FY 2009 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2008
Exhibit R-2

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603640M
PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)

COST: (Dollars in Thousands)

| Project Number & Title | FY 2007 Actual | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate |
|---|---|---|---|---|---|---|---|
| **Total PE** | 82,521 | 77,760 | 100,787 | 107,461 | 118,729 | 128,909 | 134,331 |
| 2223 MARINE CORPS ATD | 24,462 | 36,242 | 64,345 | 70,339 | 79,809 | 86,209 | 88,798 |
| 2297 MARINE CORPS WARFIGHTING LAB - CORE | 34,579 | 33,768 | 36,442 | 37,122 | 38,920 | 42,700 | 45,533 |
| 9999 CONGRESSIONAL PLUS-UPS | 23,480 | 7,750 | 0 | 0 | 0 | 0 | 0 |

**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 S&T 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.

As a key component of naval expeditionary forces, the Marine Corps has unique and technologically stressing requirements because of its expeditionary mission and intensive operational tempo, Marine Air-Ground Task Force (MAGTF) structure, and conduct of maneuver warfare. Critical requirements in this program element (PE) are: Command, Control, Communications, Computers, Intelligence, and Reconnaissance (C4ISR); maneuver techniques and means; force protection; logistic sustainment; human performance, training and education; and firepower. There are ongoing actions to develop and demonstrate advanced technologies and concepts in operational environments. Joint service efforts are aligned with Defense Technology Objectives and Joint

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Warfighting Capability Objectives. In addition, there is funding for experimentation in warfighting concepts as well as operational assessment of emerging technologies, to include technical support of operating forces to assess military utility of selected technologies. This PE specifically supports: continued development of Distributed Operations (DO) through field experiments with Marine infantry battalions; rapid response to low-, mid-, and high-intensity conflicts in the Global War on Terrorism (GWOT); methods for countering irregular threats; and expansion of seabasing and naval force packaging capabilities. The investment directly assists in fulfilling the forward presence requirements of Sea Shield and the transformational capabilities prescribed by Sea Strike. The Future Naval Capability (FNC) process is supported and funds are programmed accordingly. This PE is largely focused on demonstration of products and capabilities from the knowledge base and Discovery and Invention (D&I) phases of Naval Science and Technology (S&T). As Naval partners, the Navy and Marine Corps S&T Team strive to transition technologies that will implement objectives outlined in the Naval Operations Concept. This PE also funds technical solutions designed to increase Naval force capability, such as the Naval Expeditionary Combat Command. Investments in S&T provide the opportunities for future capabilities and will prevent technological surprise. The PE as a whole will advance the amphibious and expeditionary capabilities for the Combatant Commanders helping to meet their emerging challenges by enhancing Naval S&T contributions to the long commitment to the GWOT.

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

FY2008 funding totals do not include $13.0M in pending request for current FY2008 GWOT requirements.

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**B. PROGRAM CHANGE SUMMARY:**

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| FY 2008/FY 2009 President's Budget Submission | 83,376 | 70,968 | 68,564 |
| Congressional Action | 0 | 7,800 | 0 |
| Congressional Undistributed Reductions/Rescissions | 0 | -535 | 0 |
| Execution Adjustments | 1,070 | 0 | 0 |
| Program Adjustments | -42 | 0 | 32,205 |
| Rate Adjustments | 0 | 0 | 18 |
| SBIR Assessment | -1,883 | -473 | 0 |
| FY 2009 President's Budget Submission | 82,521 | 77,760 | 100,787 |

**PROGRAM CHANGE SUMMARY EXPLANATION:**
Technical: FY 2009 reflects funding for a DoD directed integrated capability demonstration supporting the Protection of Ground Forces and Systems. DoD directed this initiative in response to the determination that its S&T investment is likely too small 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.

Schedule: Project 2297, Worldwide contingency and combat operations (i.e. Operation Iraqi Freedom (OIF) campaigns, humanitarian efforts, and others) have increased the operations tempo of United States Operating Forces to the extent that their support of and participation in the Marine Corps Warfighting Laboratory (MCWL) Advanced Warfighting Experiments (AWEs) Sea Viking (SV) 2004, 2006, and 2008 was/remains substantially reduced. Events are rescheduled and adjusted so that operational assessments may be conducted by operational units preparing to deploy to Iraq and subsequently in Iraq in order to accommodate troop availability.

**C. OTHER PROGRAM FUNDING SUMMARY:**
Not applicable.

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**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. The program consists of a collection of projects categorized by critical warfighting function. Individual project metrics reflect the technical goals of each specific project. Typical metrics include the advancement of related Technology Readiness Levels, the degree to which project investments are leveraged with other performers, reduction in life cycle cost upon application of the technology, and the identification of opportunities to transition technology to higher categories of development.

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Exhibit R-2a

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603640M PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)
PROJECT NUMBER: 2223 PROJECT TITLE: MARINE CORPS ATD

COST: (Dollars in Thousands)

| Project Number & Title | FY 2007 Actual | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate |
|---|---|---|---|---|---|---|---|
| 2223 MARINE CORPS ATD | 24,462 | 36,242 | 64,345 | 70,339 | 79,809 | 86,209 | 88,798 |

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

In addition, this project supports the goals and objectives of the Littoral Combat/Power Projection related Enabling Capability (EC)within the Future Naval Capabilities (FNC) portfolio. The focus of the EC within this PE in FY 2007 and beyond will be on technology related to Urban, Asymmetric, and Expeditionary Operations (UAEO). The UAEO Capability Gap is a science and technology developmental area that is of the highest importance to Marine Corps operations in Iraq and Afghanistan and is one of the highest ranked Capability Gaps prioritized by the Chief of Naval Operations and the Marine Corps Combat Development Command (MCCDC). The UAEO technology gap is being pursued as part of an overall effort that addresses the Sea Strike Capability Gap.

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**B. ACCOMPLISHMENTS/PLANNED PROGRAM:**

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **MANEUVER** | 6,740 | 6,709 | 9,597 |

The Maneuver Thrust Technology Area focuses on the development, demonstration, and transition of technologies that will increase the warfighting capabilities and effectiveness of current and future Marine Corps maneuver systems. This Thrust aims at capturing emerging and "leap ahead" technologies in the areas of mobility, materials, propulsion, survivability, durability, signature reduction, modularity, and unmanned systems. Beginning in FY 2009, MCM efforts will be funded under the Force Protection activity. Presently, MCM supports and enhances the maneuver and force protection Marine landing forces with the development of technologies to enable detection, neutralization, breaching, and clearing of mines, Improvised Explosive Devices (IEDs), and unexploded ordnance from the beach exit to inland objectives. MAGTF MCM is a functional component of Naval Expeditionary Maneuver Warfare and includes Ship to Objective Maneuver (STOM), Expeditionary Operations from a Sea Base, sustained Operations Ashore, Urban and Asymmetric Operations, and OOTW.

