

MARINE CORPS WARFIGHTING LABORATORY EXPERIMENTATION CAMPAIGN PLAN (ECP)

NOV 2005

This document provides a conceptual framework for Marine Corps experimentation supported by the Marine Corps Warfighting Laboratory. It is intended as a guide to experimentation initiatives currently underway with Lab support. It is primarily distributed via the MCWL web site.

The Plan is organized into five individual sections to permit ready reference to specific areas of interest. Section I provides a general description of the Lab's mission, organization, and functions. Sections II, III, and IV describe the major Lab "product lines" of experimentation, technology development, and wargaming. Section V contains a compendium of individual experimentation initiatives supporting the "product lines".

Since the previous Campaign Plan was written, MCCDC has undergone reorganization. The Lab organization has added the Concepts and Plans Division, the Center for Emerging Threats and Opportunities (CETO) and the Joint Concept Development & Experimentation (JCDE) Division. This reorganization has broadened the scope of the Lab's mission and this expanded role is reflected throughout this document.

Operation Iraqi Freedom (OIF) continues as a primary focus of the Lab. The IED working group remains resident within the Lab and technical development supporting this and other OIF efforts are described in many of the Lab initiative sheets found in Section V. As indicated in Sections II and IV, support to operational forces in OIF remains a key focus area even while *Sea Viking* has remained focused on Distributed Operations experimentation.

My intent is that the *ECP* reflect a near-term (two years) focus outlining Lab efforts and priorities. The document will continue to be completely reviewed annually, however, in view of the pace of change associated with experimentation, the document is designed to permit rapid updating at any time. Comments and recommendations may be forwarded to Commanding General, Marine Corps Warfighting Laboratory (Attn: S&T Plans Division) or by e-mail as provided on the MCWL web site.

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The Lab

Section I

The Lab

Why a Marine Corps Warfighting Laboratory?

The Marine Corps has a rich legacy of innovation including; amphibious warfare, close air support, maritime prepositioning, and tilt-rotor technology, but cannot rest on its laurels or current capabilities.

In a world of great uncertainty, rapid technological diffusion, and potentially volatile conflict, it is vital that the Marine Corps aggressively explore new operational concepts, innovative organizational designs, and advanced technologies to meet tomorrow's challenges.

The emerging security environment places a premium on a continuous transformation of capabilities in order to maintain our competitive advantage over potential adversaries. Potential adversaries can seek out asymmetric tactics, or elect to confront U.S. forces in complex terrain, such as dense urban settings to offset American technological advantages. The future suggests that U.S. military preeminence could be short lived unless we stretch the competitive boundaries of existing capabilities or develop entirely new competencies that distinctly alter future military operations.

The Lab is a key component of the Marine Corps expeditionary force development system in support of the naval transformation roadmap. It employs wargaming, modeling and simulation, concept development and operational experimentation to test and validate tactics, techniques, procedures, new concepts, and technologies that result in increased capabilities.

In short, the Lab operationalizes the Commandant's goals, stated in *Marine Corps Strategy 21*, to harness innovation and technology to ensure future Joint Force Commanders have the necessary naval expeditionary capabilities they will require.

Mission. The mission of the Marine Corps Warfighting Laboratory is as follows:

(The Lab) develops joint and service concepts, and conducts concept-based experimentation to develop and evaluate tactics, techniques, procedures and technologies in order to enhance current and future warfighting capabilities.

The Mission of the Lab has evolved over the years from an experimentation focus to a broader mandate to develop the future vision and map the future capabilities for the Marine Corps as an integral part of the combat development process. It now is responsible for not only collecting lessons learned but also for developing warfighting concepts, in response to emerging threats and opportunities, and the integration of joint experimentation.

Experimentation is conducted to meet Service Title X responsibilities. Service experimentation supports the Warfighting Advocates – Command Element, Ground Combat Element, Aviation Combat Element, and Combat Service Support Element – with the end results supporting the Marine Corps Expeditionary Force Development System - the process by which the Marine Corps translates concepts into fielded combat capabilities.

History

Established in October 1995, the Lab quickly established itself as a focal point for

revolutionary ideas and innovation. Within 18 months, the Lab had developed a means for looking at change – called the *Sea Dragon Process*.

A major component of this process was a five-year experimentation plan – the Warrior Experimentation Series – each phase intended to last approximately two years in length, culminating in an Advanced Warfighting Experiment (AWE). Each phase was given a title – *Hunter Warrior*, *Urban Warrior*, and *Capable Warrior* – reflecting the conceptual focus of the phase.

In 1997, the Lab executed *Hunter Warrior* as its initial major Advanced Warfighting Experiment involving West Coast Navy and Marine operational forces. This phase examined a number of concepts and issues related to sea-based power projection using emerging information technology, precision indirect weapons, and dispersed ground units in an extended battlespace.

Beginning in 1997, the *Urban Warrior* experimental phase focused on the implications of information technology and new tactics while operating in urban environments. The culminating event of this phase was a major urban experiment in Oakland, CA in the spring of 1999.

The *Capable Warrior* phase culminated in the summer of 2001 with an experiment in conjunction with the *Extended Littoral Battlespace Advanced Concept Technology Demonstration* to explore the impact of emerging broadband wireless technologies, intelligent agent decision support tools, and collaborative decision-making systems on sea-based operations in an extended battlespace with multiple maneuver units.

In 1998, the Commanding General of the Lab was assigned the additional responsibility of

Vice Chief of Naval Research and assumed a major role in oversight of Marine Corps related Naval Science and Technology programs.

In 2002, the Lab switched from an odd year experimentation cycle to an even year cycle to synchronize with the JFCOM schedule of experimentation and executed *Millennium Dragon 2002* (MD 02). MD02 supported the Marine Corps service contribution to JFCOM's *Millennium Challenge 2002* experiment. MD02 was conducted from 24 July to 15 August 2002 at MCB Camp Pendleton and at the former George AFB, Victorville, CA.

In 2003 and 2004, the Lab continued to refine its Basic Urban Skills Training package for transition to the Training and Education Command and conducted a number of limited experiments focused primarily in urban combat and urban reconnaissance, surveillance, and target acquisition. A plan to conduct a major experiment in the Western Pacific in 2004 was cancelled in recognition of the demands on the operating forces caused by *Operation Iraqi Freedom*.

Accordingly, the principal focus of effort for technology development shifted to Marine operational forces in stability operations using prototype technologies originally developed to support experimentation in Ship-to Objective Maneuver in support of the *Sea Viking* and *Distributed Operations* campaign plan. Both *Distributed Operations* and *Sea Viking* are discussed in greater detail in Chapter II.

In May of 2005, the charter of the Lab was expanded with the assimilation of responsibility for concept development and coordination with JFCOM for joint concept, doctrine, and experimentation coordination.

Although remaining a command under the cognizance of the Commanding General, Marine Corps Combat Development Command, these added responsibilities continue the integration of the Lab into the combat development process under the Deputy Commandant for Combat Development and Integration (DC, CD&I).



The Dragon as a Symbol of Change

Since its inception, the Lab has adopted the *dragon* as its unique emblem representing the Lab's commitment to an open exploration of change. The *dragon* has appeared within each successive logo used by the Lab. Its perhaps apocryphal source is that of an ancient Chinese proverb about change:

Change is like a dragon. You can stand in its way, in which case it will destroy you with its power. You can run from it, in which case it will rapidly overtake and bury you. Or you can jump on its back, and let it take you where it will into the future.

The *dragon* has been used throughout the history of the Lab in the nicknames for Lab-specific technologies such as the *Dragon Drone*, *Dragon Eye*, and *Dragon Warrior* unmanned aerial vehicles, the *Dragon Fire*

advanced mortar system, and the *Dragon Runner* unmanned ground vehicle.

Organization

As indicated in the Chart on the next page, the Lab is divided into a number of divisions and offices in order to accomplish the wide variety of assigned combat development functions.

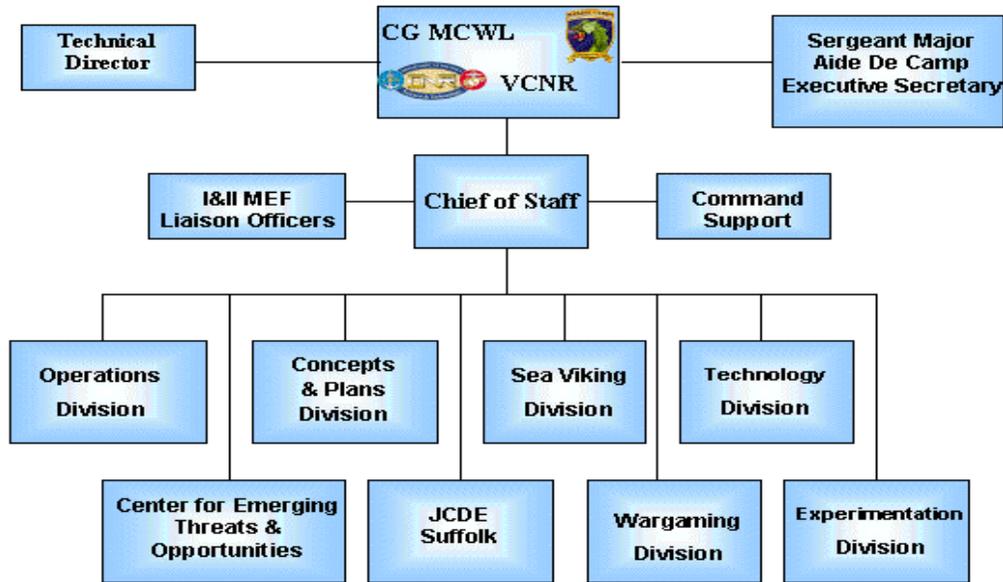
Science & Technology Plans Office

Under the direction of the Tech Director, the Science & Technology (S&T) Plans Office supports the Commanding General in his role as the Executive Agent for Marine Corps S&T to develop the vision, policies, and strategies needed to exploit scientific research and technological development.

The Office integrates and focuses S&T efforts and coordinates the Marine Corps S&T process as well as serving as the principal point of contact for the operational forces in coordinating S&T support for emergent needs.

The Office also acts as the Marine Corps Representative and coordinates input into the Department of Defense Advanced Concept Technology Demonstration (ACTD) Program. Several documents are developed and published by S&T Plans including the biennial Marine Corps S&T Strategic Plan, a supporting S&T Investment Plan, and a S&T Process Handbook. Additionally, the Division publishes the annual Marine Corps Warfighting Laboratory Experimentation Campaign Plan.

Lab Organization Chart



Operations Division

The Operations Division is the Lab’s entry point in providing support to Marine Corps operating forces. The Operations Division is also responsible for the Marine Corps Improvised Explosive Device Working Group (IED WG) and the SECNAV Technology Support Briefings. The IED WG, is the Marine Corps focal point for developing IED countermeasures and coordination with the various Joint and interagency IED working groups.

The IED WG is driving technology procurement, training and TTP development with the focus on *prediction, prevention, detection, neutralization and mitigation*. It has succeeded in identifying and assisting in the development of low-power jamming systems for the operating forces. These have

now been fully funded and deliveries are taking place in theater. Additionally, a change detection technology has been funded for testing and planning is ongoing. New technologies are identified and assessed on an almost daily basis that could be of benefit to deployed forces.

Concepts and Plans Division

The Concepts and Plans Division develops concepts for addressing the future environment per guidance provided in the national defense and military strategies and projections of the future threat environment. CONOPS are developed to support emerging concepts so that capabilities can be identified for future combat development. The process of developing capability requirements based on concepts and CONOPS that are further based on the National Military Strategy is key to the

eventual development of new USMC capabilities.

Joint Concept and Development and Experimentation (JCDE)

The JCDE fuses Marine Corps Doctrine and future strategy with the rapidly evolving Joint Vision. JCDE focuses on three primary areas of the Joint Vision Implementation Process: (1) Joint Concepts, (2) Joint Experimentation and Assessment, and (3) Joint Integration and Implementation/DOTMLPF. It is located in Suffolk, VA in close proximity to the Joint Forces Command J7 and J8.

Center for Emerging Threats and Opportunities (CETO)

CETO is designed to provide the Combat Develop process with a “think tank” type organization capable of developing ideas in response to emerging threats or to exploit opportunities across the DOTMLPF spectrum. Its products are aimed at appraising promising concepts and technologies and serving as a catalyst to stimulate thought and debate on issues of importance to the Marine Corps at large as well as the combat development process.

Sea Viking Division

The Sea Viking Division is responsible for experiment planning and design of the Lab's ongoing Sea Viking *live* force experimentation campaign. Sea Viking is planned and executed in two-year segments. Supporting events consist of workshops, wargames, limited technical assessments, limited objective experiments and Advance Warfighting Experiments.

The current focus for Sea Viking 2006 (SV06) is identification and assessment of the training and advanced technologies required by small



units within a forward deployed, seabased MAGTF that enable that force to conduct immediate joint forcible entry operations (JFEO). The near term goal is to develop a training syllabus and equipment suite that supports achievement of selected Distributed Operations capabilities. These products will be a key input to the DO Implementation Working Group that is identifying the train, man, and equip requirements to implement a DO capability throughout all infantry battalions in the Marine Corps. This effort will serve as a key step towards the ultimate objective of Marine Corps and Naval experimentation – the full implementation of the Ship-to-Objective Maneuver and Expeditionary Strike Group concepts.

Experimentation Division

The Experiment Division is the live-force experimentation arm of the Warfighting Laboratory. This Division is task organized for each experimental mission assigned and traditionally is augmented with units or personnel from the operating forces to support the MCWL Experimentation Campaign Plan. The Division is responsible for:

(1) *Detailed experiment planning*, which consists of developing the detailed experimentation plan in order to accomplish the experimentation objectives within assigned resource restraints; this development often includes the introduction of new TTPs and the training associated generally along the major warfighting functions;

(2) *Experiment Execution*, which consists of coordinating and conducting all experimentation; and

(3) *Experiment Assessments*, which consists of developing operational assessment reports and overseeing the development of transition documentation such as Tactics, Techniques & Procedures (TTPs), Universal Needs Statements (UNSS), Urgent UNS (UUNS's), Programs of Instruction (POIs) recommendations, etc.



Three core functions are performed in the Experiment Division:

(1) Fulfill the experiment operations and experiment control responsibilities for all Advanced Warfighting Experiments

(AWEs) and the vast majority of Limited Objective Experiments (LOEs);

(2) Experiment with technical and non-technical solutions to warfighting challenges that result in the development of new TTPs and that may also support current and new warfighting concepts; and

(3) Experiment with select "commercial off the shelf" (COTS) products that do not require technical development (but may require operational or TTP recommendations for employment).

In the course of every-day service-wide operations and training, certain functional areas have been identified as requiring special attention to enhance warfighting capabilities. Lab projects provide focus and dedicated resources to analyze needs and develop capabilities to address these critical areas.

The Experiment Division examines the introduction of a variety of enhanced capabilities to infantry small units and other warfighting functions. Currently, four major projects exist that are designed to answer specific questions confronting the infantry and Ground Combat Element (GCE) for the Infantry Operational Advisory Group (IOAG), Ground Board, TECOM and the Marine Corps Ground Advocate at Plans, Policies, and Operations (PP&O).

Project Metropolis (urban experimentation and training initiative),

Project Rifleman (infantry specific experimentation and training initiative),

Project Phoenix (aviation related experimentation and training initiative),

and *Project RSTA* (an upcoming initiative to improve ISR integration for better actionable intelligence)

All projects are a means to address areas such as Military Operations in Urbanized Terrain (MOUT), Stability and Support Operations (SASO), and Distributed Operations (DO).

Project Metropolis has a five-fold purpose:

- (1) Develop TTPs to enable Marines to survive, fight and win Military Operations in Urbanized Terrain (MOUT);
- (2) Assess proposed lessons learned from operations during Operation Iraqi Freedom;
- (3) Develop a comprehensive urban warfighting Program of Instruction (POI) to include the Basic Urban Skills Training (BUST) Computer Based Trainer (CBT);
- (4) Recommend improvements to existing and future training facilities; and
- (5) Evaluate selected enabling technologies that enhance combat capability in the urban environment.

Project Metropolis experimentation systematically identifies weaknesses or problem areas across the spectrum of ground warfare and designs experiments in order to find solutions. Project Metropolis partners with operating force units as well as our Coalition partners to conduct experiments at the platoon through battalion (reinforced) level. Experimentation is accomplished across all spectrums of conflict with symmetric and asymmetric threats in both high and low intensity combat environments.

