continue all efforts from FY 2009. - Complete development of urban sensing technologies to detect weapons at distance. - Initiate 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 efforts to track entities of interest in a high clutter environment via geolocation of optical tags from a UAV platform. - Initiate 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.				

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B. Accomplishments/Planned Program ($ in Millions)		**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
- Initiate 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. - Initiate development of sensors that provide near-real-time decision support to distributed operations by detecting specific interactions utilizing nanotechnology. - Initiate efforts to derive high resolution models of human networks statistically with associated behavior attributes.					
LITTORAL COMBAT/POWER PROJECTION This activity is aligned with the Sea Strike, Sea Shield, Sea Basing and FORCEnet pillars and 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 GWOT. 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 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 2008 Accomplishments:* - Continued Expeditionary Fighting Vehicle (EFV) obstacle avoidance subsystem design, integrated subsystems and prepared for demonstration.		8.734	9.657	9.750	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- Continued efforts to provide urban direction finding of Radio Frequency (RF) emitters from moving platforms. (Concurrent funding in PE 0603640M.) - Continued effort in Distributed Common Ground/Surface System (DCGS) that involves the migration of tactical intelligence systems (sensor networks) to a net-ready architecture and the development of enterprise services that translate this data. - Continued development of target acquisition architecture, information exchange, connectivity and interoperability of target hand-off, fire control, and coordination systems. (Concurrent funding in PE 0603640M.) - Continued design and test of hostile fire detection and counter-fire system (GUNSLINGER). - Continued development of integrated vehicle self-defense system technologies to defeat incoming Rocket Propelled Grenades (RPGs). (Concurrent funding in PE 0602782N.) - Continued development and integration of network monitoring and management tools technology and transition to acquisition. (Concurrent funding in PE 0603782N.) - Continued integration and demonstration of innovative relays Beyond Line Of Sight (BLOS) in the areas of wideband communications and advanced modular systems. (Concurrent funding in PE 0603782N.) - Continued development of algorithms and initiated modifications of hardware and software for use in discriminating between individual single channel RF emitters on the battlefield and determining their locations; provide algorithms to MARCORSYSCOM Program Manager (PM) INTEL. (Concurrent funding in PE 0603782N.) - Continued development and began transitioning EFV obstacle detection capability to EFV Direct Reporting Program Manager. - Continued development of land mine countermeasure insensitive munitions technology. - Continued development of integrated vehicle self-defense system to defeat incoming RPGs. - Continued development of tactical ISR data structures and pattern recognition algorithms. - Continued advanced concept development to alert approaching targets with an unambiguous warning that, if ignored, will clearly demonstrate hostile intent of the approaching target. (Realigned from PE 0602123N.) - Continued transparent urban structure ‘see thru the wall’, image and mapping technologies development. - Continued modular scalable effects weapons technologies development.				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- 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. (Transparent Urban Structures) - Continued indirect prototype technology development. (Modular Scalable Effects Weapon) - Initiated development of Modular Scalable Effects weapons technologies. (Concurrent funding in PE 0603640M.) - Initiated development of counter Improvised Explosive Device (IED) technologies. (Concurrent funding in PE 0603640M.) - Initiated development of tactical urban breaching technologies. (Concurrent funding in PE 0603640M.) *FY 2009 Plans:* - Continue all efforts of FY 2008. - Initiate development of individual Warfighter protection technologies. (Concurrent funding in PE 0603640M). - Initiate development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. (Concurrent funding in PE 0603640M and 0603236N). *FY 2010 Plans:* - Continue all efforts of FY 2009. - Complete development and transition improved fire control technologies based on small-scale hardened non-magnetic azimuth sensor to improve timeliness and accuracy of mortars/howitzers. (Concurrent funding provided by PE 0602114N.)				
LOGISTICS 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,	2.535	3.410	4.809	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
sustainment, reconstitution/redeployment, and command and control. These pillars are thoroughly integrated and perpetually related in execution. The increase from FY 2008 to FY 2009 reflects additional funding for additional efforts in lightweight portable battlefield power sources supporting USMC priorities in lightening the load of the individual Marine and enhancing the Marine Corps rifle squad's overall capabilities; and a DoD directed integrated capability demonstration supporting the Protection of Ground Forces and Systems. This capability demonstration has been directed to be wide ranging and encompass technologies for: - Pre-detonation of IEDs, - Personal protection materials, - Personal power generation, - Micro power sources, and - Augmented reality The integrated demonstration will be a broad, multi-year thrust to both investigate technology integration as well as spur 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. Technologies being developed by the Logistics activity are central to the integrated demonstration program. The FY 2009 to FY 2010 increase results from initiation of new applied research directed at producing a lightweight device for converting hydrocarbon fuels to electrical energy. *FY 2008 Accomplishments:* - Continued developing and assessing concepts that permit precision delivery of logistics assets while also reducing the logistics footprint ashore. - Continued development of an alternate power source to reduce logistics footprint and increase sustainability of Marine expeditionary forces. - Continued assessment of 20W Stirling Engine for increased efficiency during distributed operations. - Continued assessment of portable, alternative water purification systems.				