FY 2009 reflects an increase 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,
- Personal power generation,
- Micro power sources, and
- Augmented reality

The Maneuver activity directly supports this integrated demonstration which 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 2007 Accomplishments:**

- Continued Advanced Electronically Controlled Active Suspension System (ECASS) development in support of High Mobility Multi-Purpose Wheeled Vehicle (HMMWV), MAGTF Expeditionary Family of Fighting Vehicles (EFV) and

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other Light Armored Vehicles.
- Continued Electromagnetic Non-Explosive Reactive Armor (E-NERA) and Advanced Electromagnetic Armor technology development efforts.
- Continued development of scalable explosive neutralization technologies for MCM.
- Continued development of technologies to defeat side/top attack and advanced fuse mines through signature reduction and advanced signature duplication.
- Continued the development of technologies to locate and defeat IEDs.
- Continued S&T programs to address MAGTF Land MCM Master Plan capability gaps.
- Continued development of technologies to defeat advanced mine fuses (seismic, acoustic, and infrared).
- Continued the formation of blast consortia to foster the increased understanding of blast and fragmentation interaction with vehicles and biological effects.
- Completed the program to examine the feasibility of using lightweight mine clearance devices on USMC combat vehicles. (Effort transferred to MCWL).
- Initiated development of a Combat S&T vehicle prototype to enhance crew survivability and vehicle fuel efficiency.
- Initiated efforts to detect IEDs using radio frequency sources.
- Initiated studies to identify technology development plans to close identified force protection capability gaps.
- Initiated development of a test bed to demonstrate advanced survivability concepts.

**FY 2008 Plans:**

- Continue all efforts of FY 2007.
- Complete development of scalable explosive neutralization technologies for MCM.
- Complete Advanced ECASS development in support of HMMWV, MAGTF Expeditionary Family of Fighting Vehicles and other Light Armored Vehicles.
- Complete and transition continued development of technologies to locate and defeat IEDs into PEs associated with the FNC program.
- Complete E-NERA.
- Initiate technology development programs to address force protection capability gaps.
- Initiate development of fuel efficiency and battle field power systems for improved performance.

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**FY 2009 Plans:**

- Continue all efforts of FY 2008, less those noted as completed above.
- Initiate development of a Combat S&T Vehicle demonstrator to enhance crew survivability and vehicle fuel efficiency.
- Initiate survivability improvements and technologies to mitigate acceleration and traumatic brain injuries to occupants to enhance tactical mobility and survivability in support of Distributed Operations.
- Initiate advanced suspension systems development with ride height adjustment, ride quality adjustment, rollover prevention, and load equalizing systems for USMC tactical wheeled platforms to enhance tactical mobility in support of Distributed Operations.
- Initiate a Survivability/ Active Protection Systems Improvement effort to increase effectiveness of defeat (Pdefeat) of shoulder launched RPG type threats and ATGM threats on light platforms utilizing non-kinetic kill technologies.
- Initiate new mobility efforts for On-Board Vehicle Power to increase mobile exportable power for Diesel Electric Propulsion Concepts and a Fuels effort to investigate future fuel alternatives for internal combustion engines to include Fischer-Tropsch and coal gasification processes for use in military tactical wheeled vehicles.
- Initiate Maneuver Enabling Technologies such as Vehicle Stabilization to improve vehicle suspension and control technologies to stabilize the platforms themselves to improve ride quality, shoot on the move capability and human systems integration.
- Initiate a Vehicle Demonstrator program to design and fabricate an Integrated Power Demonstrator platform capable of producing the power needs for mobility and survivability concept demonstrations.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **FORCE PROTECTION** | 0 | 0 | 6,715 |

This activity supports the Force Protection Thrust’s Advanced Technology Demonstration efforts in the areas of individual Marine platforms, equipment and autonomous systems. This includes technologies to enable detection, neutralization, breaching, and clearing of mines, Improvised Explosive Devices (IEDs), and unexploded ordnance from the beach exit to inland objectives. Efforts supported under Force Protection also include the demonstration of technologies such as Counter Rocket and Mortar (CRAM) and Counter Sniper technologies in support of maneuver warfare, small unit distributed operations, and fixed installation protection and technologies for improved Personnel Protective Equipment for individual protection against blast and ballistic threats as well as in a chemical, radiological, and biological environment. Physical

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Security technologies to support expeditionary maneuver warfare, pier/port and base infrastructure are also addressed under this thrust. FY 2009 is the first reporting cycle where Force Protection Thrust efforts are separated from the Maneuver Thrust. Counter-IED and Counter-RPG Technologies remain high priority Marine Corps focal areas.

FY 2009 reflects additional funding ($3.4M) 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,
- Personal power generation,
- Micro power sources, and
- Augmented reality

The Force Protection activity is central to the integrated demonstration program, which 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 2009 Plans:**

- Continue development of technologies to defeat side/top attack and advanced fuze mines through signature reduction and advanced signature duplication.
- Continue development of technologies to locate and defeat IEDs.
- Continue development of technologies to defeat advanced mine fuzes (seismic, acoustic, and infrared).
- Continue efforts to detect IEDs using radio frequency sources.
- Continue technology development programs to address force protection capability gaps.
- Complete studies to identify technology development plans and develop roadmaps to close identified force protection capability gaps.
- Complete design of a novel low passive inter-modulation wideband antenna for use against multiple classes of radio frequency triggered IEDs.
- Complete investigation of polarization diversity designs to counter specific placements and orientations of radio frequency triggered IEDs.
- Initiate new Explosive Hazard Defeat to address the Suicide-Bomber threat. This effort will combine multiple sensor modalities, analysis algorithms, and data fusion to demonstrate high Pd, low FAR detection of

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suicide bombers from standoff distances from multiple aspect angles.
- Initiate a new Anti-Tank Guided Missile (ATGM) effort to defeat ATGMs in complex urban environment.
- Initiate Warfighter modeling and simulation efforts for the Warfighter-as-a-System analysis approach and methodology combining survivability, mobility, and warfighter performance parameters.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **LITTORAL COMBAT/POWER PROJECTION (LC/PP)** | 3,806 | 16,165 | 16,675 |

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. Littoral Combat/Power Projection is the Enabling Capability (EC).

The funding profile from FY 2007 to FY 2009 reflects the reorganization of the FNC program investments into ECs. As a result of this reorganization, the funding for each EC has been realigned to a 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. Understandably, these Warfighter Capability Gaps are among those highest ranked of the prioritized Capability Gaps (prioritized by the OPNAV N-6/7 and the MCCDC). 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 to EC's for IED's, Modular Scalable Effects Weapons, Advanced Naval Fires Technology, Dynamic Target Engagement, Position Location Information, Transparent Urban Structures and Hostile Fire Detection and Response.

Increase from FY 2007 to FY 2008 and out reflects a net zero realignment of USMC S&T resources from BA 2 (PE0602131M) to BA 3. This was done to align the FNC products with the proper funding source. Additionally the FNC Program conducted a rephasing of funds ($320K), during execution, to support transitioning the GUNSLINGER hostile fire detection and counter fire system to the Naval Expeditionary Combat Command (NECC).