Project Rifleman has a three-fold purpose:

- (1) Enhance Small Unit leadership and develop TTPs to enable the individual Marines and the Small Units to operate commensurate with the Distributed Operations (DO) concept;
- (2) Assess proposed lessons learned from current operations; and

- (3) Recommend improvements to existing and future training facilities, equipment suites, and TTP integration methods.

Project Rifleman experiments enhance the warfighting capability of the individual Marine by assessing the effectiveness of training, and evaluation of selected enabling technologies that enhance small unit combat capability. The program has evolved into an experimental test bed for near term initiatives requested through the Marine Corps Advocates. *Project Rifleman* also assists the Marine Corps Systems Command's Marine Expeditionary Rifle Squad Program to make procurement decisions. *Project Rifleman* is the vehicle upon which the Marine Corps concept of Distributed Operations will be experimented for the future.

Project Phoenix examines aviation and indirect fire related aspects of combat operations. Currently, Project Phoenix is devoted to assessing the aptitude of individual Marines to determine the ability to provide a Terminal Attack Control capability at the Small Unit Level. This initiative is intended to study and provide recommendations for the further development of the Joint Terminal Attack Controller (JTAC) and Joint Fires Observer (JFO) programs, and determining the appropriate level at which this capability should reside in support of the Distributed Operations (DO) concept experimentation. This includes an assessment of the DOTMLPF impacts as a result of this initiative.

Project Phoenix also reviews lessons learned from current operations, and provide recommended improvements to existing and future training facilities. This includes the use of simulation to enhance training and reduce resource requirements to attain the Terminal Attack capability at the Small Unit level.

Previous experimentation efforts were focused on Rotary Wing Survivability and Aircraft Armoring in addition to the fielding of the M3M .50 cal machine gun. Recent experimentation has focused on the Distributed Operations concept, with future experimentation assessing the ability for small-unit leaders to conduct terminal control of aircraft and Joint fires.

Output from the Division takes the form of TTPs and training syllabi, recommended doctrine, X-Files, Universal Needs Statements (UNS), assessment reports or other initial programmatic documents, operational force training, after action reports, and experimentation support to the other divisions within the Lab.

Technology Division

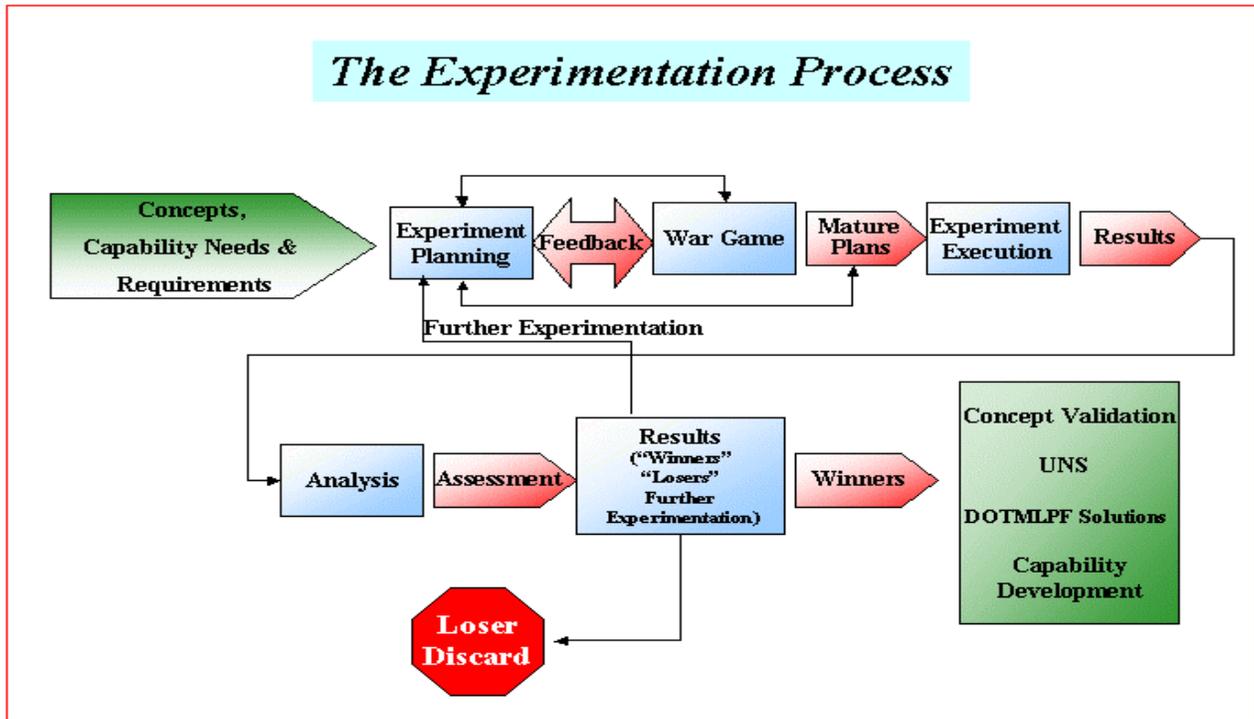
The Technology Division identifies and develops technologies with advanced capabilities through Limited Technical Assessments (LTAs). Candidate technology solutions are used to support selected experimental or proof of concepts efforts. The technology solutions may be prototype systems solely developed by the Lab or in a coordinated effort with the Office of Naval Research (ONR). Additionally, Program Managers from Marine Corps Systems Command can request the Lab's assistance in developing a capability for an on-going program of record. Since the division coordinates with other agencies some candidate solutions may be surrogate systems developed by Defense Advanced Research Project Agency, ONR, or commercial off-the-shelf systems available from industry. Experimentation may present opportunities to insert emerging technologies with advanced capabilities into concept-based experimentation. The Technology Division is a key participant in concept development,

modeling and simulation, and technology development as mandated by Congress.



Wargaming Division

The Wargaming Division supports the entire experimentation process from concept exploration to technology validation and refinement. The Division specifically serves as the Lab's office of record for Joint experimentation and for support to the *Sea Viking* Conceptual Pathway virtual experimentation. In addition, they conduct the Marine Corps Title X Wargame and train Marines for participation in other services wargames.



Innovation and Experimentation Process

The Sea Viking Division, in coordination with the rest of MCCDC and inputs from the advocates, identifies the concepts or ideas for experimentation. The Wargaming Division refines the concept and provides capability insights. The Technology Division identifies equipment and technology candidates for the proposed experimentation. The Experiment Division conducts detailed planning and executes the experiment.

The Lab Experimentation Process, as shown in the diagram above, supports the Expeditionary Combat Development Process and is designed to provide experimentation results necessary to support assessing the needs of the operating forces (*current Marine Corps*), the programmed force (*Next Marine Corps*), and exploring new concepts for warfighting (*Marine Corps After Next*).

Joint Experimentation Support

The Marine Corps experimentation philosophy is targeted at producing the right mix of Marine Corps capabilities for the Joint Force Commander. The key to producing the right mix of capabilities is to ensure that Marine Corps capabilities support joint concepts and where appropriate embed or merge Title X requirements and processes with Joint venues and processes.

The goal of this integrated approach is to produce complementary service and joint Doctrine, Organization, Training, Material, Leadership, Personnel and Facilities (DOTMLPF) recommendations.

Based on this philosophy, the Lab examines the direction of United States Joint Forces Command's experimentation to identify those unique future Marine Corps capabilities that have the potential to contribute to Joint capability development.



Experimentation

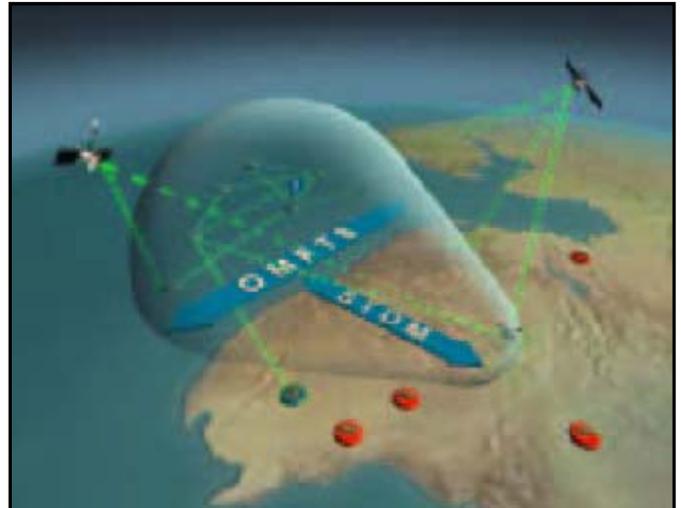
Section II

Experimentation

Background

Lab experimentation is conducted to meet Service Title X responsibilities and to provide Marine Corps contributions to Joint Concept Development and Experimentation (JCDE). Experimentation efforts are guided by the *Defense Planning Guidance, Marine Corps Strategy 21, Expeditionary Maneuver Warfare (EMW), Expeditionary Maneuver Warfare Capabilities List (ECL)* along with input from the Advocates, Marine Corps Combat Development Command (MCCDC), Office of Naval Research and a variety of other sources. The Lab is responsible for service experimentation focus and direction. Experimentation conducted by the Lab is designed to improve current and future naval expeditionary warfare capabilities by:

- Conducting concept-based experimentation to develop and evaluate tactics, techniques, procedures and technologies.
- Supporting MCCDC, Training and Education Command, and Systems Command to meet service-specific requirements.
- Supporting Joint experimentation through Wargaming Division's participation in Title X War Games, Joint Concept Development and Experimentation (JCDE) War Games, and External War Games.
- Forwarding results of experimentation to MCCDC's Capabilities Development Directorate (CDD) with recommendations for action.



Sea Viking 06

SV06 is comprised of two areas of effort, Seabased Operations and Distributed Operations. Seabased Operations are focused on achieving capabilities to conduct STOM. Key objectives are refining the requirement and recommending solutions for tactical over the horizon/on the move voice and data communications, develop and assess expeditionary fire support system enhancements and develop a concept for enhancing the C2, maneuver and force protection of combat service support elements operating in a non-linear battlespace.

CMC Sea Viking Guidance

- Assess the future seabased MEB in a Joint Forcible Entry context
- Assess future MEB capability sets
- Assess seabased command relationships & interfaces across all warfighting functions
- Develop and assess an additive Distributed Operations capability
- Accelerate seabasing capabilities through experimentation and the use of existing technology

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SV 06 will also examine the emerging Distributed Operations (DO) concept (a capability that deploys tactical units across the depth and breadth of a battlespace in order to maximize opportunities to achieve favorable intelligence driven engagements... enabled by a robust and easily accessible C4 backbone and prompt, responsive fires) and envisions experimentation with one rifle platoon from a selected Marine Expeditionary Unit (Special Operations Capable). The focus of SV 06 is identification and assessment of the training and advanced technologies required by small units within a forward deployed, seabased MAGTF that enable that force to conduct immediate JFEO.



MCWL Experimentation Plans for FY 07 and FY 08.

MCWL experiments during FY 07 and FY 08 will continue to focus on small unit enhancements associated with DO. FY 07 programs will identify, develop and test sustainment related DOTMLPF innovations that provide the flow of material and services required by combat units operating ashore per the DO concept. Concurrently, MCWL will begin the development of a "next generation" C2 architecture that includes tactical level OTH voice and data communications tailored

to meet the information requirements of the individual rifleman up through the infantry company. Plans for FY 08 include testing the individual and collective C2 innovations as well as experiments to determine the utility of currently available ISR assets to small units that do not normally employ these assets.

The Lab has also identified high priority experiment efforts to satisfy current urgent needs of deployed USMC forces conducting combat operations. Counter IED technologies, a Mobile Counterfire System, vehicle and body armor experiments will continue as needed through FY 08.

In addition to the priority efforts linked to DO and support for Marines in combat, MCWL will conduct experiments that cover a wide variety of other innovations. These experiments will support joint programs, MCSC programs of record, and other areas selected by MCWL. FY 07 and 08 experiments that fall into these categories will assess advanced ground weapons, vehicle technologies, expeditionary medicine, unmanned aerial sensors, and sea basing technologies.





Technology Development

Section III

Technology Development

Background

The principal reason the Marine Corps Warfighting Lab develops technology is to support concept-based experimentation. Technologies developed for this purpose differ fundamentally from technologies developed within any other venue within Marine Corps Science & Technology (S&T) because they are not necessarily intended to transition into acquisition.

There are also three other purposes for which the Lab develops technology initiatives:

- (1) Technologies explored because the Lab is mandated through Congressional language and provided funding for a specific technology development purpose.
- (2) Technologies developed as a direct result of experimentation either as concept demonstrators or as prototypes emerging from experimentation that have proven to be strong candidate technology insertions into programs of record.
- (3) Technologies developed to meet emerging operational needs of the Operating Forces.

In addition, to developing technologies as described above, the Lab also assists ONR, MARCORSSCOM, or the Operating Forces in assessing candidate technologies for sufficient maturity for an extended operational assessment. In this regard, the Lab may also conduct assessments as part of a limited technical experiment for the purpose of developing a concept of employment or interim tactics, techniques and procedures for using the technologies by the Operating Forces.

Prototypes and Surrogates

Concept-based experimentation typically requires technology that can represent capabilities not currently available in military equipment. In some cases, commercial off-the-shelf or government prototypes can be used in providing a capability not yet available with military equipment. For example, during *Hunter Warrior* the Lab used early prototypes of the FO/FAC system as a prototype for a target location data hand-off system. During *Urban Warrior*, the Lab used Libretto palm top computers as a prototype for future tactical hand-held computers.



However, in other cases, there is no available prototype and instead a surrogate that represents specific characteristics of a future capability can be approximated by a surrogate technology. During *Hunter Warrior* a system involving landlines and tower relays served as a surrogate for a future over-the-horizon tactical communications system to support experimentation into the *Ship-to-Objective Maneuver* concept from over-the-horizon distances.

In other cases, the surrogate technology can be even more basic. During the experimentation leading up to *Urban Warrior*, the employment of a Marine with a clipboard with “yellow-stickers” carrying a controller

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radio simulated the battlefield “situational awareness” that could be afforded potentially to a small-unit leader by a not-yet-available digital assistant in order to explore the information needs of tactical units in urban combat.

Typically, prototypes and surrogates have no use upon completion of experimentation. However, in some cases these systems are offered to the Operating Forces as residual capability upon completion of experimentation with the caveat that the Lab does not provide life cycle support, e.g., maintenance and spare parts.

Congressionally Mandated Initiatives

Annually, Congress mandates and resources the development of specific technologies.



When the Marine Corps requests the Congressional resources it is with the expectation that the Marine Corps will use the resources to either complete a desired development program or initiate a program that the Marine Corps intends to fund in subsequent years.

However, there are other congressional initiatives that have not been requested and are not precursors to Marine Corps acquisition programs. In these cases, the Lab focuses the

program on achieving a product that does not require sustainment nor further development. The expectation is that absent congressional resourcing in subsequent years, there will be no further Marine Corps funding of the initiative.

FY 06 Congressional Initiatives

- **Mobile Fire Support System (MFSS)**
- **UAV/UGW Wearable Computer (MOWC)**
- **Precision Approach Landing System (PALS)**
- **Telepresent Rapid Aiming Platform (TRAP)**
- **Remote Weapons Systems (RWS)**

Technology Enhancement to a Program of Record

The Lab is a component of the overall Marine Corps Science and Technology (S&T) Enterprise. Although technology development in support of MARCORSSYSCOM acquisition programs is the responsibility of ONR – in most cases Code 30 (formerly Code 353) – there are occasions when a Lab initiative may emerge into a technology enhancement for a program of record.

In most cases, such a technology initiative will emerge from a technology prototype or surrogate initially developed for experimentation. For example, the Tactical Handoff System (Experimental) was identified as a potential block upgrade to the Target Location Data Hand-off System as a result of a Lab-developed Advanced Close-Air Support System (ACASS), which proved to be both more advanced and more desirable to the Operating Forces than the prototype pathway of the program of record.

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Alternately, technologies can transition directly to acquisition after experimentation. Examples include the Personal Role Radio (PRR) used in Project Metropolis for tactical communications in Urban Operations which was requested by the operating forces for use in Operation Iraqi Freedom and over 10,000 acquired from British War Reserve.

Technologies Developed to Meet Emerging Operating Needs of the Operating Forces

Operation Iraqi Freedom – and specifically *Operation Iraqi Freedom 2* (OIF 2) – offered the opportunity for the Lab to develop



technologies tailored specifically to the needs of the Operating Forces in combat. These technology needs are situation specific and thus not necessarily applicable to the Marine Corps as a whole.