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B. Accomplishments/Planned Program ($ in Millions)		**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
- Continued analysis of Personal Power Network / Centralized Distributed Operations Power Generation System. - Initiated development of wireless vehicle health diagnosis and reporting. - Initiated development of advanced logistics distribution system. *FY 2009 Plans:* - Continue all efforts from FY 2008. - Complete analysis of Personal Power Network for transition to “Lighten the Load” FNC EC beginning in FY 2010. - Initiate 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. - Initiate advancement of high specific energy electrochemical capacitors to function as peak electric load-leveling buffers in advanced lightweight portable power applications. - Initiate applications of advanced material surface treatments and coatings for reducing required maintenance and enhancing operational readiness of expeditionary warfare vehicles, machinery, and electrical systems. *FY 2010 Plans:* - Continue all efforts of FY 2009. - Initiate applied research toward producing a light weight device for converting hydrocarbon fuels to electrical energy.					
MANEUVER 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		5.581	5.784	6.309	

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
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. Beginning in FY 2009, Mine Counter Measure (MCM) efforts are funded under the Force Protection activity. Force Protection (FP) related technologies, including all MCM and counter Improvised Explosive Device (IED) related technology development are now reflected in that thrust area's submission. The increase in funding from FY 2009 to FY 2010 is due to initiation of technology programs to improve/ increase occupant protection within the platform by reducing injury due to the effects of dynamic blast events and accidental vehicle rollover. *FY 2008 Accomplishments:* - Continued lightweight Expeditionary Systems Materials (ESM) efforts to determine feasibility of scaling and producing candidate structural armor. - Continued Cognitive Assessment and Task Management technologies for combat vehicle crewmen (formerly Augmented Cognition effort). - Continued development of Advanced Electromagnetic Armor (E-NERA). - Continued S&T programs to address MAGTF Land MCM Master Plan capability gaps. - Continued technologies for stand-off detection and neutralization of mines, IEDs, and Unexploded Ordnance (UXO). (Transitions to Force Protection activity in FY 2009) - Continued technologies to defeat side/top attack and advanced fuse mines through signature reduction and advanced signature duplication. (Transitions to Force Protection activity in FY 2009) - Continued development of modeling tools to accurately determine loading and fragmentation effects on targets from mine explosions. (Transitions to Force Protection activity in FY 2009) - Continued development of technologies to defeat advanced mine fuzes (seismic, acoustic, and infrared). (Transitions to Force Protection activity in FY 2009)				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- 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. (Transitions to Force Protection activity in FY 2009) - Continued development of countermeasures for smart mine sensors. - 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 development of advanced electromagnetic armor for ground vehicle survivability. - Continued development of cognitive assessment and task management concept for CSTV. - Completed development of scalable explosive neutralization methods. - Initiated integration of CSTV capabilities. - Initiated development of fuel efficiency and battlefield power technologies for the CSTV and ground vehicles. - Initiated studies into mine signature classification. (Transitions to Force Protection activity in FY 2009) - Initiated technology development programs to address force protection capability gaps. (Transitions to Force Protection activity in FY 2009) - Initiated spectral signature classification efforts for MCM applications. (Transitions to Force Protection activity in FY 2009). *FY 2009 Plans:* - Continue all efforts of FY 2008, less those noted as completed above. - Initiate efforts addressing survivability and technologies to mitigate acceleration and traumatic brain injuries to vehicle occupants to enhance tactical mobility in support of Distributed Operations. - Initiate 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 in support of Distributed Operations. - Initiate efforts addressing improvements in vehicle fuel efficiency by improvements in drive train efficiencies, engine efficiencies and alternative fuels capabilities to enhance tactical mobility in support of Distributed Operations.				

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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
- Initiate 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. - Initiate 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. *FY 2010 Plans:* - Continue all efforts of FY 2009.				

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C. Other Program Funding Summary ($ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
PE 0204163N/Fleet Telecommunications (Tactical)									Continuing	Continuing
PE 0206313M/Marine Corps Communications Systems									Continuing	Continuing
PE 0206623M/Marine Corps Ground Combat/ Supporting Arms Systems									Continuing	Continuing
PE 0601152N/In-House Laboratory Independent Research									Continuing	Continuing
PE 0601153N/Defense Research Sciences									Continuing	Continuing
PE 0602235N/Common Picture Applied Research									Continuing	Continuing
PE 0602782N/Mine and Expeditionary Warfare Applied Research									Continuing	Continuing
PE 0603004A/Weapons and Munitions Advanced Technology									Continuing	Continuing
PE 0603005A/Combat Vehicle and Automotive Advanced Technology									Continuing	Continuing
PE 0603235N/Common Picture Advanced Technology									Continuing	Continuing

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PE 0603236N/Warfighter Sustainment Advanced Technology	Continuing	Continuing
PE 0603606A/Landmine Warfare and Barrier Advanced Technology	Continuing	Continuing
PE 0603612M/USMC Mine Countermeasures Systems - Adv Dev	Continuing	Continuing
PE 0603635M/Marine Corps Ground Combat/ Support System	Continuing	Continuing
PE 0603640M/USMC Advanced Technology Demonstration (ATD)	Continuing	Continuing
PE 0603782N/Mine and Expeditionary Warfare Advanced Technology	Continuing	Continuing

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.