**FY 2007 Accomplishments:**

- Continued development of tools and technologies to support Marine Corps Intelligence, Surveillance and

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Reconnaissance (ISR) efforts Measurement and Signature Intelligence Tactical Remote Sensor System (MASINT/TRSS) in remote sensor integration within the Distributed Common Ground/Surface System (DCGS). (Realigned to PE 0603114N in FY 2007.)
- Continued design and development of advanced weapons materials for use in artillery and mortar systems to reduce weight while maintaining strength, and increasing operational life and capability. (Concurrent funding in PE 0602131M and 0602236N; realigned to PE 0603114N in FY 2007.)
- Continued development of improved lightweight computational fire control interface technology. (Concurrent funding from PE 0602131M, 0602236N, 0603236N and 0603782N; realigned to PE 0603114N in FY 2007.)
- Continued development of improved fire control systems technologies to Expeditionary Fire Support System artillery and mortar systems. (Realigned to PE 0603114N in FY 2007.)
- Continued effort to incorporate advanced target acquisition target hand-off technologies to reduce sensor to shooter loop and improve target location. (Previous and concurrent effort funded in PE 0602131M). (Realigned to PE 0603114N in FY 2007.)
- Continued development of ammunition packaging techniques to lower weight and have the packaging provide additional use on the battlefield. (Previous and concurrent funding provided by PE 0602131M). (Realigned to PE 0602114N and 0603114N in FY 2007.)
- Continued integration of hostile fire detection and counter-fire system (GUNSLINGER). (Concurrent funding in PE 0602131M and 0603782N; realigned to PEs 0602114N and 0603114N in FY 2007.)
- Continued development of innovative relay Beyond Line of Sight (BLOS) technology through integration and demonstration of secure wireless networks/secure wireless local area network (LAN) communication technologies. (Concurrent funding in PEs 0602131M, 0602236N, 0603236N and 0603782N; realigned to PE 0603235N in FY 2007.)
- Completed efforts to provide urban direction finding of RF emitters from moving platforms; provided algorithms to MARCORSYSCOM Program Manager INTEL.
- Completed development and begin transition of an obstacle detection system on the EFV. (Transitioned from 0602131M.)

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Complete development and transition of Asymmetric Threat Weapon technologies. (Transitioned from PE 0602131M and 0602123N)
- Complete development and transition unambiguous warning devices technologies. (Transitioned from PE 0602131M)
- Complete development and transition active RPG defense technologies. (Transitioned from PE 0602131M)

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- Complete development and transition improved imaging (Electro Optic/InfraRed/Laser) technologies. (Transitioned from PE 0602131M)
- Complete development and transition reconfigurable surveillance Unmanned Aerial Vehicles (UAVs) for Warfighter protection technologies. (Transitioned from PE 0602131M)
- Initiate development of transparent urban structures technologies. (Previous and concurrent funding from PE 0602131M)
- Initiate development of modular scalable effects prototype weapon. (Concurrent funding from PE 0602131M.)
- Initiate development of counter improvised explosive devices technologies. (Concurrent funding from PE 0602131M)
- Initiate development of tactical urban breaching technologies. (Concurrent funding from PE 0602131M)

**FY 2009 Plans:**

- Continue all efforts of FY 2008, less those noted as completed above.
- Initiate development of individual Warfighter protection technologies. (Concurrent funding in PE 0602131M; funding will also be provided by PE 0603236N in FY 2009).
- Initiate development of advanced survivability and mobility technologies for Marine Corps tactical and combat vehicles. (Concurrent funding in PE 0602131M; funding will also be provided by PE 0603236N in FY 2009).

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **HUMAN PERFORMANCE, TRAINING & EDUCATION** | 3,551 | 3,563 | 8,227 |

This activity develops and demonstrates advanced training technology and technologies that enhance neural and cognitive aspects of human performance including tactical decision-making, modeling, simulation, range instrumentation, synthetic environment generation and training effectiveness evaluation.

FY 2009 reflects an increase for enhanced requirements in support of Distributed Operations and 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,
- Personal power generation,
- Micro power sources, and
- Augmented reality

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The Human Performance, Training and Education activity is key to the integrated demonstration program, which 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 2007 Accomplishments:**

- Continued integration of cognitive performance improvement (augmented cognition) technology using operationally relevant systems and scenarios, and demonstrated improved human cognition via multiple sensory modalities.
- Continued the development of tools to capture metrics and lessons learned from a variety of simulation and training sources.
- Continued research into augmented reality training systems to enhance warfighter performance in urban combat.
- Continued development of immersive closed loop training system for MOUT.
- Continued MACHSI: physical protection of the head, neck and face. (Transitioned from the Firepower activity.)
- Completed the integration and evaluation of cognitive state detection technologies with instructor-based training scenario applications and demonstrated improved individual task performance.
- Initiated development of the Distributed Operations Training/Virtual Test Bed.
- Initiated research into environmental effects on cognitive and team performance.

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Complete research into augmented reality training systems to enhance warfighter performance in urban combat.
- Complete integration of cognitive performance improvement (augmented cognition) technology using operationally relevant systems and scenarios, and demonstrate improved human cognition via multiple sensory modalities.
- Complete development of immersive closed loop training system for MOUT.

**FY 2009 Plans:**

- Continue all efforts of FY 2008, less those noted as completed above.

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- Initiate development of adaptive experiential learning tools for Distributed Operations Training.
- Initiate in-depth analysis, state-of-the-art report, and testing on all USMC physical training regimens, their effectiveness and their injury incidence rates
- Initiate development of "Warfighter as a System" modeling tools
- Initiate development of automated behavioral and neurophysiological performance measurement technologies for Distributed Operations Warfighter assessment, classification and assignment to training.
- Initiate Human Performance and Training capabilities (Cognitive and physical enhancement, modeling and simulation, virtual reality squad level training) in support of Distributed Operations.
- Initiate demonstrations and field studies of mitigation/augmentation capabilities that enhance squad level communication in support of Distributed Operations.
- Initiate development of a Distributed Operations virtual reality simulation training system prototype that will be scalable across fire team, squad, and platoon.
- Initiate Lightening the Load efforts aimed at developing the software necessary to conduct trade off analysis on a physically and ergonomically accurate model of the United States Marine and its infantry equipment.
- Initiate new Experiential Learning Technologies to improve the Infantry Immersive Trainer to support the Squad Immersive Training Environment (SITE) Marine Corps Urgent Needs Statement. This includes developing tracking, Helmet Mounted Displays, and software technologies to enable Augmented Reality in unimproved locations.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **LOGISTICS** | 3,491 | 3,628 | 9,004 |

This activity supports Marine Corps Expeditionary Logistics which is the practical discipline and real world application of the deployment, sustainment, reconstitution, and re-deployment of forces engaged in expeditionary operations. Expeditionary Logistics replaces mass with assured knowledge and speed, is equally capable ashore or afloat in austere environments, and is fully scalable to meet uncertain requirements. Expeditionary Logistics logically divides into five pillars: deployment support, force closure, sustainment, reconstitution/redeployment, and command and control. These pillars are thoroughly integrated and perpetually related in execution.

FY 2009 reflects an increase for sustainability/logistics programs (includes fuel, water, ammunition, rations, and casualty care /MEDEVAC) in support of Distributed Operations; new USMC priorities in lightening the load of the individual Marine and enhancing the Marine Corps rifle squad's overall capabilities; and for a DoD

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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 Logistics activity directly supports the integrated demonstration program, which 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 2007 Accomplishments:**

- Continued exploring the development of portable fuel cell technologies capable of providing power in the 100 Watt to 500 Watt power range.
- Continued development of vehicle embarked & powered manipulator arm for next generation expeditionary vehicles.
- Completed research into developing a lightweight expeditionary bridging capability through assessment of bridge design, manufacturing, construction, and material solutions to include composites, extrusion, and forming techniques.
- Completed Marine Corps Seabasing Roadmap study.
- Completed development of lightweight high specific energy battery charger.
- Initiated efforts to develop a micro turbine generator capable of 100W average power.
- Initiated research into developing a replaceable electrode battery power source that consists of a metallic structure that is consumed during power generation and then easily replaced with a new metallic component that restores a full charge. (Realigned from PE 0602131M.)