For example, the Lab responded to the need for an appliqué armor system for support vehicles such as the HMMWV and LVTS with the identification of a variety of potential

commercial products. In coordination with ONR and the Army Rapid Equipping Force, the Lab assisted in the expedited testing of various commercial products and approaches to armor systems, aiding in the definition of the protection standard and in quickly assessing the validity of various vendors protection claims.



In addition, the Lab responded to the Operating Force's request for force protection sensors by providing lightweight night cameras for integration into an aerostat program. As a result, forces received an otherwise unavailable capability for 360-degree night surveillance around a key command element and airfield.

As the Combat Developer's Executive Agent for technical support to OIF/OEF, the Lab provides S&T initiative review functions for the Expeditionary Force Development System. In addition, the Lab supports and provides direction to the Marine Corps IED Working Group in developing initiatives to meet the IED challenge and to coordinate Marine Corps Service positions in a variety of joint forums.



Wargaming

Section IV

Wargaming

Background

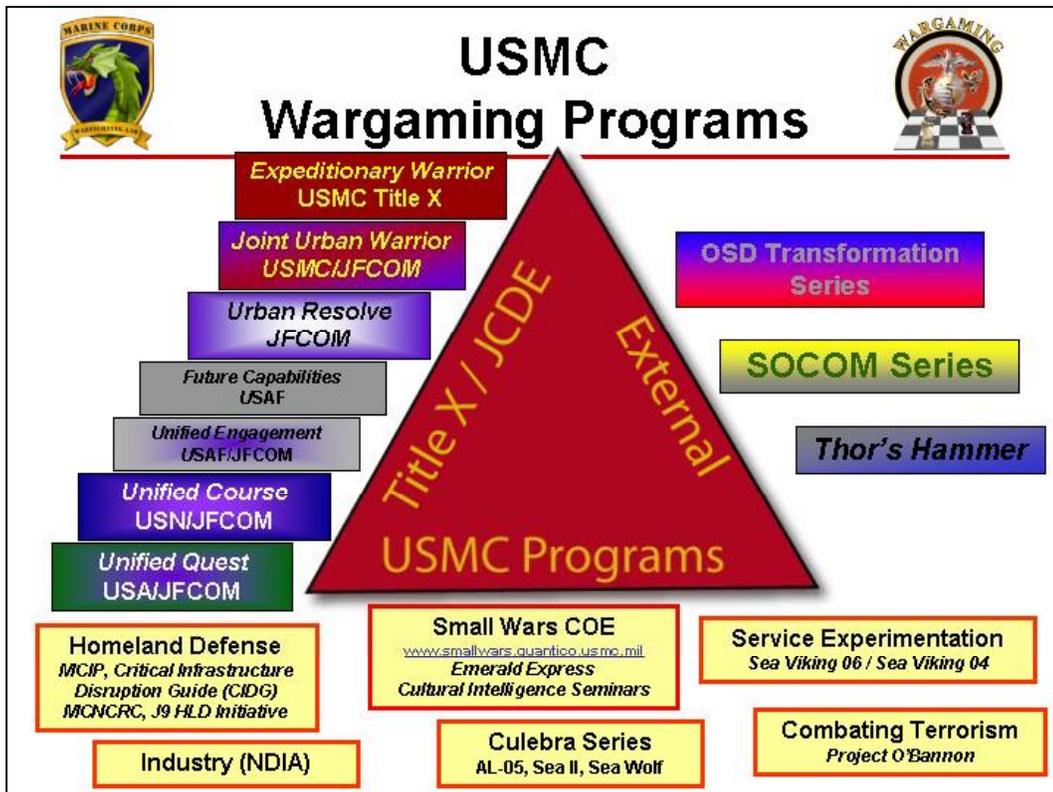
Wargaming employs highly flexible exploratory and assessment methodologies that can address a broad range of issues involving varying degrees of conflict. These tend to focus on war and war-related matters, but can include many issues outside the scope of war proper. For example, gaming methodologies have proven particularly useful in addressing the complexities of fire and rescue operations, and WMD incident response. An operational definition of "wargaming" is *"the artificial replication of a situation of competition or conflict not involving actual military force that is characterized by human decision-making which impacts the course of events throughout. It revolves around the interaction of two or more opposing forces*

guided by predetermined objectives, rules, data, and procedures designed to depict an actual or assumed real world situation."

Wargaming is especially useful in generating, refining, and assessing concepts, plans, decision alternatives, issues and technologies; identifying capabilities and deficiencies; reducing surprises; and creating conditions which allow risk-taking difficult to reproduce in experimentation, exercises or operations.

Key Programs

The Marine Corps Wargaming Program, executed by the Wargaming Division of the Lab, is a comprehensive and multifaceted effort focused on concept, policy, and operational exploration at several levels: Title X Wargaming, Joint Concept Development and Experimentation (JCDE) and external gaming efforts, and a broad and diverse array of Service programs. This scope is illustrated in the graphic below, and



described in more detail in the following sections.

Title X Wargaming

Title X Wargaming consists of two broad components. The first is the management, oversight, and assessment of Marine Corps participation in other service-sponsored Title X War Games. The second is the execution and assessment of the Marine Corps' Title X Wargaming Program, *Expeditionary Warrior (EW)*. Title X War Games generally address future visions and capabilities in the context of core Title X responsibilities of organizing, training, and equipping forces to execute each Service's statutory roles and functions. Title X War Games, sponsored at high levels within each Service, are Joint in that they involve participation by all the Services and Combatant Commands as appropriate, and, in some cases, are cosponsored by a Service and Joint Forces Command (JFCOM). Finally, these programs are expected to have major implications for the future direction and capabilities of the sponsoring Service.

Current other-Service Title X Wargaming Programs managed on behalf of the Marine Corps comprise the Army's *Unified Quest (UQ) Series*, co-sponsored with JFCOM, the Air Force's tandem *Unified Engagement (UE)* and *Futures Capabilities Series*, the former co-sponsored with JFCOM, and the Navy's *Unified Course (UC) Series*, again co-sponsored with JFCOM. These are large annual programs, each with a pathway cycle of 8-10 months.



In June 2002, the Commandant of the Marine Corps officially approved the re-establishment of a Marine Corps

Title X Wargaming Program (in the late-1980s and early-1990s the Marine Corps had pioneered what today is termed "Title X" gaming with the **CMC Policy and Strategy War Game Series**). As noted, the new program is designated *Expeditionary Warrior* and is designed differently than other-Service Title X programs. It is intended to provide a highly flexible venue to address issues of pressing concern to the leadership of the Marine Corps. The first event in the program, *EW 03*, was conducted in November 2002, and focused on USMC-SOCOM interoperability in conducting preemptive operations in the Global War on Terrorism (GWOT) as articulated in the *National Security Strategy (NSS)* of September 2002. *EW 04* was conducted in October 2003, and continued and extended the work of *EW 03* in exploring the interoperability of USMC and SOCOM forces within the same context of the GWOT and the *NSS*. *EW 05* was conducted in December 2004 and provided a detailed look at the draft Marine Corps Distributed Operations concept. *EW 06* is scheduled for 22-27 January 2006 and will inform concept development aimed at countering irregular threats, as well as broader range of Small Wars related issues.

Joint Concept Development and Experimentation (JCDE) War Games

The major Marine Corps JCDE program line – *Joint Urban Warrior (JUW)* was developed in response to JFCOM's designation as the DOD Executive Agent for Joint Urban Operations (JUO). Due to the deep well of urban wargaming and experimentation experience in MCWL, Wargaming Division formulated the *JUW* program concept as the annual USMC contribution to the JUO initiative, as well as to provide an institutionalized venue in

which to examine complex urban operations in a Joint, Interagency, and Multinational context. From its inception, *JUW* was conceived as a co-sponsored program between the USMC and JFCOM. Two significant events marked the beginning of this program - *Emerald Express (EE) 03 and 04-1*. They were designed to establish a



foundation or baseline for future *JUW* events from lessons learned in recent operations involving urban warfare - Operation Enduring Freedom (OEF) and Operation Iraqi

Freedom (OIF). *EE 04-2* expanded the program into the realm of Interagency operations by focusing on that dimension with regard to ORHA / CPA during OIF. *Emerald Express*, focused on insights and observations from real-world operations, is a long-standing component of the *Small Wars Center of Excellence*, and a major component of the *JUW* Pathway.

External War Games

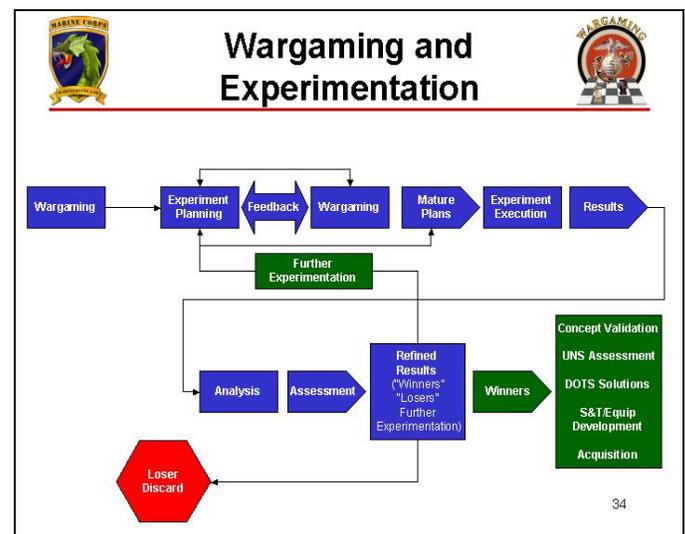
External Wargaming Programs are a broader and less well-defined aspect of the USMC Wargaming effort. Among the many examples of these games are the *Special Operations Command (SOCOM) War Game Series*, and *Thor's Hammer*, cosponsored by Strategic Command (STRATCOM) and JFCOM, as well as relevant gaming efforts of other Services not encompassed by Title X or JCDE Programs.

Marine Corps Wargaming Programs

Marine Corps wargaming programs embrace an extensive array of activities that are planned and executed by the Wargaming Division. As such, they are Marine Corps

initiatives even though many include Joint, interagency, and even non-governmental participation.

Service Experimentation Wargaming functions as a means of exploring, vetting, and assessing issues prior to the commitment of resources to live experimentation. A component of the MCWL Innovation and Experimentation (I&E) Process, Service Experimentation Wargaming occurs at the front-end of an experimentation track in order to assess concepts, issues, etc. that shape the direction of the track as a whole. Additionally, the wargaming component could “game” the experimentation plan for refinement and possible modification. And, depending on time and resources, the experiment itself could be conflated into the wargaming component. Since the inception of MCWL in 1995, most major experimentation programs have contained a wargaming component. Most recently, *Sea Viking 04* and *Sea Viking 06* have involved wargaming in their formative stages. The following graphic illustrates the role of wargaming in the I&E process.



Culebra Series. This dimension of the USMC Wargaming Program is focused on a broad and eclectic range of expeditionary

warfare issues related to developing distinctive USMC force capabilities. This includes concept development, doctrine refinement, and the identification and refinement of critical capabilities. **Culebra** often connects with and leverages Title X programs. Some of its more prominent initiatives include the recently completed Autonomic Logistics (AL) War Game with Marine Corps Systems Command, the *Sea II* Program that resulted directly in the revision of *Joint Publication 3-02: Joint Doctrine for Amphibious Operations*, and any number of efforts directed at core USMC expeditionary warfighting capabilities.

Small Wars Center for Excellence (COE)

In early 1999, the Commandant tasked the Marine Corps Warfighting Laboratory (MCWL) with establishing a Marine Corps Operations Other Than War (OOTW) Center of Excellence (COE). The basis for this organization was *Exercise Emerald Express*, a program implemented by the CG, I MEF in 1995, which was the first large-scale interagency Operations Other Than War (OOTW) exercise that attempted to address the issues from a holistic perspective, integrating all their complex and multifaceted components. That integrated, interagency approach has remained the guiding framework for the ongoing Emerald Express conference program, as well as for the activities of the now Small War Center of Excellence. The COE's broad mission is to provide a forum of information for the understanding, history, and challenges presented by the Marine Corps's involvement in Small Wars, to explore innovative Small wars concepts, and tactics,



techniques, and procedures (TTPs) and to address Small Wars policy, doctrine, and key programs where appropriate. These mission elements are expanded by several key supporting functions: to identify insights and issues from Small Wars operations; to maintain a cultural intelligence information base, to conduct Small Wars conferences, war games, etc., and to coordinate with other Small Wars-related conferences, war games, and related events involving other Services, Combatant Commands, Government Agencies, Non-Governmental Organizations (NGOs), and Private Volunteer Organizations (PVOs). Key COE programs comprise:

- ***Small Wars Center of Excellence Web Site.*** Designed to provide “one stop shopping” for the multifaceted scope of Small Wars research and activities, the site features over 1000 vetted links, including a search engine replete with journal articles, book recommendations, after-action reports, and lessons learned from recent operations, an expanding collection of cultural intelligence reports and links, and extensive links to other Small Wars-related organizations and web sites. Much of the material on the site is password protected. Access requirements and procedures are available on the site.
- ***Emerald Express*** is a continuing series of conferences and workshops designed to quickly garner critical insights and issues from recent operations and directly distribute the results as widely as possible. Participants are typically commanders and senior staff of units that have participated in operations under scrutiny, as well as relevant interagency and non-governmental organizations. *EE* is, by definition, joint and interagency, as well as increasingly combined in scope,

and is conducted regularly based on the availability of appropriate participants as opposed to a set schedule. Recent *EE* events have addressed urban operations in OIF I & II, the interagency dimensions of OIF, humanitarian assistance and stability and support operations in OIF, and USMC and Royal Marine operations in OEF.

- ***Cultural Intelligence Seminars*** seek to provide a “missing piece” to conventional military planning by focusing on both the complexities and nuances of indigenous cultures, as well as the “actual” network of power and influence operating beneath the “line and block charts.” While the principal beneficiaries are Marine and other Service organizations, participants are drawn primarily from interagency organizations (DOS, USAID, etc) and NGOs. Cultural Intelligence Seminars have addressed Cuba, Haiti, Indonesia, Kosovo, Colombia, Somalia, Rwanda, Urban Warfare, and central Africa. Cultural Intelligence reports remain among the most requested items from the Small Wars COE web site, attesting to the importance and success of this program.

Homeland Defense. This component of the USMC Wargaming Program focuses on the multifaceted issues of military support to civil authority in several contexts.

- Prominent in this regard is the ***Metropolitan Critical Infrastructure Protection (MCIP)*** initiative in support of the Deputy Commandant for Plans, Policies, and Operations (PP&O). This has included a significant wargaming effort with the New York Police Department, the City of Seattle, and an August 2003 event in San Francisco.

Additionally, a tabletop war game is scheduled for October 2005 (exact date TBD) in New Orleans as part of the handover of the *MCIP* program to the cognizance of MARFORNORTH.

- Much of the context for the Homeland Defense effort has focused on chemical/biological incident response, particularly in antiterrorism scenarios that potentially involve the Marine Corps’ Chemical Biological Incident Response Force (CBIRF). A number of war games have been directed toward this end, particularly ***Project Atlanta***, a congressionally mandated effort exploring new technologies and critical organizational and command and control issues involved in military support to civil authority. Ongoing efforts include the development of a ***Critical Infrastructure Disruption Guide (CIDG)*** in collaboration with HQMC PP&O and the Naval Operations Other Than War (OOTW) Center at Dahlgren for use by operating forces engaged in urban operations, both Homeland Defense and overseas. The Guide is a compendium of knowledge that provides visual/graphic and written descriptions of key infrastructure elements and how they integrate. It includes methods of destroying or degrading these infrastructure elements through the minimal use of force is detailed in this document and is optimized for small military units with conventional capabilities, or small non-military groups using field expedients to accomplish the task. This product is currently awaiting the development of a railway infrastructure module.
- The Homeland Defense program also supports various activities incident to CG, MCCDC’s responsibilities as CG,

Marine Corps National Capital Region Command (MCNCRC), as well as the security dimensions of the Marine Corps Marathon. For example, the *Marine Corps Marathon Tabletop Exercise (MCMEX 04)* was initiated in October 2004 in conjunction with the Marine Corps Marathon Office. It brought together a broad spectrum of key professionals from the National Capital Region (NCR), federal agencies, and DOD for a staff-training war game shaped around simulated responses to scenario-based incidents. Planning for *MCMEX 05* is expected to commence in August 05.