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Complete development of vehicle embarked & powered manipulator arm for next generation expeditionary vehicles.
- Initiate analysis of material alternatives for automated vehicle health monitoring and reporting.

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- Initiate development of a tracking capability for major classes of supplies, forces & equipment.

**FY 2009 Plans:**

- Continue all efforts of FY 2008, less those noted as completed above.
- Initiate technology demonstration for responsive precision aerial logistic transport from Seabase to Distributed Operations Squad or Platoon.
- Initiate technology demonstration of an innovative bridge structure constructed from highly versatile modular composite components, thus expanding site-specific assembly options while simplifying logistic transport.
- Initiate development of a backpack that prevents oscillatory and transient peak loading forces from causing skeletal injury while enhancing human mobility with heavy loads.
- Initiate development of a man-portable capability to analyze captured fuel for adulterants and contaminants.
- Initiate development of a lightweight man-portable multi-fuel thermoelectric battery charger.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS, AND INTELLIGENCE, SURVEILLANCE AND RECONNAISSANCE (C4ISR)** | 3,756 | 2,971 | 0 |

This activity integrates and demonstrates enhanced communications and situational awareness in warfighting environments and communication and situational awareness technologies for near term USMC operations.

The decrease from FY 2007 to FY 2008 is due to FY 2007 including $750K for the Software Reconfigurable Payload (SRP) and Software Reprogrammable Payload Programs to address capability gaps and shortfalls in the areas of: converged services networks; intelligent network monitoring, maintenance and mobility; multilevel information security and information assurance. The SRP payload can provide dynamic allocation among users and provide an interference mitigation capability that is currently not available to the operating forces.

FY 2009 reflects both Command, Control, Communications, Computers (C4) and Intelligence, Surveillance and Reconnaissance (ISR) efforts and funding now being placed into separate activities within this PE.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603640M PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)
PROJECT NUMBER: 2223 PROJECT TITLE: MARINE CORPS ATD

**FY 2007 Accomplishments:**

- Continued integration and demonstration of naval tactical warfighting applications and network connectivity.
- Continued development and demonstration of low-cost compact conformal antenna capability.
- Continued development and demonstration of urban communications capability.
- Continued efforts to reduce the risk in investing in the ability to see through urban structures in an effort to identify enemy personnel or other assets.
- Continued designing tools for mission specific tactical sensor fields capable of fulfilling specific mission objectives.
- Continued developing smart tactical sensors, platforms and algorithms capable of forwarding information/knowledge vice raw data.
- Continued creating a service oriented sensor network for expeditionary forces' current and future tactical sensors.
- Continued creating fusion tools capable of translating tactical sensor data into appropriate situational awareness for expeditionary forces in near real-time.
- Continued designing autonomous platforms and automatic sensor planning and management tools to ensure that the right data is collected by the right sensor in support of intelligence requirements.
-Continued developing tailored tactical Human to Machine Interfaces aligned to primary operational functions and non-intrusive within the battlespace.
- Continued creating services for the tactical network that are fully operable with DCGS and the DCGS Integration Backbone.
- Completed demonstration of advanced network mobility and network security capabilities.
- Initiated development and demonstration of measurement and signature intelligence data management and integration capability.
- Initiated demonstrations of tagging, tracking and locating various adversarial targets.
- Initiated development of adaptable enemy course of action engine (smart algorithms) development to interfere with or influence adversarial plans.

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Complete efforts to reduce the risk in investing in the ability to see through urban structures in an effort to identify enemy personnel or other assets.
- Initiate demonstrations of improved urban communications capabilities.

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PROGRAM ELEMENT: 0603640M PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)
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- Initiate urban navigation with limited Global Positioning System availability demonstrations.
- Initiate development of advanced tactical sensor nets that will localize mobile detection of threats.

**FY 2009 Plans:**

C4 and ISR efforts have been realigned to separate activities within this PE.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS (C4)** | 0 | 0 | 4,163 |

This activity integrates and demonstrates enhanced communications and situational awareness in warfighting environments and communication and situational awareness technologies for near term USMC operations. The focus is on development and leveraging advanced C4 technologies to enable enhanced Distributed Operations, Irregular Warfare, and Marine Corps Expeditionary Warfare. Specifically, the C4 Thrust intends to demonstrate markedly improved capabilities in over-the-horizon (OTH), beyond line-of-sight, and restricted environment communications; mobile networking; tactical decision making; tactical situational awareness; and small unit position location and navigation. Advanced technology resources will be applied to complement commercial, other service, and defense agency investments to produce a technology base to address identified Marine Corps technology gaps.

*In FY 2007 and FY 2008, this effort was funded in the C4ISR activity within this PE.
FY 2009 reflects an increase 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,
- Personal power generation,
- Micro power sources, and
- Augmented reality

The C4 activity directly supports the integrated demonstration program, which 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.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603640M PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)
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**FY 2009 Plans:**

- Continue urban navigation with limited Global Positioning System availability demonstrations. (Realigned from C4ISR Activity)
- Continue demonstrations of improved urban communications capabilities. (Realigned from C4ISR Activity)
- Continue creating a service oriented sensor network for expeditionary forces' current and future tactical sensors. (Realigned from C4ISR Activity)
- Continue developing tailored tactical Human to Machine Interfaces aligned to primary operational functions and non-intrusive within the battlespace. (Realigned from C4ISR Activity)
- Continue creating services for the tactical network that are fully operable with DCGS and the DCGS Integration Backbone. (Realigned from C4ISR Activity)
- Complete conformal antenna integration and demonstrations. (Realigned from C4ISR Activity)
- Initiate an Assured Connectivity effort to develop waveforms suited to maintaining low data rate links under extreme conditions.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR)** | 0 | 0 | 2,774 |

This activity supports the demonstration of technologies to enhance situational awareness and tactical decision making through automated analysis, fusion of data, rapid integration of information, and acquired knowledge resulting in actionable intelligence at the lower command levels. The activity includes the demonstration of ISR efforts involving enhanced reconnaissance and persistent surveillance, and sensors for unmanned ground and aerial vehicles. Advanced Technology demonstrations also include the collection of information [monitoring, sensing, and locating] in the 3D urban battlespace as well as exploiting information [identifying and classifying data] as part of the intelligence preparation of the battlespace in order to facilitate operational maneuver and distributed operations.

*In FY 2007 and FY 2008, this effort was funded in the C4ISR activity within this PE.
FY 2009 reflects an increase 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,
- Personal power generation,

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- Micro power sources, and
- Augmented reality

The C4 activity directly supports the integrated demonstration program, which 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 2009 Plans:**

- Continue development of advanced tactical sensor nets that localize mobile detection of threats in a complex environment. (Realigned from C4ISR Activity)
- Continue development and demonstration of measurement and signature intelligence data management and integration capability. (Realigned from C4ISR Activity)
- Continue integration and demonstration of naval tactical warfighting applications and network connectivity.
- Continue tagging, tracking, and locating efforts to demonstrate the effectiveness of tactically relevant tag readers which support track classification algorithms. (Realigned from C4ISR Activity)
- Continue efforts to refine enemy course of action prediction software to adapt to stimuli. (Realigned from C4ISR Activity)
- Continue and initiate new Actionable Intelligence for Expeditionary and Irregular Warfare efforts which include Human Network Decision Modeling and the fusion across modeling approaches to increase prediction accuracy. (Realigned from C4ISR Activity)
- Initiate development of tactical sensor nets with organic unattended multi-level security processing and information dissemination.
- Initiate new Relevant and Situational Information on Demand such as Identity Dominance Enabled by an Integrated Biometric/Tag Track and Locate (TTL) Capability, providing human tracking algorithms based on models of biometric (face, voice and soft) and TTL (optical taggant) capabilities and modeling a biometric/optical taggant system relevant to human tracking across an urban 5 km x 2 km area.
- 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.

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| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **FIREPOWER** | 3,118 | 3,206 | 7,190 |

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 2009 reflects an increase for emerging priority requirements in lightening the load of the individual Marine while simultaneously enhancing the combat capabilities of the Marine Corps Rifle Squad and 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,
- Personal power generation,
- Micro power sources, and
- Augmented reality

The Firepower activity directly supports the integrated demonstration program, which 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 2007 Accomplishments:**

- Continued scalable effects conventional warhead concept development.
- Continued shipboard submunition Microelectromechanical System (MEMS) fuze safety and reliability enhancement effort from PE 0602131M.
- Continued MACHSI advanced technology development. (Transitioned from FY 2005 PE 0602131M.)
- Continued development of caseless small caliber ammunition.
- Initiated enhanced lethality and extended range ammunition demonstrations.

**FY 2008 Plans:**

- Continue all efforts of FY 2007.
- Complete development of caseless small caliber ammunition.

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- Initiate improved mortar munition integration and demonstrations.
- Initiate development of targeting and engagement technologies for distributed operations collaborative fires integration and demonstrations.
- Initiate a Wind Sensing Program to provide technology that senses wind velocity & direction at firing point to apogee and supporting algorithms to compensate the computed/predicted wind effects on the ballistic flight of the 81mm mortar round in order to enhance weapon accuracy.

**FY 2009 Plans:**

- Continue all efforts of FY 2008, less those noted as completed above.
- Complete shipboard submunition MEMS fuze safety and reliability enhancement effort.
- Complete enhanced lethality and extended range ammunition demonstrations.
- Initiate an effort in Ballistic Flight Compensation Aiming in support of Distributed Operations Precision Engagement.
- Initiate design and prototyping of lightweight technologies that provide individual Marines enhanced capabilities to detect and identify man-size targets out to at least the maximum effective range of their personal weapons during all conditions (daylight, limited visibility, & darkness) by integrating multiple capabilities into a single system.
- Initiate a Flight Control Kinematic Unit effort. Design & develop technology that provides guidance, navigation, and controls (GNC) to 81mm mortar rounds to enable trajectory shaping in urban environment to precisely & accurately strike specific targets.

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PROGRAM ELEMENT: 0603640M PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)
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**C. OTHER PROGRAM FUNDING SUMMARY - NAVY RELATED RDT&E::**
PE 0204163N Fleet Telecommunications (Tactical)
PE 0206313M Marine Corps Communications Systems
PE 0206623M Marine Corps Ground Combat/Supporting Arms Systems
PE 0305204N Tactical Unmanned Aerial Vehicles
PE 0601152N In-House Laboratory Independent Research
PE 0601153N Defense Research Sciences
PE 0602131M Marine Corps Landing Force Technology
PE 0602236N Warfighter Sustainment Applied Research
PE 0602782N Mine and Expeditionary Warfare Applied Research
PE 0603235N Common Picture Advanced Technology
PE 0603236N Warfighter Sustainment Advanced Technology
PE 0603612M USMC Mine Countermeasures Systems - Adv Dev
PE 0603635M Marine Corps Ground Combat/Support System
PE 0603782N Mine and Expeditionary Warfare Advanced Technology

**OTHER PROGRAM FUNDING SUMMARY - NON-NAVY RELATED RDT&E::**
PE 0603004A Weapons and Munitions Advanced Technology
PE 0603005A Combat Vehicle and Automotive Advanced Technology
PE 0603606A Landmine Warfare and Barrier Advanced Technology
PE 0603607A Joint Service Small Arms Program
PE 0603619A Landmine Warfare and Barrier - Adv Dev
PE 0603772A Advanced Tactical Computer Science and Sensor Technology
PE 0604710A Night Vision Systems - SDD
PE 0604808A Landmine Warfare/Barrier - SDD
PE 0602702E Tactical Technology

**D. ACQUISITION STRATEGY:**
Not Applicable.

FY 2009 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: February 2008
Exhibit R-2a

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603640M PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)
PROJECT NUMBER: 2297 PROJECT TITLE: MARINE CORPS WARFIGHTING LAB - CORE

| Project Number & Title | FY 2007 Actual | FY 2008 Estimate | FY 2009 Estimate | FY 2010 Estimate | FY 2011 Estimate | FY 2012 Estimate | FY 2013 Estimate |
|---|---|---|---|---|---|---|---|
| 2297 MARINE CORPS WARFIGHTING LAB - CORE | 34,579 | 33,768 | 36,442 | 37,122 | 38,920 | 42,700 | 45,533 |

**A. MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION:** Marine Corps Warfighting Laboratory (MCWL) examines lessons learned from current operations, explores emerging threats and opportunities, and explores Joint and emerging service concepts through concept-based experimentation in order to enhance current and future warfighting capabilities. The use of modeling and simulation (M&S), both conducted within Service wargaming and virtual experiment venues (conducted in partnership with the Navy and Joint Forces Command (JFCOM)), will provide both a necessary Joint context for the Marine Corps Expeditionary Force Development System process as well as the opportunity to explore the implications of proposed future programs on seabased power projection capabilities.

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

Using operational forces, MCWL conducts Advanced Warfighting Experiments (AWEs) supported by Limited Objective Experiments (LOEs), Limited Technical Assessments (LTAs), Wargames, and Studies. AWEs, LOEs, and LTAs examine discrete variables in as much isolation as can be achieved. Technologies assessed in LTAs are incorporated in LOEs while LOEs are building blocks from which resulting AWE-level campaigns are constructed. These campaigns (e.g., the Sea Viking (SV) experimentation series) are executed under the guidance of the Commandant of the Marine Corps (CMC) and in support of the Marine Corps Expeditionary Maneuver Warfare Enabling Capability List (ECL).

SV is a series of two-year campaigns that provide focus and synergy to MCWL concept-based experimentation.

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This approach allows integration of United States Marine Corps (USMC) service experiments with other services and with JFCOM experiments. SV experiments are currently focused on the implementation of the Distributed Operations (DO) Concept as an extension of maneuver warfare down to the small unit tactical level. DO is a concept characterized as the physical dispersion of network-enabled units, from squad to battalion size, over an extended battlespace.

- Sea Viking 2006 (SV06): (FY 2005 through FY 2006) SV06 was a series of related events that examined enhanced infantry training and tactics through several LOEs that culminated in the SV06 AWE which completed in first quarter FY 2007. The SV06 AWE was a live force experiment that examined the DO concept in the operational context provided by a deploying Marine Expeditionary Unit (MEU) in the Global War on Terrorism (GWOT). SV06 permitted development of prototype and surrogate technologies in order to better refine material and non-material capabilities needed by the Marine Corps to adapt to the shift toward irregular warfare.