- Additionally, Homeland Defense has emerged as a major component of JFCOM's overall Joint Urban Operations (JUO) effort. In that context, there may be applications to the *Joint Urban Warrior* Program, as well as broader engagement under the JUO umbrella.
- Finally, this effort integrates with the activities of the National Institute for Urban Search and Rescue (NIUSR), an organization of First Responders heavily engaged in issues of military support to civil authority.

The Industry War Game Series is conducted in conjunction with the National Defense Industrial Association (NDIA). This program helps maintain a dialogue with industry, facilitates a larger role for industry in Marine Corps events, and leverages the considerable expertise of the defense industry in addressing key expeditionary capabilities issues. As examples, the 2003 NDIA War Game focused on Enhanced Networked Seabasing, the 2004 effort addressed Joint Forcible Entry Operations (JFEO), and the 2005 war game (Jun 05)

considered Distributed Operations.

Exploratory/Futures Gaming is a long-range, open-ended effort to explore future and emerging operational concepts, organizations, technology, and "strategic futures," among other topics.

RMA/Project Ellis
War Game 00-1

The Anti-Access Issue:
A Case Study in
Asymmetric Warfare



The first component of this effort is *Project Ellis*, which examines pivotal shifts in the strategic landscape that may result in major changes to US military strategy and the role of the Marine

Corps. *Project Ellis* has examined, through workshops and war games, such issues as changing strategic assumptions, asymmetric warfare, counter anti-access strategies, and the impact of quantum technology shifts.

Current *Project Ellis* efforts are focused on supporting the war on terrorism; more specifically *Project O'Bannon* and *Expeditionary Warrior*.



Initiatives

Section V

Coalition C4 Interoperability

Purpose: Initially, this initiative will provide a migration path to allow UK BOWMAN radios to interoperate with current and future USMC communications systems at the tactical voice level. Future years will explore data interoperability and involve additional NATO allies.

Background: After a trip to the UK, it was determined that both the US and UK could capitalize on the individual strengths of C4 systems to help the combined US/UK team establish a single method of command and control. Starting with current radio technologies, the possibility of combined experimentation will also be explored.



Description: The objective of this initiative is to provide a new avenue of C4 coalition interoperability; concurrent with parallel advancements in Distributed Operations/Small Unit Enhancement. Additionally, the project seeks to provide a migration path to allow UK BOWMAN radios to interoperate with current and future USMC communications systems at the voice and data level. The intent is to develop an initial test plan, followed by a field-based experimental test for voice compatibility. In FY07, the focus will be broadened to include data interoperability and include additional allies (CAN, AUS, NZ and others). Technological development will be made in conjunction with MCSC MOA to provide corresponding transition plan(s).

Deliverable Products: Utilizing existing tactical equipment, COTS technology, and new solutions; provide a path towards voice and data interoperability for allied partners. FY06 will focus on United States/United Kingdom tactical voice interoperability via SINCGARS, BOWMAN and PRR/IISR. FY07 and FY08 will include data interoperability and additional allies.

Milestones:

TASK	FY06	FY07	FY08
US/UK Initial Interoperability Experiment	▲		
US/UK Voice Radio LTA	▲		
Interoperability Engineering	▲	▲	
US/UK Data Exchange		▲	
Coalition Testing & Evaluation, LTA		▲	▲

POC: (703) 784-1335

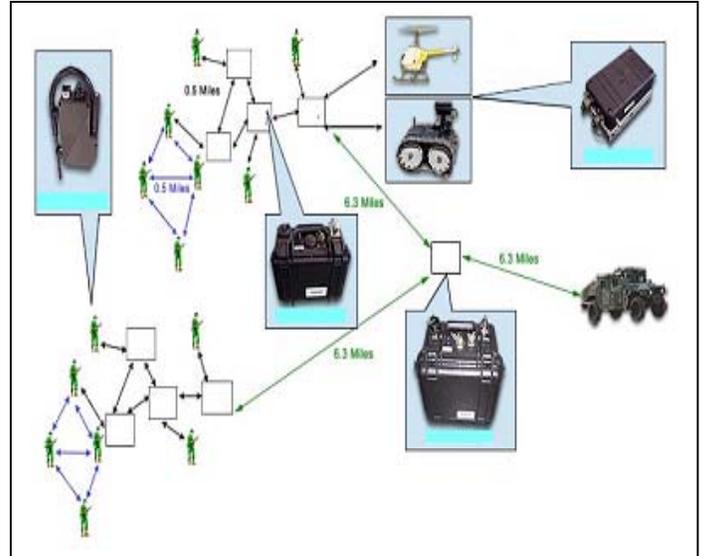
Company and Below Wireless Network Infrastructure and Management

Purpose: In conjunction with other initiatives, this initiative will provide the backbone to bring robust, secure voice and data to the bandwidth-disadvantaged warfighter.

Background: While investigating the technologies available to increase the range of the cellular initiative, mobile ad-hoc networks showed to be the best possibility. Such networks tend to be extremely lightweight for those placing the network nodes where they are needed. Wireless Fidelity (WiFi) also offers the best opportunity to bring real information down to the lowest tactical level.

Description: Design and build a secure, managed, mobile ad hoc wireless network in order to provide critical information for small unit leaders. This initiative will develop and test radios that provide voice and data communications to disadvantaged tactical users.

At the company and below, lightweight command and control mostly consists of small voice radios. Using current Commercial Off The Shelf technologies that bring WiFi capabilities into cellular handsets, it is possible to harness the capability and disposability of communications devices that are taken for granted in garrison and bringing them to the battlefield. This initiative provides the communications pipe that will enable this information exchange.



Deliverable Products: A “best of breed” that extends the range and reduces the footprint of current systems is the main deliverable. In conjunction with that deliverable, the network will be an integral part of the TACCELL network.

Milestones:

TASK	FY06	FY07	FY08
Identify & Evaluate	▲————▲		
Prototype development; voice and data		▲————▲	
LTA 1, 2, 3	▲	▲	▲
Distributed Operations			▲————▲

POC: (703) 784-1331

C2 Experimentation Support

Purpose: To provide the communications support necessary to conduct Distributed Operations (DO) experimentation.

Background: The Distributed Operations concept envisions decentralized decision authority for widely dispersed maneuver elements. DO relies on small units that are better trained and equipped to locate, close with, and destroy the enemy. Small units such as squads and platoons are not adequately equipped for DO operations, especially in the area of Command and Control. The Lab is purchasing the equipment necessary to train and conduct DO experimentation and ultimately determine the recommended quantity and mix of C2 gear.



Description: The Command and Control communications suite envisioned for DO and purchased for experimentation provides enhanced HF, VHF, UHF, GPS, and SATCOM capability down to the platoon, squad, and team level. The C2 equipment will provide enhanced communications and links for fires, and links for ISR (intelligence, surveillance, and reconnaissance). Once purchased, units conducting experimentation will be trained in a Tactical Small Unit Leadership Course (TSULC) followed by the Limited Objective Experiment (LOE II).

Deliverable Products: Experiment report.

Milestones:

TASK	FY06
Purchase C2 equipment	▲▲
Tactical Small Unit Leaders Course	▲▲
DO LOE II	▲▲

POC: (703) 432-1476

Expeditionary Tactical Communications System (ETCS)

Purpose: To provide voice and data, over-the-horizon (OTH), on-the-move (OTM) communications to the mounted and dismounted tactical warfighter.

Background: The Marine Corps Combat Development Command (MCCDC) identified the need for an OTH tactical communications capability to support Expeditionary Maneuver Warfare (EMW) that is not currently met by any program of record. This requirement is to enable Ship to Objective Maneuver (STOM) at the tactical level over a 200 nautical-mile area with minimum ground infrastructure. It must provide an assured OTM capability to dismounted tactical maneuver units and fires and logistic assets operating in complex terrain. After review of the Universal Needs Statement, the Commanding General of MCCDC directed the Lab to investigate capabilities for experimentation in the SV04 AWE. Due to contingency operations that impacted the availability of FMF users, the ETCS Extended User Evaluation (EUE) portion of the SV04 AWE is being conducted with II MEF forces OCONUS. ETCS will provide the OTH communications backbone during the MCWL-sponsored Sea Viking 06 (SV06) Advanced Warfighting Experiment (AWE).



Description: ETCS is a modified version of the commercial Iridium system that will provide netted (one-to-many) push-to-talk communications vice the current point-to-point, dial-up capability. It will provide OTH and OTM communications between the seabased C2 nodes and elements ashore down to the dismounted company commander and reconnaissance team. The system is based upon a modified Motorola 9505 handset with an integrated Global Positioning System and a Group Radio Controller to manage the voice/data traffic and the individual nets. ETCS will be fitted aboard ship and in an OTM Combat Operations Center in the SV06 AWE that is scheduled for June 2006. It will be integrated with current Marine Corps Systems such as the Command and Control Personal Computer (C2PC) application to provide extended netted communications over greater distances than the required 200 nautical miles without ground infrastructure. With MCWL's Command and Control Integration Translator (CCIT), ETCS supports injection of blue PLI into the C2PC application.

Deliverable Products: Prototype system of 400 Global net Radios for operational experimentation, requirements documentation, and recommendations to MCCDC.

Milestones:

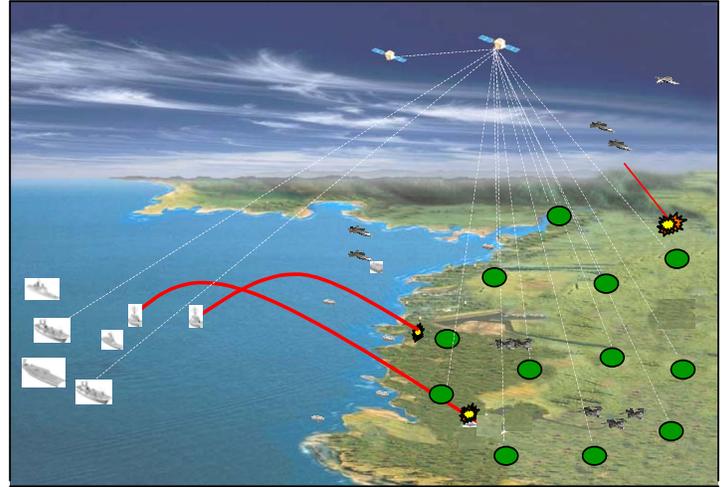
TASK	FY06
Software Development	▲
System Improvements	▲
OIF II Extended User Evaluation	▲
Assessment	▲
Sea Viking 06 AWE	▲

POC: (703) 784 1331

Netted Iridium

Purpose: To develop a *scalable, secure, global* netted voice and data communications capability. Netted Iridium has the potential to alleviate the acute tactical satellite communications gap currently experienced by the U.S. Military.

Background: Building on the success of ETCS, this initiative was started to address the scalability problem of ETCS. Currently being used in Iraq and CJTF Horn of Africa, ETCS is currently limited in the amount of voice systems allowed to operate inside one spot beam. Netted Iridium is planned to alleviate this restriction.



Description: This initiative will examine a new Netted Iridium system to supercede ETCS. The initiative will include development, testing, user evaluation and SV 08. Phase 1 (FY06) will produce a tactical level, highly scalable solution (25000 users, 1000 nets projected) that will cover portions of a theater AOR (approximately 150 mile diameter area). Phase 2 (FY07) will provide a scalable, global solution. This technology will have a direct contribution to Distributed Operations/Small Unit Enhancement.

Deliverable Products: A prototype system to transition to Marine Corps Systems Command.

Milestones:

TASK	FY06	FY07	FY08
Phase I LTA	▲		
Phase II LTA #2	▲		
Phase II Development	▲	▲	
Phase II LTA		▲	
LOA/Extended User Evaluation		▲	▲

POC: (703) 784-1335

On the Move Combat Operations Center

Purpose: To provide an On the Move (OTM), Over the Horizon (OTH) Combat Operations Center (COC) to the infantry battalion commander for surface and vertical employment during *Ship to Objective Maneuver* (STOM).

Background: STOM operations require the ability to rapidly maneuver over an expanded littoral battlespace. The STOM battlespace is non-linear, without secure rear-unit COCs. This environment requires COCs that can operate OTM, to include voice and data communications. Since the command element COC is seabased, they will also require OTH communications. The Lab's *Sea Viking*, STOM focused experimentation will require an OTM/OTH COC capability for experimentation in a 2006 Limited Objective Experiment. In order to provide this capability, the Lab is partnering with Marine Corps Systems Command (MCSC), the Office of Naval Research (ONR) and industry to develop an experimental OTM/OTH Digital COC (DCOC).



Description: The Lab is partnering with MCSC's Unit Operations Center (UOC) and Expeditionary Fighting Vehicle programs, ONR's Littoral Combat Power Projection Future Naval Capability program, and General Dynamics to explore integration of the Lab's OTH Expeditionary Tactical Communications System (ETCS) and on the move capable C2 systems (C2PC/AFATDS) into battalion COC platforms. Platform options are an integrated towed trailer COC and multiple wirelessly-connected Interim Fast Attack Vehicles (IFAV) or HMMWVs. The HMMWV variant was completed in July of 2004 and the IFAV variant began initial testing in July of 2005. Integration of ETCS and the Inmarsat-based data communications suite into the IFAV will provide OTH/OTM communications to the surface and vertical maneuver element commander.

Deliverable: TBD

Milestones:

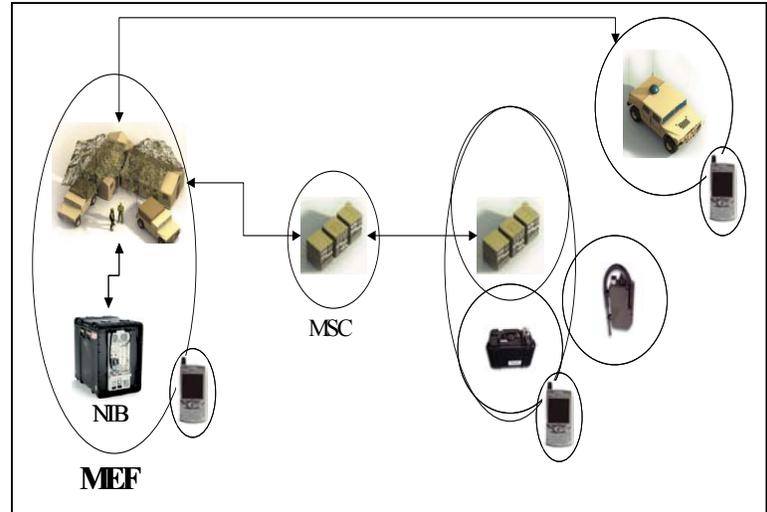
TASK	FY06	FY07	FY08
ITV OTM COC Design	▲▲		
Limited Objective Experiment	▲		
Prototype		▲▲	
Sea Viking			▲▲

POC: (703) 703-784-1335

Tactical Cellular (TACCELL)

Purpose: TACCELL will put a highly flexible, capable, and disposable communications device in the hands of the warfighter for use from garrison, in-transit, and on the battlefield.

Background: TACCELL started as an initiative briefed to MCWLs Technology OPT. While investigating options on the original concept, wireless networking was added to make the system more flexible and attempt to bridge the digital divide from the headquarters to the squad leader. The few systems that are in the hands of Marines at the lowest tactical level either give voice only or such small bandwidth as to be useless. Cell phone and Personal Digital Assistant (PDA) technology has combined to make handsets that are small, highly capable, flexible, lightweight, and disposable.



Description: Combining the capabilities of cellular networks and the portability of cellular handsets could allow the platoon commander/squad leader on the move to an objective to see up-to-date photos and video of his objective while he is moving towards it. It is possible to make that communicator be the very same cell phone that the platoon commander was using as a personal communications device while back in garrison. At the headquarters end, the system will tie in to the tactical voice and data networks to allow a seamless communications device between TACCELL and any other voice or data system.

Deliverable Products: The Lab will procure a system that will be capable of providing a single means of communication to a Marine while in garrison, in transit to deploy, during deployment, and during combat. The system will allow contact with the Marine through the same phone number and handset, regardless of geographical location and even in combat.