- Sea Viking 2008 (SV08): (FY 2007 through FY 2008) SV08 continues exploration of DO in the irregular, nonlinear, battlespace emphasizing enhanced individual and small unit capabilities. SV08 expands the focus of DO beyond infantry training and tactics into logistics, command and control (C2), fires, and ISR. In keeping with the SV06 DO objective of empowering small unit leaders, SV08 seeks to identify decision support tools that will increase the individual Marine’s situational awareness through small unit access to tactical ISR assets and exploitation of actionable intelligence to better fight and win the GWOT.

- Sea Viking 2010 (SV10): (FY 2009 through FY 2010) SV10 shifts the focus of MCWL DO experimentation to exploring the use of computer based simulation systems to expand the training opportunities that will enable infantry units to gain and maintain the enhanced skill sets and tactical decision making expertise of small units as well as provide tools for mission planning and mission rehearsal. Experimentation with improved technologies in the areas of logistics, ISR, and C4 will continue during SV10 to complete the projects initiated during SV08.

**B. ACCOMPLISHMENTS/PLANNED PROGRAM:**

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS (C4)** | 9,198 | 8,082 | 8,649 |

This activity encompasses all MCWL C4 related experimentation efforts. Although this category covers several small (less than $500K per FY) efforts being pursued by MCWL, most programs listed below are considered major

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(valued at $500K or more) or have near real-time operational impact.

Funds were realigned from other activities within this project to cover company and below requirements in FY 2008.

FY 2009 includes additional funding to support USMC major investments in the Lightening the Marine's Load & Enhancing the Rifle Squad; Operational Adaptation; Asymmetric/Irregular Warfare and Distributed Operations; and Counter Sniper Technologies.

**FY 2007 Accomplishments:**

- Continued C4 extended user assessments of selected prototype technologies in support of forces engaged in Operation Enduring Freedom and OIF.
- Continued experimentation of enhanced OTH communications Low Earth Orbit Satellite (LEOSAT)/Line of Sight (LOS) hybrid in support of SV08.
- Continued experimentation of coalition C4 interoperability concept demonstrator.
- Continued experimentation of concept demonstrators to support company and below alternative C2 architectures.
- Continued C4 related small unit enhancements against irregular forces, including urban terrain.
- Completed support for the SV06 experimentation campaign plan.
- Initiated C4 support for SV08 experiments.
- Initiated experimentation of enhanced communications concept demonstrators as part of SV08.

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Initiate USMC participation in Joint Forces Exercise Future Combat System (JFEX FCS) C4 spinout technology experiments.

**FY 2009 Plans:**

- Continue all efforts of FY 2008.
- Complete C4 support for SV08.
- Complete experimentation of OTH LEOSAT/LOS hybrid in support of SV08 and emerging DO architecture.

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- Initiate C4 support for SV10 experiments.
- Initiate experimentation of enhanced communications concept demonstrators as part of SV10.
- Initiate development and testing of an automated language translator concept demonstrator.
- Initiate efforts to assess/develop alternative communications (e.g., lasers, Ultraviolet) for use in an electronically challenged environment (i.e., electronic jamming against IEDs).

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR)** | 6,910 | 7,112 | 7,611 |

This activity includes MCWL ISR related experimentation efforts involving enhanced reconnaissance; sensors (to include mine detection); and unmanned ground and aerial vehicles. Although this category covers several small (less than $500K per FY) efforts being pursued by MCWL, most programs listed below are considered major (valued at $500K or more) or have near real-time operational impact.

Funds were realigned from other activities within this project to cover increased requirements associated with the Small Unit Surveillance System (SUSS), Mobile Wearable Computer (MOWC), and Tier II in FY 2008.

FY 2009 includes additional funding to support USMC major investments in the Lightening the Marine's Load & Enhancing the Rifle Squad; Operational Adaptation; Asymmetric/Irregular Warfare and Distributed Operations; and Counter Sniper Technologies.

**FY 2007 Accomplishments:**

- Continued additional IED investigations into promising detect and neutralize technologies.
- Continued experimentation of Tier II Unmanned Aerial System (UAS) concept demonstrator to provide persistent ISR at regimental and battalion level.
- Continued development and experimentation of ISR technologies in preparation for SV08 planned experiments.
- Continued development and experimentation of the Wasp micro UAS, with the Defense Advanced Research Projects Agency (DARPA), in support of DO experimentation and OIF.
- Completed support for the SV06 experimentation campaign plan.
- Initiated efforts to develop the TTPs required for small infantry units to employ Unmanned Ground Vehicle (UGVs), Unmanned Aerial Vehicle (UAVs), and unattended ground sensors.
- Initiated ISR related small unit enhancements against irregular forces, including urban terrain.

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- Initiated experimentation with the Small Unit Surveillance System (SUSS) and the Mobile Wearable Computer (MOWC).
- Initiated experimentation of enhanced ISR concept demonstrators as part of SV08.

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Complete participation in DARPA's development and upgrade of the Wasp micro UAS and conduct extended operational assessment of Wasp Block II and Block III.
- Complete ISR related small unit enhancements against irregular forces, including urban terrain.

**FY 2009 Plans:**

- Continue all efforts of FY 2008, less those noted as completed above.
- Complete experimentation with SUSS and MOWC.
- Complete experimentation of enhanced ISR technologies and concept demonstrators as part of SV08.
- Initiate development and experimentation in small unit disposable sensors to enhance small unit force protection.
- Initiate assessment of technologies supporting company and below intelligence collection and integration – focused specifically on Stability and Support Operations (SASO) and GWOT applications.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **FIRES, TARGETING, AND MANEUVER** | 2,256 | 2,761 | 2,955 |

This activity includes MCWL experimentation efforts in the areas of fires, targeting, and maneuverability. Although this category covers several small (less than $500K per FY) efforts being pursued by MCWL, most programs listed below are considered major (valued at $500K or more) or have near real-time operational impact.

Funds were realigned from efforts associated with program management, XM-326, Heavy Machine Gun (HMG), 12 Gauge, and Electronic Control Active Suspension System (ECASS) in this activity to cover increased requirements in other activities within this project in FY 2008.

FY 2009 includes additional funding to support USMC major investments in the Lightening the Marine's Load &

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Enhancing the Rifle Squad; Operational Adaptation; Asymmetric/Irregular Warfare and Distributed Operations; and Counter Sniper Technologies.

**FY 2007 Accomplishments:**

- Continued evaluation of alternative counter shooter technologies.
- Continued development and testing of Heavy Machine gun Initiative (HMGI), an effort to design advanced mounts for USMC crew served weapons.
- Completed ECASS investigations/experimentation.
- Completed development of second XM326 120mm mortar system.
- Completed support for the SV06 experimentation campaign plan.

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Initiate development, testing and experimentation with UAS electronic warfare payload concept demonstrators.
- Initiate development, testing, and experimentation in technology intended to lighten the load of infantry.

**FY 2009 Plans:**

- Continue all efforts in FY 2008, less those noted as completed above.
- Complete development and testing of HMGI.
- Complete development, testing and experimentation with UAS electronic warfare payload concept demonstrators.
- Initiate development of concept demonstrators supporting SV10 simulation in small unit training.
- Initiate development, testing and experimentation with non-kinetic-effects systems.
- Initiate development, testing and experimentation in a new family of expeditionary counter-fire technologies.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **COMBAT SERVICE SUPPORT (CSS) AND FORCE PROTECTION** | 3,747 | 3,543 | 4,096 |

This activity includes MCWL experimentation efforts involving seabasing, logistics, CSS, urban combat, medical, force protection, as well as training and education. Although this category covers several small (less than $500K per FY) efforts being pursued by MCWL, most programs listed below are considered major

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(valued at $500K or more) or have near real-time operational impact.

Funds were realigned from High Speed Connector (HSC), medical, armor, and IED Detector Dogs efforts within this activity to other activities with this project in FY 2008.

FY 2009 includes additional funding to support USMC major investments in the Lightening the Marine's Load & Enhancing the Rifle Squad; Operational Adaptation; Asymmetric/Irregular Warfare and Distributed Operations; and Counter Sniper Technologies.

**FY 2007 Accomplishments:**

- Continued IED Detector Dog experiment that will merge specialized breeding, urban conditioning, and multi-disciplinary training techniques in support of small unit infantry operations. Effort supports OIF.
- Continued MCM/Counter IED efforts for mine and IED clearance, detection and neutralization.
- Continued to develop and experiment with bio-science (medical) technologies.
- Continued experimentation of simulation based training technologies to enhance small unit leader decision-making ability.
- Completed investigation of individual equipment to enhance survivability and combat effectiveness.
- Completed study of robotic Road-Side (RS) IED/Vehicle-Borne (VB) IED vehicle capability effort.
- Completed lightweight body armor materials investigation and human performance evaluation and modeling of extremity body armor systems.
- Completed and transition HSC experimentation efforts to Joint Program Office.
- Completed support for the SV06 experimentation campaign plan.
- Completed development and experimentation with Tactical Medical Coordination System.
- Completed lightweight body armor materials experimentation.
- Terminated development and testing of the LAV Self-extractor.
- Initiated experiment to develop training, organization and equipment allowance modifications for logistics units based on the requirement to support DO.
- Initiated development and experimentation with concept demonstrators that enable distribution of material from the seabase to small, widely dispersed, units ashore.
- Initiated development and experimentation of logistics related equipment and employment tactics tailored to the requirements of logistics units supporting DO.

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**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Complete experiment to develop training, organization and equipment allowance modifications for logistics units based on the requirement to support DO.

**FY 2009 Plans:**

- Continue all efforts of FY 2008, less those noted as completed above.
- Complete IED Detector Dog experiment.
- Complete development and experimentation with logistics-related equipment tailored to requirements of DO.
- Complete development and experimentation with concept demonstrators that enable distribution of material from the seabase to small, widely dispersed, units ashore.
- Initiate development and testing of Modeling and Simulation (M&S) tools supporting training, logistics and force protection planning.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **MARINE CORPS WARFIGHTING LABORATORY (MCWL)OPERATIONS (SUPPORT)** | 8,142 | 7,597 | 8,130 |

MCWL Operations (Support) efforts include overall MCWL experimentation doctrine, planning, analysis, data collection, as well as technology transition tracking efforts. Although this category covers several small (less than $500K per FY) efforts being pursued by MCWL, most programs listed below are considered major (valued at $500K or more) or have near real-time operational impact.

Funds were realigned from other activities in this project to cover increased program management, analysis, and strategic planning requirements.

FY 2009 includes additional funding to support USMC major investments in the Lightening the Marine’s Load & Enhancing the Rifle Squad; Operational Adaptation; Asymmetric/Irregular Warfare and Distributed Operations; and Counter Sniper Technologies.

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PROGRAM ELEMENT: 0603640M PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)
PROJECT NUMBER: 2297 PROJECT TITLE: MARINE CORPS WARFIGHTING LAB - CORE

**FY 2007 Accomplishments:**

- Continued to synthesize results and lessons learned into proposed DOTMLPF recommendations for the Marine Corps.
- Continued to provide technical, strategic, and managerial support to Marine Corps experimentation.
- Continued to provide overall analysis and reporting of experimentation efforts, analytical assistance during experiment design, and maintenance of an ad-hoc analysis capability.
- Completed support for the SV06 experimentation campaign plan.
- Initiated engineering, technical and data collection support for SV08.

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.

**FY 2009 Plans:**

- Continue all efforts of FY 2008.
- Complete engineering, technical and data collection support for SV08.
- Initiate engineering, technical and data collection support for SV10.

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **WARFIGHTING EXCELLENCE** | 4,326 | 4,673 | 5,001 |

This activity includes MCWL experimentation efforts in the areas of wargaming, the Center for Emerging Threats and Opportunities (CETO), and Joint experimentation. Although this category covers several small (less than $500K per FY) efforts being pursued by MCWL, most programs listed below are considered major (valued at $500K or more) or have near-real-time operational impact.

FY 2009 includes additional funding to support USMC major investments in the Lightening the Marine’s Load & Enhancing the Rifle Squad; Operational Adaptation; Asymmetric/Irregular Warfare and Distributed Operations; and Counter Sniper Technologies.

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**FY 2007 Accomplishments:**

- Continued executive agent responsibilities for Joint Title X programs, such as Unified Quest, Unified Course, and Unified Engagement. Title X war games generally address future capabilities in the context of Title X readiness responsibilities.
- Continued management and oversight of non-Title X Wargaming, including the highly visible Office of the Secretary of Defense Net Assessment Transformation War Game series and the Special Operations Command wargaming series.
- Continued to conduct quarterly Emerald Express seminars that resulted in collection and dissemination of insights and observations from the Operating Forces. Produced reports for the purpose of professional military education and advancing the lessons-learned process.
- Continued to support the CETO mission: 1) prevent operational and tactical surprises to senior Warfighting Commanders by assessing future security environments in light of emerging threats and potential conceptual and technological opportunities; 2) help focus science, technology, and experimental efforts by appraising promising concepts and technologies; 3) serve as a catalyst to stimulate thought and debate on issues of importance to the Marine Corps.
- Continued funding contributions to Joint Concept Technology Demonstrations and (JCTD) and Advanced Concept Technology Demonstrations (ACTD). Both JCTDs and ACTDs are intended to rapidly field needed capabilities by using emergent mature technologies matched with innovative operational concepts.
– Completed support for the SV06 experimentation campaign plan.
- Completed Marine Corps funding contribution to the Joint Force Projection ACTD to provide warfighters with a simple, timely, and comprehensive understanding of deployment and distribution of information. ACTDs are intended to rapidly field needed joint capabilities by using emergent mature technologies matched with innovative operational concepts.
- Initiated concept development and Modeling and Simulation support for SV08.
- Initiated technology assessment and operational evaluation of DARPA-developed robotic prototypes in support of DO experimentation.
- Initiated investigations/participation into promising ACTDs.

**FY 2008 Plans:**

- Continue all efforts of FY 2007, less those noted as completed above.
- Complete Joint Force Projection ACTD.

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**FY 2009 Plans:**

- Continue all efforts of FY 2008.
- Complete technology assessment and operational evaluation of DARPA-developed robotic prototypes in support of DO experimentation.
- Complete concept development and M&S support for SV08.
- Initiate participation in approved JCTDs and related Joint programs supporting Marine Corps combat development objectives.
- Initiate concept development and M&S support for SV10.