Milestones:

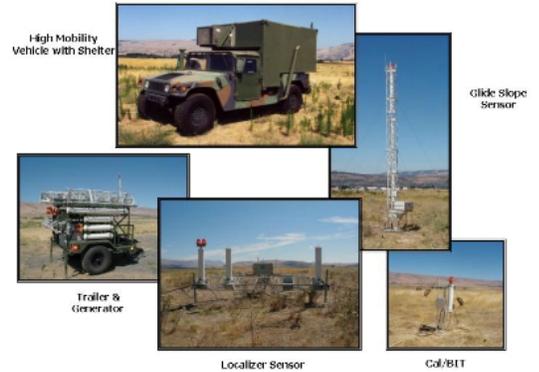
TASKS	FY06	FY07
Capabilities Assessment		▲
RSO&I Deployment	▲	
Follow-on Assessment	▲	▲
Work on transition		▲

POC: (703) 784-0149

Transportable Transponder Landing System (TTLS)

Purpose: To provide a rapidly deployable (HMMWV mounted or smaller), all weather, precision, non-emitting, air traffic control terminal.

Background: TTLS was originally developed under a Defense Advanced Research Projects Agency effort through NAVAIR and Advanced Navigation and Positioning Corporation. The system was designed to provide a precision approach capability by using inexpensive ground systems to provide position information for aircraft equipped with a transponder and standard Federal Aviation Administration Category I Instrument Landing System (ILS) equipment. During April 2001, the Marine Air Board identified a requirement for a non-emitting precision approach landing capability more robust than the initial TTLS, that included multiple aircraft tracking and guidance; a miniaturization of the system for mounting on a supporting ground vehicle; and reciprocal approaches/runway support. Congress appropriated funds in FY04 to explore TTLS technology to determine if it has the potential to fulfill the Marine Corps requirements. These funds were focused on refining the system design, system miniaturization, and system testing. FY06 funds were used to make improvements in software and hardware, and conduct an interoperability demonstration.



Description: TTLS is a combined effort between NAVAIR PMA 213, MCWL, and HQMC (Aviation) APC-5. APC serves as the lead agency in this proof of concept. The Lab, in conjunction with NAVAIR and HQMC (Aviation), will assess the TTLS's ability to perform: multiple aircraft tracking, 360-degree surveillance, and primary and reciprocal runway approach guidance. Following the assessment, HQMC (Aviation) will determine suitability of TTLS for Marine Corps employment and acquisition. The system hardware includes: time and angle-of-arrival sensors; an interrogator; and an uplink antenna. No new equipment is required onboard aircraft. The prototype Rhino II TTLS can be packed into a single C-130 aircraft, driven off and rapidly employed (setup within six hours) to provide Category I guidance to both military and civilian aircraft. In addition to the ILS-emulation capability, the TTLS also presents a precision approach radar (PAR) display to the operator enabling ground-controlled approaches (GCA). It tracks aircraft out to 20 nautical miles up to 10,000 feet. With a single system, pilots can be guided to safe landings whether or not they are ILS-capable.

Deliverable Product(s): Assessment reports, requirements documentation, interrogation trade study, equipment (Rhino II prototype system with miniaturized computer components), flight demonstration, and testing.

Milestones:

TASK	FY06
Software complete	▲
Sub-system and System Integration Test	▲

POC: (703) 432-0452

Advanced Light Strike Vehicle (ALSV)

Purpose: To prove that it is possible to design and build a combat effective and combat suitable strike vehicle that is transportable internal within the MV-22 aircraft.

Background: The requirement shortfall driving the vehicle design is the need for a motorized, offensive strike platform transportable in the MV22 aircraft. Commercially available, mission-effective, and mission-suitable production vehicles transportable by the MV22 do not exist. The single greatest challenge for ALSV project is to design and build a prototype vehicle that complies with the MV22's internal transportability key performance parameters (KPP) while simultaneously retaining the strike/attack capabilities required by the vehicle's end users. A team comprised of Marine Corps operational/mission subject matter experts (SME), Navy vehicle design and aircraft design SMEs, and partnered commercial entities will design the optimum light strike mission vehicle from the ground up. This program has used, and will continue to use the most advanced vehicle prototyping tools available to design and build the ALSV. The ALSV program began with conducting the necessary trade-off studies and proceeded to a paper design of a vehicle. This paper design with the accompanying engineering design excursions was presented to the Integrated Program Team (IPT) Critical Design Review (CDR) in April 04. The paper design approved by the infantry and reconnaissance advocates at the CDR and by the Commanding General, Marine Corps Warfighting Laboratory (MCWL) is now in the build phase. MCWL in conjunction with industry will build two working prototypes and assess their performance across a wide range of environments and mission scenarios.



Description: The design phase incorporated proprietary technologies, independent research and development, and emerging technologies for the design of a working prototype ALSV. Additionally lessons learned from past vehicle design efforts, and efforts to adapt commercial vehicles to internal transport aboard MV22s have been incorporated. The ALSV will be MV-22 internally transportable and capable of aircraft certification. It will mount heavy machine guns with a crew of three plus a driver. The vehicle will be powered by a diesel engine and the suspension and drive train will incorporate the latest mature technologies. A load distribution device (LDD) will be incorporated for internal transport aboard MV22 aircraft.

Deliverable Product(s): Two working Generation 1 ALSV prototypes. An option exists for design and build of a Generation 2 ALSV prototype.

Milestones:

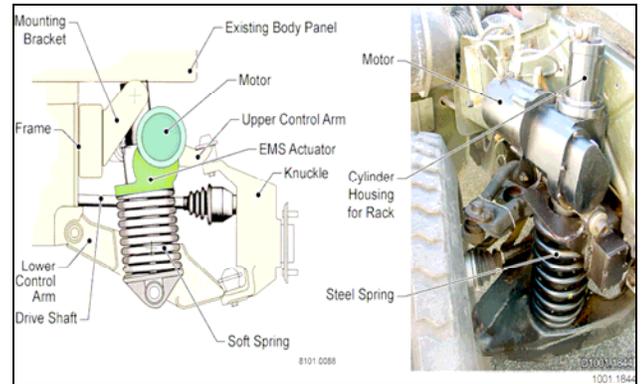
TASK	FY06	FY07	FY08
Gen-1 Prototypes Build	▲		
Gen-1 Prototypes Testing	▲	▲	
CDR for Gen-2 Prototype		▲	
Gen-2 Prototypes Build		▲	▲
Gen-2 Prototypes Testing			▲

POC: (703) 784-3425

Electronically Controlled Active Suspension System (ECASS)

Purpose: To develop an Electronically Controlled Active Suspension Systems (ECASS) that could greatly increase the operational performance of the High Mobility Multi-purpose Wheeled Vehicle (HMMWV) in terms of improved combat effectiveness and combat suitability.

Background: The increased tempo of the modern battlefield has increased the demands upon wheeled vehicles to operate at greater speeds, with greater payloads, and with greater safety. Increased vehicle speeds over all types of road conditions enable combat forces to rapidly maneuver against enemy forces, thus maintaining the initiative on the battlefield. Current passive suspension shock loads are partially absorbed and isolated by the suspension system with the remaining shock load absorbed by the contents of the vehicle (passengers and equipment). The University of Texas – Center for Electro Magnetics (UT-CEM) has pioneered electro-magnetic (EM) active suspension technology that more efficiently isolates shock loads induced into a vehicle.



Description: ECASS is a coordinated MCWL and ONR initiative to use the active suspension technology developed by UT-CEM. It will provide the USMC with the capability to increase the payload of HMMWVs, increase fuel efficiency, provide a ride height adjustment feature, and improve off road mobility. ECASS will effectively stabilize the vehicle chassis when the vehicle is traveling at speeds over all types of terrain, thereby significantly improving the ride quality of the vehicle for the driver, passengers, and equipment. It continually responds to sensors and adjusts the forces on each corner of the vehicle to optimize ride under all operational conditions. This is accomplished by replacing passive shock absorbers with fully controllable actuators at each wheel. An electronic control unit controls the system. An integrated ride height adjustment system compensates for increasing payload by adjusting nominal ride height. Based on UT-CEM’s proof-of-principle results, the ECASS is projected to increase the load carrying capacity of an up-armored HMMWV, ride limiting speed, simultaneously improve ride quality, and reduce off-road fuel consumption when compared to a passive suspension HMMWV. Phase II of this initiative will culminate in a decision to either transition ECASS to a Marine Corps Systems Command Program of Record, or to a Phase III for further development and evaluation. ECASS will be installed on up-armored HMMWVs and ready for production and installation on new or existing HMMWVs within 18 months of project completion.

Deliverable Products: The deliverable is a working ECASS installed on an armored HMMWVA2.

Milestones:

TASK	FY06	FY07	FY08
Prototype Build – Test-Fix-Test	▲		
Gov’t test/demo	▲	▲	
Phase II for pre-production TRL		▲	▲

POC: (703) 784-5178

Project Metropolis

Purpose: Identify weaknesses or problem areas across the spectrum of ground warfare within the urban arena and experiment to find solutions.

Project Metropolis has a five-fold purpose: (1) Develop TTPs to enable Marines to survive, fight and win Military Operations in Urbanized Terrain (MOUT); (2) Assess proposed lessons learned from operations during Operation Iraqi Freedom; (3) Develop a comprehensive urban warfighting Program of Instruction (POI) to include the Basic Urban Skills Training (BUST) Computer Based Trainer (CBT); (4) Recommend improvements to existing and future training facilities; and (5) Evaluate selected enabling technologies that enhance combat capability in the urban environment.

Project Metropolis partners with operating force units as well as our Coalition partners to conduct experiments at the platoon through battalion (reinforced) level. Experimentation is accomplished across all spectrums of conflict with symmetric and asymmetric threats in both high and low intensity combat environments on urban terrain.



Background: The Lab began examining the urban environment in 1997 as part of the Urban Warrior series of experiments. *Project Metropolis* was initiated in June '99 due to the Marine Corps challenges regarding TTP development as well as technological and Marine-specific equipment shortcomings. *Project Metropolis* evolved into the repository for urban expertise in the Marine Corps. It has resulted in a wholesale revision of urban doctrine that is currently underway. It has been designated as the lead agent for the Marine Corps regarding participation with the Joint Urban Operations Cell at JFCOM.

Description: *Project Metropolis* experimentation systematically identifies weaknesses or problem areas across the spectrum of urban operations and designs experiments in order to find solutions through the conduct of live force experimentation with operating force units at the platoon through battalion (reinforced) level. Experimentation is accomplished across all spectrums of conflict with symmetric and asymmetric threats in both high and low intensity combat environments. Heavily involved in the preparation of Battalions of the 1st, 2 d, and 4th Marine Divisions for Operation Iraqi Freedom (OIF) 2. MCWL created an Iraqi village environment at the family housing area of March Air Reserve Base. Those assigned to *Project Metropolis* Staff, along with Marine SMEs and coalition partners, trained seventeen battalions in support of the 1st Marine Division during Jan to Aug '04 while also conducting a Basic Urban Skills Training (BUST) Instructor Training Course. This training places heavy emphasis upon creating an environment that closely replicates the people and threat forces that the Marines will face in the Global War on Terror. Feedback from Marine Battalions deployed to Iraq during OIF-II was favorable. MCWL has currently transitioned this capability to TECOM.

Deliverable Product(s): Technology assessments and supporting TTPs.

Metropolis:

TASK	FY06	FY07
Project Metropolis	▲	▲

POC: (703) 432-1025

Sea Viking Experimental Vehicles

Purpose: To provide high performance, high mobility, CH-53 Internally Transportable Vehicles (ITV) in support of SV 06 experimentation.

Background: In the late 1990s the Lab purchased four ITVs for experimentation. The vehicles were used in various experiments until 2002, but have since been idle. The Distributed Operations (DO) experimentation being conducted as part of SV 06 has renewed the need for an ITV that can provide Marines on the ground with enhanced off-road mobility, C2 capabilities, and firepower. Distributed Operations experimentation requires six ITV vehicles. Therefore, in addition to refurbishing the four existing vehicles, two new vehicles will be built.



Description: The existing ITVs are designed to be internally transportable in a CH53E helicopter. Its mobility exceeds the HMMWV and is capable of serving as a heavy machine gun platform. The vehicle crew consists of the driver plus three Marines. It is capable of supporting the C2 systems organic to an infantry company.

Specifications:

- Wheel Base.....112 inches
- Payload.....2750 lbs
- Cruising Range.....325 miles
- Max grade.....60%
- Vehicle dimensions...H 74 x W 79 x L 176
- Engine type.....Turbo Diesel

Deliverable Products: Six ITVs and a report detailing the performance of ITV-type vehicles versus mission requirements in support of DO to MCCDC/MCSC.

Milestones:

TASK	FY06
Refurbish four vehicles	▲
Build two new vehicles	▲
Comm gear modifications	▲▼
SV 06 LOE/AWE	▲—▲

POC: (703) 784-0389

Combat Trauma Registry/Modeling and Simulation

Purpose: The ability to provide appropriate medical care in remote and austere environments has made substantial advances in recent years with new training and technologies. Various efforts within DoD are underway to improve the capture and value of information gathered during treatment of combat casualties. However, no systematic database of medical treatment records of casualties has been developed for the United States Marine Corps (USMC).

Background: Naval Health Research Center (NHRC), San Diego established the Navy and Marine Corps Combat Trauma Registry (CTR) functional prototype in a theater of operations. The CTR data retrieval process is belabored, largely done by subject matter expert review of patient medical records and manually typing coded data into the database. This is the only functional CTR to include field forward medical treatment data since the Vascular Trauma Registry that was discontinued thirty years ago.



Description: NHRC shall perform substantial raw data collection and entry into the CTR database and perform analysis and reporting on casualties treated at USMC medical units during Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). At the current rate of reporting, the estimate of medical records subject to entry into the CTR database is 2,500.

Deliverable Products: NHRC shall provide weekly progress reports via e-mail to the Marine Corps Warfighting Laboratory (MCWL) Project officer beginning the first full week after receipt of funds. These e-mail reports shall include the number of records received identified by medical treatment unit and listed as Battle Injury versus Non-Battle Injury. Additionally, statistically significant variations in wounding patterns, or morbidity, shall be cited in the weekly progress report and followed-up separately on the monthly statistical report.

Milestones:

TASK	FY06
Perform Analysis	▲▲
Perform Phase II Study	▲▲
Incorporate into experimentation	▲

POC: (703) 432-0467

Dragon Doc Medical Assault Pack (MAP)

Purpose: To provide Field Corpsman/ First Responder personnel the capacity to treat two to four severely injured casualties, in a combat environment, before replenishment is necessary.

Background: The Dragon Doc medical assault pack fulfills the operational need for a comprehensive field portable medical bag also capable of storing personal non-medical equipment as well as an integrated hydration system needed in a combat environment. Past field medical bags have traditionally been subject to one of two criticisms with regard to supplies: They have been either insufficient to competently accomplish mission objectives (such as the meagerly outfitted Unit 1) or inappropriate for use by basic Field Medical Service Technicians (such as the liberally equipped Molly Bag). The Unit 1 medical bag has not been fundamentally updated in several years and the Molly Bag is considered to be too bulky and contains medical gear that is unused by the Field Corpsman/First Responder. The medical equipment supplied in the Dragon Doc medical assault pack is specifically intended for use by the front-line field Corpsman; the packing list is catered to the requisite Hospital Corpsman’s skill level as determined by in-service training.



Description: The MAP, being much larger than the insufficient Unit 1, but much smaller than the cumbersome Molly Pack, is a compact, comprehensive field portable medical bag also capable of storing personal non-medical equipment needed in a hostile environment. The medical equipment supplied in the MAP is specifically intended for use by the front-line field Corpsman and expressly tailored for this purpose.

Deliverable Products: The Subject Matter Experts (Division medical department personnel) will physically conduct evaluations and review to provide formal recommendations.

Milestones:

TASK	FY06
End User Evaluation	▲▲
Final Report	▲

POC: (703) 432 - 0467

Enroute Care

Purpose: To develop an improved Enroute Care package suitable for experimentation. After selecting prototype equipment, the improved Enroute Care package needs to go from Initial Operations Capable (IOC) to Final Operations Capable (FOC). This task includes the reduction in weight from 700 lbs to 200 lbs. This effort would entail the HIOX oxygen generator, a newer hand held suction unit and the next generation of Wireless Vital Signs Monitoring (WVSM).



Background: Current health service doctrine provides for maintenance of shore-based elements in order to provide resuscitative care. Following such care, the casualties are held in the shore base until they can be safely transported on opportune lift aircraft. The Enroute Care initiative provides personnel and material to rapidly convert opportune transport to attended medical transport platforms and provide supervised medical transport for seriously injured but stabilized casualties. Reducing the time casualties are held on shore will decrease the shore based logistic requirements and improve clinical outcomes.