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**C. OTHER PROGRAM FUNDING SUMMARY - NAVY RELATED RDT&E:**
PE 0204163N Fleet Telecommunications (Tactical)
PE 0206313M Marine Corps Communications Systems
PE 0206623M Marine Corps Ground Combat/Supporting Arms Systems
PE 0305204N Tactical Unmanned Aerial Vehicles
PE 0601152N In-House Laboratory Independent Research
PE 0601153N Defense Research Sciences
PE 0602131M Marine Corps Landing Force Technology
PE 0602236N Warfighter Sustainment Applied Research
PE 0602782N Mine and Expeditionary Warfare Applied Research
PE 0603235N Common Picture Advanced Technology
PE 0603236N Warfighter Sustainment Advanced Technology
PE 0603612M USMC Mine Countermeasures Systems - Adv Dev
PE 0603635M Marine Corps Ground Combat/Support System
PE 0603782N Mine and Expeditionary Warfare Advanced Technology

**OTHER PROGRAM FUNDING SUMMARY - NON-NAVY RELATED RDT&E:**
PE 0603004A Weapons and Munitions Advanced Technology
PE 0603005A Combat Vehicle and Automotive Advanced Technology
PE 0603606A Landmine Warfare and Barrier Advanced Technology
PE 0603607A Joint Service Small Arms Program
PE 0603619A Landmine Warfare and Barrier - Adv Dev
PE 0603772A Advanced Tactical Computer Science and Sensor Technology
PE 0604710A Night Vision Systems - SDD
PE 0604808A Landmine Warfare/Barrier - SDD
PE 0602702E Tactical Technology

**D. ACQUISITION STRATEGY:**
Not Applicable.

BUDGET ACTIVITY: 03
PROGRAM ELEMENT: 0603640M PROGRAM ELEMENT TITLE: USMC ADVANCED TECHNOLOGY DEMONSTRATION (ATD)
PROJECT NUMBER: 9999 PROJECT TITLE: CONGRESSIONAL PLUS-UPS

**CONGRESSIONAL PLUS-UPS:**

| | FY 2007 | FY 2008 |
|---|---|---|
| C3RP | 3,108 | 0 |

This effort identified and supported relevant research and expertise at the California Central Coast Research Partnership, an interdisciplinary center of excellence in research relevant to national security and the Marine Corps on the central coast of California, by bringing together universities, government agencies (both federal and state) and the private sector creating a valuable national resource.

| | FY 2007 | FY 2008 |
|---|---|---|
| CRAFT INTEGRATED ELECTRONIC SUITE (CIES) | 1,603 | 2,384 |

In FY 2007, this effort distributed the data received from the Gunslinger sensors into the Common Operational Picture (COP) surveillance tool as well as integrated the COP into the Gunslinger graphical user interface. Gunslinger is a hostile fire detection and counter fire system that automatically detects, locates, identifies and engages hostile fire sources in constrained, dispersed and urban environments, in near real-time, with high precision.

In FY 2008, this effort will expand the efforts of FY 2007 to support the integration of an electronic control system to enhance the situational awareness of the crew of a small boat (Stilitto) to improve the understanding of ad hoc survivable networks delivering a boat with upgraded electronic control and C4ISR.

| | FY 2007 | FY 2008 |
|---|---|---|
| DUAL STAGE ULTRA RELIABLE WATER FILTRATION TECHNOLOGY DEVELOPMENT | 971 | 1,989 |

In FY 2007, this effort supported dual stage water filtration technology. The funding stimulated science to advance water purification technology and potentially reduced cost and energetics to desalinate or purify water.

In FY 2008, the effort will develop a compact individual water purification (IWP) device for use by Marine

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warfighters that will provide emergency treatment of field drinking water that is based on dual-stage ultrafilters and size-efficient pump/filter technology.

| | FY 2007 | FY 2008 |
|---|---|---|
| EXPEDITIONARY UNIT WATER PURIFICATION | 3,157 | 0 |

This effort addressed the following areas: 1) Design specification/fabrication of an Engineering Prototype 300,000 Gallons Per Day (GPD) multi-pass high purity aircraft carrier reverse osmosis desalination plant demonstrator. 2) Design and fabrication of a ruggedized EUWP system that is capable of operation in the field. Advanced demonstrations of large capacity water systems, both ship board and land based, were conducted. These Expeditionary Water Purification Systems may lead to lower cost and more compact desalination systems that will allow Expeditionary Forces to desalinate seawater in high biofouling waters near the shore.

| | FY 2007 | FY 2008 |
|---|---|---|
| INDIRECT FIRE MULTI-GRENADE LAUNCHER | 996 | 0 |

This effort investigated the feasibility and suitability of a different underbarrel grenade launcher for the M16-series service rifle. This effort focused on technologies for a multi-shot capability and enhanced accuracy and lethality throughout the effective engagement range of the weapon.

| | FY 2007 | FY 2008 |
|---|---|---|
| LASER INTEGRATED TARGET ENGAGEMENT SYSTEM (LITES) | 4,710 | 0 |

This effort continued development of fiber-optic laser-based one man portable system for forward operating units to be used for precision target location/tracking, target identification, and laser designation. This effort also continued to provide improved power efficiency and performance, consolidation of functions and remote operation to improve safety/accuracy, lighten workloads, and open new operational scenarios for forward units. This effort also funded the completion of the LandSafe system which will provide enhanced situational awareness to helicopter pilots landing in reduced visibility conditions.

| | FY 2007 | FY 2008 |
|---|---|---|
| MARINE AIR-GROUND TASK FORCE SITUATIONAL AWARENESS | 971 | 993 |

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In FY 2008, this effort will integrate data between the Common Operational Picture (COP) and Gunslinger interface.

| | FY 2007 | FY 2008 |
|---|---|---|
| MEMS MICRODETONATOR PACKAGING TECHNOLOGY | 0 | 2,384 |

This effort will develop batch hermetic packaging of microdetonator devices. The microdetonators needed by the Navy and the Marine Corps require hermetic packaging for long shelf life and reliable operation in harsh environments.

| | FY 2007 | FY 2008 |
|---|---|---|
| ULTRA PROGRAM | 2,914 | 0 |

This effort developed and demonstrated advanced survivability, mobility, and power generation technologies for future recon/scout vehicles. The operational impacts are increased crew survivability, improved mobility & safety and potentially reduced vehicle costs. The deliverables from the ULTRA program have helped define the future Marine Corps vehicle performance requirements.

| | FY 2007 | FY 2008 |
|---|---|---|
| USMC ADVANCED TECH DEMO | 5,050 | 0 |

This effort was devoted, almost exclusively, toward IED mitigation and detection, force protection, and counter sniper technologies. Efforts included IED Detector Dogs (off-leash, small unit support), barrier protection (adhesives that minimize blast effects on existing barrier structures), and technologies to detect, protect, and or provide an offensive capability against enemy combatants. In addition, this effort addressed

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other critical enablers which include C4ISR capabilities that facilitate operations over widely dispersed areas, sustainment of the distributed force (to the tactical level), casualty treatment and evacuation on the distributed battlefield, and human performance (cognitive and physiological). This effort supported the war in Iraq and helped accelerate the transition of critical 6.3 efforts to the Marine Corps' acquisition command.