Description: The Enroute Care initiative provides personnel and equipment to rapidly convert opportune transport to attended medical transport platforms that provide supervised medical transport for seriously injured but stabilized casualties. Reducing the time casualties are held on shore will decrease the shore based logistic requirements and improve clinical outcomes. Concept of experimentation entails prototype development and field user evaluation.

Deliverable Products: Prototypes and assessment reports.

Milestones:

TASK	FY06
End User Evaluation	▲
LTA - Improved Equipment	▲
End User Evaluation	▲

POC: (703) 432-0467

Joint High Speed Vessel

Purpose: To assess the utility of a commercially available Joint High Speed Vessel (JHSV) to provide high speed, long range, and high-volume surface lift capabilities as a component of the networked sea base.

Background: Since October 2001, the Marine Corps and Navy have been conducting concept based experiments with JHSVs in order to assess their capabilities and limitation within the context of Seabasing and OMFTS. Joint experiments are exploring commercially available high-speed, shallow draft vessels with advanced hull, propulsion, and communications technologies. Currently there are four vessels under lease by the Army, Navy and Marine Corps in support of experimentation. They are the HSV-2 Swift (USMC/USN), TSV-1X Spearhead (US Army), HSV-X1 Joint Venture (USN), and WestPac Express (USMC).



Description: The Swift (HSV-2) is a 98-meter, 45 knot, dual hull, shallow draft, commercial catamaran that has been modified to meet military experimentation requirements for rotary wing aircraft, roll-on/roll-off vehicles, small boats, and a state-of-the art command and control system. Experimentation is exploring the concepts, capabilities, and military utility associated with high-speed, shallow-draft intra-theater vessels that are integrated with advanced hulls, propulsion technologies, and innovative communications. As an intra-theater surface connector the JHSV is a transformational technology that fills a critical capability gap in the family of sea base connectors by linking advanced bases, sea bases, and forces operating ashore. JHSV's will play a crucial role as an operational maneuver platform that can rapidly project forces and sustainment in support of the Global War on Terror (GWOT) and Theater Security Cooperation (TSC) objectives. The evaluation of all data collected from previous and future experimentation will be used to support the Expeditionary Force Development process, and refine potential missions for future Joint High Speed Vessels (JHSV).

Deliverable Products: A definitive USMC requirement and CONOPS in order to transition via Navy as a joint program with the Army TSV (Theater Support Vessel) program.

Milestones:

TASKS	FY06	FY07	FY08	FY09	FY10
WATC 06	▲▲				
Initial Capabilitv Document Signed	▲				
Analvsis of Alternatives	▲				
Canabilitv Develonment Document	▲—▲				
Lead Vessel			▲—▲		
MCWL/MCOTEA Testing (TBD)					▲

POC: (703) 784-1089

Study of Medical Capability in Support of Ship to Objective Maneuver Modeling and Simulation

Purpose: The ability to provide appropriate medical care in remote and austere environments has made substantial advances in recent years with new training and technologies. Various efforts within DoD are underway to improve the capture and value of information gathered during treatment of combat casualties. However, no systematic database of medical treatment records of casualties has been developed for the United States Marine Corps.

Background: Naval Health Research Center (NHRC), San Diego established specialized medical modeling and simulation tools needed to assist medical planners and project focused logistics solutions to various operations.

Description: NHRC shall perform a study of the medical capability requirements for support of Ship to Objective Maneuver (STOM) and Distributed Operations (DO). The use of existing surgical capabilities such as the Forward Resuscitative Surgical System is prohibitive within the STOM/DO environment. NHRC shall provide modeling and simulation, software engineering support and subject matter expertise in identifying the medical support requirement for STOM and DO.



Deliverables: NHRC shall provide the MCWL with a complete report of casualty type and treatment requirements. They will provide analysis and recommendations for a focused logistics medical capability that will provide adequate support to STOM and DO.

Milestones:

TASK	FY06
Perform Analysis	▲▲
Perform Phase II Study	▲▲▲
STOM Medical Workshop	▲
Incorporate into Experimentation	▲

POC: (703) 432-0467

Tactical Medical Coordination System (TacMedCS)

Purpose: To develop a prototype system to enhance casualty evacuation via an *individual casualty locator* and provide an electronic, redundant patient treatment record retrievable from external locations.

Background: Since a current system does not exist, the Lab in collaboration with Marine Corps Systems Command and the Navy Medical Department is developing a prototype system to enhance casualty evacuation. The system is intended to ease locating casualties for evacuation and to provide treatment record redundancy. The relevant operational requirement document is the Theater Medical Information Program (TMIP). The JV2010 *En route Care Seminar* also indicated that this capability is needed.



Description: The Tactical Medical Coordination System will provide In Transit Visibility/ Total Asset Visibility (ITV/TAV) for casualties. This system exploits passive Radio Frequency Identification (RFID) technologies to automate some of the casualty evacuation process. This system differs from Common Access Card (CAC) and other alternative approaches to digital medical information. TacMedCS is appealing because it is a Radio Frequency based system, which doesn't require contact with the device to be able to read and write data. There is no need to remove clothing or protective gear. The tag has been tested through MOPP gear, Kevlar body armor, and various other forms of military clothing. The tag is passive. It will only transmit approximately one foot away, and only when interrogated with a RFID scanner.

The System includes four basic components: a tag, handheld RFID tag scanner, lap top computer system, and central database server. Database information will be password protected and iridium satellite communications equipment used in this system will include standard commercial encryption approved for Department of Defense users.

Deliverable Products: Prototype hand-held concept demonstrator and assessment reports.

Milestones:

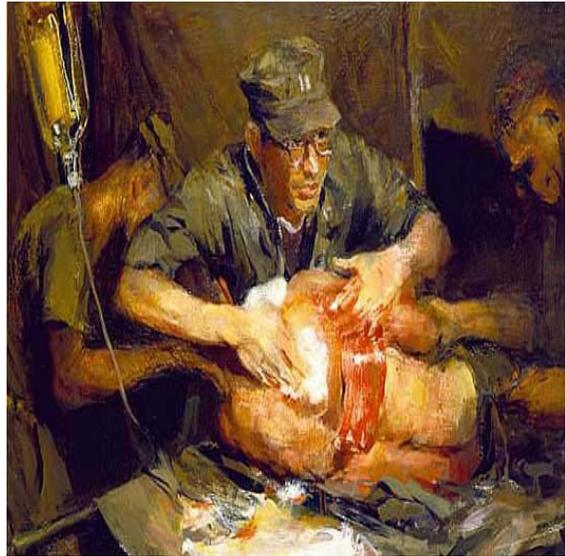
TASK	FY06
LOE - Potential Extended, End User Trial	▲▲

POC: (703) 432 - 0467

Trauma Day

Purpose: To support analysis into identifying trauma care capabilities and conduct professional review by subject matter experts to evaluate improvements in medical tactics, techniques and procedures.

Background: The Uniformed Services University of Health Sciences (USUHS) has provided essential Subject Matter Expertise (SME) in the area of Trauma and Surgical care for evaluation of battlefield medical care. As Trauma and Surgery experts, USUHS has been instrumental in accelerating approved changes in battlefield healthcare provided by physicians, nurses and corpsman in the field. USUHS has the credibility among the Medical Corps to influence changes in standards of practice. USUHS also has the ability to revise the medical school curriculum to include the new standards of practice changes for future medical school graduates. This potentially reduces the implementation lead-time for improvements in medical care from up to ten years to two.



Description: The Subject Matter Expert Panel is selected and managed as an independent medical review by the Head of Surgery at USUHS. The agenda is set through collaboration between Marine Corps Warfighting Laboratory (MCWL) and USUHS.

Deliverable Products: The USUHS shall provide to MCWL, no later than September 30, 2006, a video/DVD of all proceedings and a summary report with expert panel recommendations.

Milestones:

TASK	FY06
Trauma Day SME Panel	▲

POC: (703) 432-0467

Counter Shooter Technologies

Purpose: Provide the operational forces with a counter shooter capability by developing the ability to detect and locate a gunfire event using acoustic and/or infrared (IR) signatures.

Background: The need to be able to detect and locate gunfire is reflected in the Sniper Detection System Universal Need Statement (UNS) (00299UA), written at the Lab in 2000, and approved by MCCDC in 2002 with a recommendation to formulate a Mission Need Statement (MNS). This capability can be achieved by a variety of means, such as exploiting acoustic and IR signatures to provide azimuth, elevation, and range of a gunfire event from a given location. Acoustic systems have full time 360-degree capability with accurate ranges to 500 meters, compared to IR cameras, which provide a 60 to 120 degree field of view to ranges exceeding 1000 meters. Acoustic systems are sometimes susceptible to false alarms or missed detections due to excessive background noise, whereas IR systems are typically more accurate but considerably more expensive. Integration of these systems is the key to 360 degree detection capability at greater ranges. On the move detection and engagement capability can be achieved through the use of on board inertial navigation systems (INS) Several different systems and efforts are currently being evaluated; Boomerang Generation-II, Sniper Acoustic Detection System (SADS), Projectile Detection Cueing Tetrahedral (PDCue), PDCue 4 Corner, Pilar, Spotlight, and Gunslinger.



Description: *Boomerang Generation-II* – Acoustic system mounted in various HMMWVs or fixed site configurations that is being developed by DARPA with MCWL support, to detect and provide azimuth, range and elevation data for supersonic gunfire events by both the shock wave and muzzle blast. 25 Boomerang-I systems were delivered to I MEF in FY04. Based upon user feedback, the design has been revisited with modifications and changes after the operational assessment. DARPA will deliver 25 Boomerang-II systems to II MEF in early FY06.

Sniper Acoustic Detection System (SADS) – HMMWV mounted system built by Rafael that detects acoustic supersonic gunfire events from the muzzle blast.

Pilar – Acoustic system designed to be stationary. The US Army purchased 60 and is filling a SOCOM ONS.

Ferret – Acoustic system, built by MacDonald-Detweiler, designed to go on Canadian variant of the LAV-25, and is being modified to mount on US LAV-25s.

Spotlite – IR system that detects both super and subsonic events made by Rafael.

Gunslinger – Acoustic and IR

sensors, cameras, and a slew to cue ability for an OTM vehicle configuration being developed by ONR in support of the ACTD Overwatch.

Deliverable Products: one SADS, two PDCue systems, one Ferret, and 25 Boomerang-II systems delivered to operational forces during FY06.

Milestones:

TASK	FY06	FY07
In Theater Extended User Evaluation	▲————▲	
CONUS training (I MEF)	▲————▲	
Second in theater extended user evaluation (I MEF)	▲————▲	

POC: (703) 784-5178

Counter Rocket Artillery Mortar (C-RAM)

Purpose: C-RAM is intended to counter all aspects of the indirect fire threat and is focused on the fight in Iraq.

Background: Many attacks forces in Iraq face are indirect fire attacks. To address this threat, the C-RAM effort was established lead by the U.S. Army. The Marine Corps has been working with the Army in this effort and has been favorably impressed by the true joint approach that the Army has adopted for C-RAM.

Description: The C-RAM system of systems is linking together current technologies using the following framework:

C2: Integrate all capabilities within a Battle Command structure.

Shape: Preclude and/or pre-empt strikes.

Sense: Integrated sensors to acquire and track enemy actions and incoming rounds.

Warn: Alert troops prior to rounds impacting.

Intercept: Destroy incoming rounds.

Respond: Respond by attacking insurgents.

Protect: Provide hardened protection positions and work areas.



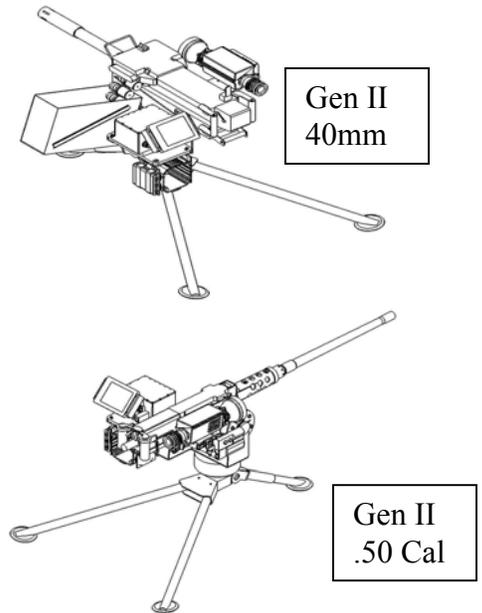
Deliverable Product(s): A system of systems to counter the indirect fire threat.

POC: (703) 432-0992

Heavy Machine Gun Technology Development Initiative (HMGTDI)

Purpose: This is a joint MCWL/ONR /NSWC Crane initiative that is intended to produce an advanced technology demonstrator to support the Improved Heavy Machinegun Universal Needs Statement (UNS) and Solution Initiating Directive. The UNS calls for improved 40mm and .50 caliber heavy machineguns, fire control capable of direct and indirect fire with current inventory optics in the direct fire mode, and an improved gun mount that incorporates both major and minor azimuth and elevation controls into the gunner's grips.

Background: Heavy Machineguns (HMG's) constitute the most responsive fire support asset available to the battalion commander to influence the battle space. Currently our machine gunners utilize aging weapons that are incurring an ever-increasing maintenance burden and due to inherent design characteristics cause several safety concerns. The gun-mounts used to aim and point our heavy machineguns use turn of the century traversing and elevating technology and are not particularly suited to indirect fire missions. There are limited provisions for mounting optics and no hyper elevation capability for using optics on the 40mm gun requiring gunners to employ offset aiming techniques beyond 800 meters that are inherently inaccurate. There are no provisions what so ever for true fire control offering ranging and ballistic compensation.



Description: HMGTDI is divided into two major developmental components; the Automatic Weapon Fire Control System (AFCS) being developed by ONR and the Advanced Common Mount (ACM) being developed by MCWL. AFCS utilizes a laser range finder (LRF), GPS, and Inertial Measurement Unit (IMU) in conjunction with a ballistic computer to provide ballistically compensated aiming cues to the gunner in direct and indirect fire modes of fire. The ACM project will develop a common compatible mount for the M2HB .50 caliber and the GMG 40mm heavy machineguns with hydraulic buffers for recoil attenuation.

Deliverable Product(s):

- (2) HMGTDI weapon systems with AFCS fire control ACM mounts and modern .50 caliber and 40mm HMG's.
- Test report from the Technical and Operator Testing of the systems.
- Technology Trade Off Study

Milestones:

TASK	FY06	FY07
Gen III Design & Fabrication	▲	
Gen III T&E/Op-eval	▲	▲
Transition to MCSC		▲

POC: (703) 432-0458

Mobile Counter Fire System (MCFS)

Purpose: To develop a counter sniper system with an on the move capability



Background: In 1999, the Marine Corps validated a Universal Need Statement (UNS) for a sniper detection system (00299UA). At this time the Marine Corps along with the Army Research Laboratory started working on a system that would not only detect snipers location, but also counter the sniper by returning fire to that location. Additionally, this system has the ability to work while on the move.



Description: Mobile Counter Fire System is an eight point acoustic based gunfire detection platform that feeds a digital link into a slew to cue gun mount that will automatically slew the mounted weapon to the detected gun fire event. Once the operator makes positive target identification, he can fire remotely from inside and armored vehicle. The complete system is integrated with an inertial navigation system and global positioning system to allow the system to hold the stabilized gun mount on target while on the move. When a shot is taken at the vehicle, the sensors are able to sense the “bang” of the rifle and the “crack” of the round exceeding the speed of sound. Once these event are detected, the system software can calculate location of the shooter within 2-3 degrees of direction, + - 10 percent in range and elevation.

Deliverable Product: One Complete Mobile Counter Fires System with all software will be delivered to the Marine Corps Warfighting Laboratory Nov 2005 for safety evaluation being conducted at Naval Surface Warfare Center Dahlgren Division.

Milestones:

TASK	FY06	FY07
MCFS Delivery	▲	
LTA User Evaluation	▲ —▲	
Operational Assessment		▲ —▲

POC: (703) 432-0450

Project Phoenix

Purpose: *Project Phoenix* examines aviation and indirect fire related aspects of combat operations. Currently, Project Phoenix is devoted to assessing the aptitude of individual Marines to determine the ability to provide a Terminal Attack Control capability at the Small Unit Level. This initiative is intended to study and provide recommendations for the further development of the Joint Terminal Attack Controller (JTAC) and Joint Fires Observer (JFO) programs, and determining the appropriate level at which this capability should reside in support of the Distributed Operations (DO) concept experimentation. This includes an assessment of the DOTMLPF impacts as a result of this initiative. *Project Phoenix* also reviews lessons learned from current operations, and provide recommended improvements to existing and future training facilities. This includes the use of simulation to enhance training and reduce resource requirements to attain the Terminal Attack capability at the Small Unit level.



Background: *Project Phoenix* previously focused on examining the survivability of rotary wing in the urban environment. At the same time, close-air support, casualty evacuation, re-supply, assault support, and reconnaissance operations were examined to determine the ability of aircrews to perform these missions in an urban environment with various threats. In 2005 *Project Phoenix* was retasked to assess the viability of terminal attack control and direction of surface fires at the infantry platoon and squad level in support of the Distributed Operations (DO) Concept.

Description: Providing responsive joint supporting fires will be a challenge for the Sea Viking 2006 (SV-06) distributed operations (DO) platoon. One component; Terminal Attack Control (TAC) is the foundation for CAS, and requires skilled controllers that can direct aircraft into position to attack targets in close proximity to friendly forces.

Project Phoenix will explore the impacts of current USMC policy on DO, and some potential alternatives:

- 1) Locating the TAC capability at the platoon-level (i.e., current USMC policy)
- 2) Locating the TAC capability at the squad-level
- 3) Augmenting platoon-level TAC capability with squad-level Joint Fires Observers (JFO).

Project Phoenix will experiment, and provide an assessment of the Joint Fires Observer (JFO), and assist the refinement of the established mission essential task list (METL), and DOTMLPF requirements as it applies toward providing a supporting arms capability to the small unit. JFOs will be non-commissioned officers (NCOs) that have the authority to execute calls for fire to appropriate surface fire agencies and direct aircraft into position to deliver ordnance, without the authority to grant aviation weapons release.

Deliverable Product(s): Assessment reports, recommended METLS, and DOTMLPF solutions. MCWL will recommend, in conjunction with Naval Aero-Medical Institute (NAMI), a test battery and selection criteria to be pursued by the Marine Corps in its selection of prospective JTAC students.

Milestones:

TASK	FY06	FY07
Project Phoenix	▲	▲

POC: (703) 432-1038

Remote Weapon Systems (RWS)

Purpose: To demonstrate the utility of stabilized, remotely operated weapons systems in USMC operations and develop appropriate tactics, techniques, and procedures (TTPs).

Background: Stabilized remotely operated weapon systems have demonstrated their utility to the US military. Such systems provide the user with increased effectiveness under all conditions and long-range surveillance capability from a single platform.

Description: There are numerous different systems available. Usually they contain a remotely controlled mount, optics, a range finder, and stabilization. Some can only be mounted on a vehicle, others can be ground mounted or vehicle mounted. Some systems can accept heavy machine guns, other accept light machine guns, automatic weapons, and rifles. All have a remote operator's station that enables the operator to control the system from under armor or other cover.

Deliverable Products: Evaluation of different remotely operated weapon systems with TTPs, report to Marine Corps Combat Development Command (MCCDC).

Milestones:

TASKS	FY06	FY07
Obtain Appropriate Systems	▲▲	
LTA and TTP Development	▲▲	
Extended User Eval	▲	▲
Report/Transition		▲

POC: (703) 432-0458

Rover

Purpose: To provide Forward Air Controllers (FAC's) and artillery Forward Observers (FO's) the ability to view real time video on the battlefield from several platforms, including Unmanned Aerial Vehicles (UAV) and aircraft with Litening Pod, thus enhancing targeting confidence, situational awareness, and anti-fratricide features.



Background: FAC's and FO's require the capability to maneuver into a position to provide timely and accurate precision target locating data to CAS aircraft and other weapons systems conducting combat operations. Often, the terrain and hostile fires preclude the FAC or FO from having a clear view of a potential target area. They are currently dependent on their best estimate of the location or still imagery that is often outdated by the time the mission is required. There is the potential that the enemy has moved, non-combatants have entered the target area, and more seriously, friendly forces are dangerously close to the target area. In complex terrain, such as urban environments, particular buildings or streets are difficult to differentiate leading to inefficient or inaccurate use of fires. StrikeLink is a USMC Program of Record (POR) that is addressing these problems. This effort is based on a USMC and JSOC urgent need (Jan 04). It will leverage current capabilities in the aviation community to include the Litening Pod video. Rover is one of several Lab Advanced Development initiatives supporting the StrikeLink POR. This video imaging capability will provide the FAC/FO with real-time visual capability, which allows for pinpoint accuracy and pilot/observer target concurrence.

Description: Rover is a Lab initiative to be performed by Stauder Technologies, Inc., supported by MAWTS-1, 2dMAW, 3dMAW, and is in coordination with MCSC as an incremental improvement to the StrikeLink POR. This effort will integrate the Rover capabilities with the StrikeLink software, and its communication protocols with the StrikeLink communication systems. Rover consists of: a lightweight man-packable video imaging receiver; video imaging software and firmware will be loaded onto a ruggedized, light-weight computer with a moving map capability, laser range finder interface, and appropriate tactical radios; and an interface with the StrikeLink target handoff system to facilitate rapid, digital target planning and execution.

Deliverable Products: Software modules and a field capable prototype.

Milestones:

TASK	FY06	FY07
Software Integration	▲▲	
Gov't Testing/Demo	▲	
Transition to PoR	▲▲	

POC: (703) 432-0463

Telepresent Rapid Aiming Platform (TRAP)

Purpose: To ascertain the military utility of a lightweight remotely operated weapon mount.

Background: The TRAP system was developed in the mid 1990s to provide a remote weapon platform primarily for civilian law enforcement. This technology came to MCWLs attention in 2001. A limited technical assessment (LTA) was undertaken to assess the military applications of this capability. During initial testing it was determined that a number of modifications and improvements were necessary to adequately test this capability in a military context:



- Power supply conversion to standard BA5590 military battery, 24v military vehicle power, and shore power (110vdc).
- “Drop-in” capability to allow the use of standard USMC weapons without modification.
- 360-degree traverse capability with lock-outs for safety.
- Network controller to allow multiple systems to be controlled from a common location. This required converting the system from analog to digital format.

Description: The current T-250 system can accommodate the M240G machine gun, M249 Squad Automatic Weapon, and M-82 .50 caliber Special Application Scoped Rifle as well as the M-16A2/A4 service rifle. The weapons are placed in the system’s cradle, which can be mounted on an M3 tripod or standard vehicle pintle adapter. The weapon can be controlled from up to 100 meters away via a cable link to a hand held controller. The modular optics package can include a wide-angle search camera with 40X zoom capability, a thermal camera, and a gunsight camera slaved to either a riflescope or hologram sight. Aiming adjustment resolution is in increments as small as 1/10th minute of angle (1/10th inch at 100 yards). The controller has the capability to switch between cameras, pan and tilt the weapon, arm, and fire the weapon. Recent modifications are a 360-traverse capability, network controller, and improved optics tailored to remote applications. II MEF is currently conducting an operational evaluation of this system.

Deliverable Product(s): A recommendation to the Marine Corps Combat Development Command as to the applicability or non-applicability for the military force protection mission.

Milestones:

TASKS	FY06	FY07
Op-eval II MEF	▲	
Design & Fab of Intel Push, THL & Comms	▲	▲
Continued LTAs		▲
Transition		▲

POC: (703) 432-0458

XM-326

Purpose: Provide a concept demonstrator to test future fire support capabilities with the potential to be as mobile as the maneuver forces it supports. This experimental weapon system has the potential of transitioning as a whole system or individual technologies for injection into other fire support system programs. It is a possible counterfire weapon for the U.S. Army Counter-Rocket, Artillery, and Mortar (C-RAM) Project.



Background: In 1997, the Warfighting Lab developed and experimented with the Dragon Fire, an automated indirect fire concept demonstrator. Since then, the XM-326 has been developed to explore the use of automation for advanced fire support, incorporating the “lessons learned” from the original Dragon Fire experimentation. XM-326 employs a wide range of new capabilities, including “sensor-to-shooter” connectivity, and modular design to allow use as a towed, airmobile firing system, or as a self-propelled Light Armored Vehicle (LAV) system.



Description: A compact, automated 120mm rifled mortar that can be readily deployed from amphibious shipping either internally within an MV-22 or CH-53, towed by any available military vehicle, or internally loaded and fired from an LAV. The XM-326 can be emplaced and displaced rapidly, has configuration options and on-board communications, navigation, and fire control. It is a rifled, self-loading, electronically actuated, recoiling mortar that can traverse 6400 mils and can also use 120mm smoothbore ammunition. XM-326 has a rifled range of 8.2km (13km with rocket assisted projectile) and a rate of fire of 10 rounds/min for 2 minutes and 4 rounds/min indefinitely. It has on-board digital communications and is capable of full sensor-to-shooter (and remote) operations. The XM-326 has manual backups to ensure it is ready to answer a call for fire.

Deliverable Product(s): One weapon for operational experimentation and testing/transition with the C-RAM project as a dedicated counterfire system. Nested experiments will test actuator and suspension technologies. The XM-326 system offers the potential to transition as a LAV firing system, or a possible next-generation direct support system.

Milestones:

TASK	FY06
Firing Tests	▲
C-RAM Testing	▲
System Transition to C-RAM	▲

POC: (703) 784-6490

12 Gauge HE Cartridge

Purpose: To examine this technology and ascertain its potential military utility in close combat missions, particularly combat in urban terrain.

Background: This technology is the result of private development that has completed several years of engineering and testing. The objective of this design is to provide Marines armed with a standard shotgun the capability of defeating reinforced targets, materiel targets, protected targets and other targets requiring a high explosive or armor-piercing warhead.



Description: FRAG-12 rounds are made of standard 3-inch 12-gauge cartridge case and propellant, firing a fin-stabilized 19 mm warhead. The projectile is designed to arm 3 meters from the muzzle and detonates upon impact with a surface. The HE projectile has sufficient explosive power to make one inch holes in ¼ inch cold rolled steel plate. The maximum effective range is claimed to be 200m providing a significant improvement over current shotgun munitions. The round is designed to work in both gas-operated and recoil-operated semiautomatic shotguns. The armor-piercing projectile is a shaped charge and designed to penetrate ½ inch of steel armor. The primary reason for experimentation with these munitions is to improve the utility of shotguns (1) in urban areas, (2) stopping vehicles at roadblocks and checkpoints, and (3) remote probing of potential improvised Explosive Devices (IEDs).

Deliverable Product(s): FRAG-12 firing test and safety data; Initial interim safety recommendation; Experimental FRAG-12 rounds for extended user evaluation.

Milestones:

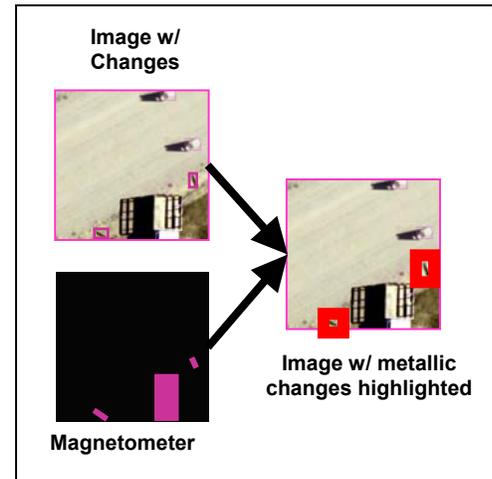
TASKS	FY06	FY07
Extended User Evaluation	▲▲	
R&D Multishot Device	▲▲	
T&E Multishot Device	▲	▲
Analysis & Report		▲▲

POC: (703) 432-0458

Counter-IED Multi-Sensor Change Detection

Purpose: To help detect Improvised Explosive Devices (IEDs) employed by insurgent fighters along transportation routes throughout deployed areas, while reducing false alarms and failed detections common in current detection technologies.

Background: Since the start of Operation Enduring Freedom and Operation Iraqi Freedom, there has been a large increase in insurgent use of IEDs. Insurgents often target convoys and patrols with hidden IEDs alongside roadways. The requirement to detect IEDs was originally documented in Urgent Universal Needs Statement (UUNS) #05054UD – Airborne Change Detection Capability. Efforts in FY05 with a single-sensor Change Detection system failed due to technical reasons, but also illustrated the ease in which IEDs could be camouflaged in ways that exploited a given sensor’s weaknesses. Additionally, efforts conducted by the US Military commonly note high degrees of false alarms caused by limitations of the tested technologies as well as the large volume of clutter and trash commonly present in operational theaters. These issues have been noted as being particularly problematic with Change Detection approaches and have strongly contributed to limiting use of such technologies in operational theaters.



Description: The Multi-Sensor Change Detection initiative conducted by the Lab in partnership with the Office of Naval Research (ONR) investigates approaches to overcome previously noted shortcomings in several ways:

1. Use of multiple sensors to compliment each other and mitigate the weaknesses of any single sensor.
2. Use of varying detection techniques, such as Anomaly Detection, to supplement Change Detection.
3. Use of data fusion to provide a unified view of the data from multiple sensors and techniques.
4. Exploitation of the multiple clues to characterize the nature of an object of interest and determine its threat potential.

Initial efforts are aimed at identifying and developing a sensor and processing architecture that exploits a set of IED characteristics that are difficult for insurgents to change without compromising the effectiveness of IED attacks. Subsequent steps are dependent on availability and maturity of gear and techniques suitable for the identified architecture, and could be at the lab development/demonstration level if mature technologies are not available.

Milestones:

Deliverable Products: The Multi-Sensor Change Detection initiative will at least provide an understanding of the utility of a multi-sensor approach in detecting and locating IEDs. If significant utility is indicated, a prototype system will be tested and potentially evaluated in an operational theater.

TASKS	FY06	FY07	FY08
Tech Research & Evaluation	▲ — ▲		
Incremental Development	▲ — ▲		
Request for Proposal	▲ — ▲		
Tech Development		▲ — ▲	
Technical Assessment			▲
User Assessment			▲ — ▲

POC: (703) 432-0463

Tier II UAV

Purpose: To develop and field a Tier II Unmanned Aerial Vehicle (UAV) system.

Background: During recent combat operations, the Marine Corps has realized a significant gap in its reconnaissance, surveillance and target acquisition capability, and has confirmed the need for close range UAV coverage in order to enhance timely situational awareness and decision making. This gap stems from the shortfall of close range UAV systems needed to support operations at regiment, applicable combat service support unit, and Marine Expeditionary Unit Special Operations Capable battalion levels. The current Tier I UAV satisfies the platoon / company commander's close battle point reconnaissance and surveillance needs while Tier III UAV systems will primarily support JTF/MAGTF level requirements. The limited number of Tier III assets precludes their dedicated and sustained use at the regiment and below levels of command. An organic Tier II system is required to support regiment and below ground maneuver operations within their applicable mission areas of influence. The Marine Expeditionary Force has requested that such a system be procured and demonstrated in an effort to validate the system in a configuration suitable for fielding, and eventually for providing this capability to Marine elements deployed overseas.



Description: The requirement for persistent surveillance at the Regimental level will be satisfied by a Tier II UAV system. Persistent surveillance is defined as a combination of endurance and system reliability, capable of sustained, 12-hour per day operations for 30 days and one surge capability of 24 hours per day for a 10-day period during any 30-day cycle. The system will be HMMWV-transportable in theater (no individual component of the system will require no more than a Two-Marine lift) and consist of: Air Vehicles, a Ground Control Station, Data Link, Remote Receive Terminals, Modular Mission Payloads, and support equipment for the operations and maintenance of the system.

Deliverable Product: Tier II UAV Concept Demonstrator LTAs Fall '06, and Extended User Assessment OCONUS beginning in CY '07.

Milestones:

TASK	FY06	FY07	FY08
Request for Proposal	▲		
Test and Experiment	▲	▲	
User		▲	▲

POC: 432-0464

Modular Wearable Computer (MOWC)

Purpose: To design a rugged, lightweight, modular system to provide monitoring, command & control, and system status for three separate small unit remote scouting system technologies. The MOWC will provide a common control system for the Dragon Eye Unmanned Aerial Vehicle, Dragon Runner Unmanned Ground Vehicle, and Small Unit Sensor System (SUSS) Unattended Ground Sensor.

Background: The Lab recognizes that tactical units need an organic suite of unmanned low-risk system capabilities to conduct Reconnaissance Surveillance, Target Acquisition (RSTA). The MOWC will assist this mission by providing real-time RSTA data, increasing the using unit's overall situational awareness. This will be executed by an organic suite of remote sensors, controlled and monitored from one central MOWC. This coverage will provide observational data of both confirmed and distant areas where human access is impractical or unsustainable, mitigating risk to the Marines normally carrying out these missions.



Symbionics Inc, Chantilly, VA, with cooperation from Icuiti, Rochester, NY, AeroVironment Inc., Simi Valley, CA, and Carnegie Mellon University, Pittsburgh, PA, is currently developing MOWC.

Description: MOWC will be a rugged, lightweight, modular control system to be worn or integrated into a Marines' uniform or equipment. It will interface with existing Dragon Eye, Dragon Runner, and SUSS radio telemetry and radio frequency hardware, enabling the MOWC to command and control all three remote sensor systems, from one common control system. A complete MOWC system will consist of one CPU, one battery pack, one Heads Up Display, and one interface hub. The interface hub features a plug and play display/controller that allows the operator to select and fully control any of the three unmanned sensors from the common control platform. The entire MOWC system will weigh less than 6 pounds.

Deliverable Product: Three prototype MOWCs will be used for initial concept validation and experimentation in fiscal year 2005 and 2006.

Milestones:

TASKS	FY06	FY07
Integrate DR, UGV, and SUSS	▲	
Limited Technical Assessments	▲▲	
Phase II Decision	▲	
Phase II	▲	▲

POC: (703) 784-3208

Wasp Micro Aerial Vehicle (MAV)

Purpose: Provide a “real time” ISR capability below the Company level.

Background: Wasp is a small UAV or MAV (~12 inch wing span; ~200 grams; ~30 miles per hour) that will provide squads and platoons with an unmanned air vehicle that possesses extremely low visual and acoustic signatures. WASP will complement the operational capabilities of existing Marine Corps unmanned air vehicles such as Dragon Eye, which support operations at the company-level and above. DARPA has partnered with MCCDC to provide 21 systems (approximately 84 vehicles) to the Marine Corps over an 18-month period for operational assessment. DARPA is paying for all costs associated with the 21 systems.

Description: Over a period of 18 months with three blocks of systems possessing spirally increasing capabilities, MCWL will conduct rigorous technical and operational assessment of Wasp. Block I is being used for technical assessment, while Blocks II and III will focus on operational assessments. While Block II will be a more robust design internally, Block III is planned with a near IR capability.



Deliverable Product(s): The deliverable will be a detailed recommendation to Marine Corps leadership as to the suitability and desirability of incorporating Wasp into the SURSS program of record as a member of the USMC family of aerial sensors.

Milestones:

TASKS	FY06	FY07	FY08
Block I LTA	▲▲		
Block II Extended Operational Assessment	▲—▲		
Block III Extended Operational Assessment		▲—▲	
USMC Procurement Decision			▲—▲

Action Officer: 784-1336

Improved Personnel Armor

Purpose: To identify and evaluate where we can reduce a Marine’s combat load with respect to current and future body armor systems with the same or a better level of protection.

Background: Insurgent use of IEDs has been ongoing since the start of Operation Enduring Freedom and Operation Iraqi Freedom. The vulnerability to IEDs due to their inability to effectively determine when and where these devices will detonate requires that protective individual armor be worn. To be effectively worn and utilized, it must be lightweight; offer the same or better ballistic and blast trauma protection than currently fielded body armor; and be an effective use of weight with regards to comfort, distribution, and other human performance factors.



Description: In order to eliminate identified performance decrements and increase occupational performance, the Marine Corps Warfighting Laboratory, along with the joint warfighting community, is striving to improve the effectiveness of its personal protective armor in an effort to thwart this disturbing enemy IED capability. In a joint effort with the Army’s Natick Soldier Center and the Office of Naval Research’s Human Performance expertise, MCWL will lead the evaluation of current and future body armor systems in order to identify ballistic, biomechanical, and form factors that will lighten body armor.



Deliverable Products: Report to Marine Corps Systems Command identifying ballistic, biomechanical, and form factors that will lighten body armor systems.

Milestones:

TASK	FY06
Tech Research & Evaluation	▲—▲
Technical Assessment	▲
Incremental Development	▲—▲
Technical Assessment	▲

POC: (571) 220-4310

Individual Identify Friend or Foe (IIF)

Purpose: To provide a device that will aid Marines in identifying combatants as either friend or foe in low light combat conditions.

Background: This project involves the development of a new IIF device that is based on polymer light emitting technology which when interrogated by U.S. targeting lasers will identify combatants as friendlies. The device employs an active, tunable, infrared (IR) IFF device. Use of the devices will require minimal changes to equipment and Standard Operating Procedures and with appropriate Operational Security (OPSEC) measures could become part of the broader Fratricide Mitigation strategy.



Description: IIF is a small American flag, coated with a material that generates a battery powered IR return to generation 4 night vision goggles. It is lightweight, OPSEC protected, and designed to work in low light combat situations. The device uses plastic substrates and light emitting polymer materials that require low-level voltages (~3-5 V) that can be battery-operated. This technology may be especially valuable for individual IIF where the operator is already heavily burdened with war fighting equipment and can ill-afford another cumbersome electronic device affixed to his body. The design upgrades the universally worn American flag patch (used as a passive visual IFF measure) and makes it an interrogatable, active IR emitting device suitable for low light situations.



Deliverable Product(s): The project will conclude with several operator assessments in the field that will inform a procurement recommendation for USMC, USA, USAF, and USSOCOM forces.

Milestones:

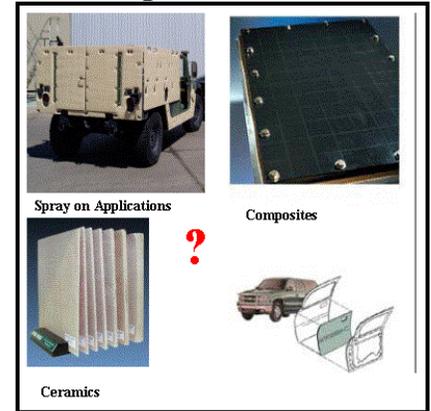
TASKS	FY06	FY07
LTA	▲▲	
Limited Op Assessment	▲	
Extended User Eval	▲▲	
Transition		▲▲

POC: (703) 432-1025

Vehicle Composite Armor

Purpose: To evaluate and test lightweight armor solutions for hardening vehicles from ballistic threats and the threats from the blast and fragmentation of Improvised Explosive Devices (IEDs).

Background: The use of weapons and IEDs by insurgents in Operation Iraqi Freedom has been a continuous problem resulting in numerous casualties to friendly forces in vehicles. This problem is reflected in the I MEF Urgent Universal Needs Statement (UNS) for IED/RPG protection. The High Mobility Multipurpose Wheeled Vehicle (HMMWV) Marine Armor Kit (MAK) introduced into service provides a reasonable degree of protection from both ballistic and IED's threats. However, the MAK is a steel-based armor solution weighing approximately 3100 lb. This weight detrimentally effects some of the primary vehicle systems (engine, chassis, suspension, brakes), places additional constraints on vehicle control, and decreases cargo carrying capacity. A substantial amount of research and development is currently being conducted by government and industry for armor solutions that provide levels of ballistic and IED protection at a reduced weight over their steel-based counterparts. Most, if not all, of these armors are based on some sort of composite structure to provide this increased performance to weight ratio. An initial parameter of vehicle composite armor that would be desired is that which results in an overall weight savings of 30-50% vs. the MAK, while providing at least the same level of protection.



Description: This is a combined effort with the Lab, MCSC, NSWC Dahlgren, NSWC Carderock, DARPA, and ONR to identify and test various composite armor materials and configurations for their effectiveness against ballistic threats and blast/fragmentation mitigation. Its primary objectives are (1) identifying potential composite armors that could provide desired levels of protection with a corresponding weight reduction, (2) testing potential solutions against ballistic (e.g., .50-cal ammo variants) and IED threats (50-cal and 20mm FSP's, 155mm HE round IED simulant), and (3) conducting an engineering analysis as to the feasibility of promising armor candidates being applicable to USMC vehicles (e.g., manufacturability, installation). Results of these objectives will be provided to MCSC and Marine Corps Combat Development Command (MCCDC).

Deliverable Products: Test results and possible candidate armor solution sets.

Milestones:

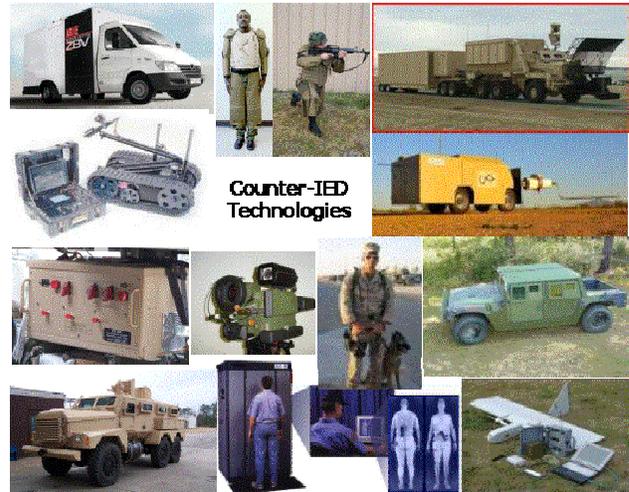
TASK	FY06
Armor Delivery	▲▲
Performance Tests	▲▲
Engineering Analyses	▲▲
Final Report	▲

POC: (703) 784-5178

IED Defeat

Purpose: MCWL’s IED Defeat initiative is aimed at significantly reducing the number of casualties caused by the use of improvised explosive devices (IEDs). The goal is to develop a synergistic combination of advanced technologies and TTPs that provide the Marine warfighter with defense in depth against the IED threat.

Background: IEDs have played a significant role in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), and their use is expected to be emblematic of future operations in the Global War on Terrorism (GWOT). Convoys and patrols (mounted and dismounted) have been frequently targeted with IEDs disguised in ways that make them indistinguishable from the abundance of refuse found along typical roads, especially in Iraq. Once hidden, IEDs are initiated in a variety of ways, including mechanical (e.g., pressure plates buried under a road), electrical (e.g., command wires attached to remotely located switches), remote control (e.g., keyless entry fobs, car alarms, wireless door bell ringers, etc.). Cell phones, long-range cordless telephones, satellite phones, two-way family radio systems and other wireless communication devices are also an emerging IED initiation mechanism. As currently deployed ECM devices and improved TTPs demonstrate their effectiveness, the enemy has increased his use of suicide bombers, who wear explosive-laden vests or drive explosive-laden vehicles into coalition convoys and other high value targets. US and coalition forces remain vulnerable to these unpredictable attacks. MCWL is partnering with the Joint warfighting community to use every means available to predict, detect, prevent, neutralize and mitigate these attacks including cutting edge technology and the development of counter-IED TTPs.



Description: MCWL’s IED Working Group has worked to rapidly identify, evaluate and facilitate the fielding of a wide variety of counter-IED systems, including electronic countermeasures and surveillance systems, IED and explosives detection devices for both mobile and stationary applications, unmanned aerial vehicles (UAVs) for persistent surveillance and counter-IED operations, multifunction EOD robots, pre-detonation systems and devices, advanced body and vehicle armor protection technology, and other COTS or special purpose devices, systems and technologies. Some of these are described in separate initiative sheets in this ECP.

Deliverable Product(s): Marine warfighters will have the ability to defeat IEDs across the spectrum of activities, including: prediction of enemy IED operations and emplacement points; detection of emplaced IEDs; detection and interdiction of IED-related activities; prevention of IED detonation; neutralization of located IEDs; and mitigation of the effects of IED blast and fragmentation on personnel and equipment.

Milestones:

TASK	FY06
X-Ray Backscatter Systems Deployed	▲
RCIED ECM Systems Upgrade Deployed	▲
Hyper-Detection System Prototype Complete	▲

POC: (703) 432-1031

IED Detector Dogs (IDD)

Purpose: To support a Lab experiment to develop new methods of breed selection and procurement, training and conditioning and technology use that will result in deployment of military working dogs with improved capability to seek out and find Improvised Explosive Devices (IEDs) in the Global War on Terrorism (GWOT).

Background: Traditional methods of training and employing explosive detector military working dogs have had limited success in finding IEDs in Stability and Support Operations (SASO) in the war on terror. The Lab is initiating an infantry dog experiment that is a departure from traditional military working dog and police dog programs. Breed selection, training, employment, and upkeep are a clean break from traditional methods, with emphasis on simplicity, low overhead and ease of maintenance. Unlike previously tested off-leash working dogs, this concept envisions an IED-hunting, semi-independent dog with greater stamina – an infantry asset already acclimated to theater environments. The IED Detector Dog is envisioned as an integral part of an infantry unit – one who is neither risk-averse nor tactically restrained.



Description: This experiment will last approximately twelve months. The initial three months will allow for procurement of the dogs, identifying the initial protocols, and starting the conditioning process (exposing the dogs to gunfire, crowded areas, and other high stimulus environments found in OIF/OEF). The next phase will require at least nine months to train/condition the IED dogs and integrate them with handlers. A successful experiment will result in the detector dogs being deployed into a GWOT theater of operations as a final proof of concept. Augmentation with DARPA ISR technologies will also be evaluated.

Deliverable Products: Ten OIF – acclimated dogs paired to Marines within one-year, providing a capability to search out IEDs while working off leash out to 300 meters.

Milestones:

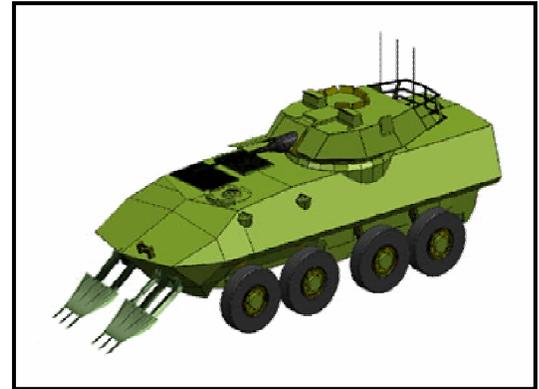
TASKS	FY06	FY07
Buy Dogs	▲ — ▲	
Train/Conditioning	▲ ————— ▲	
Eval with user/TTP Development		▲ — ▲
Deployment		▲

POC: (703) 784-0387

Mine Countermeasures (MCM) Light Armored Vehicle (LAV) Self Extractor

Purpose: To provide an organic capability to MAGTF combat vehicles to perform self-extrication from mine fields to enhance survivability.

Background: The Marine Corps Mine Countermeasures (MCM) Working Group (MCMWG) has requested the Marine Corps Warfighting Laboratory (MCWL) to conduct the concept development, design, fabrication and test of a light-weight attachment for a Light Armored Vehicle (LAV-25) to conduct a hasty breach for self-extrication from a minefield. The attachment is expected to be sufficiently light-weight to induce minimal hindrance to LAV mobility. Concept development will include an analysis of COTS/NDI mine clearance and proofing systems and the design, fabrication and test of System Design and Demonstration model for system level evaluation and experimentation with Marine Corps personnel.



This effort addresses the vital requirement for Self-Breacher/Track-Width Plow identified in the U.S. Marine Corps (USMC) Marine Air Ground Task Force (MAGTF) MCM Master Plan, dated August 2004, and the draft Initial Capabilities Document (ICD) for Explosive Hazard Defeat (EHD). The EHD ICD identifies required capabilities, including “neutralization including breaching, clearance, and proofing.”

Description: Naval Surface Warfare Center, Panama City (NSWC PC) will perform the work by conducting requirements development, system engineering analysis to include mission and system threat analysis, vehicle mobility and integration analysis, an analysis of commercial off-the-shelf (COTS)/non developmental item (NDI) hardware, conceptual development of a system design to include modeling, fabrication and test or the procurement of a candidate or modified NDI system to include its modeling and developmental test. Overall system development will include the development of notional tactics, techniques, and procedures (TTP), an evaluation of the system’s effectiveness in various soil conditions, analysis/limited testing of the system’s survivability to mine activation and experimentation with Marine Corps personnel.

Deliverable Products: Reports and fieldable prototype.

Milestones:

TASK	FY06	FY07	FY08
Project Management	▲————▲		
Engineering & Analysis	▲————▲		
SDD Development and		▲——▲	
LAV Integration		▲——▲	
Test and Evaluation		▲——▲	

POC: (703) 784-1089

Mine Countermeasures Unmanned Ground Vehicle (UGV) Mine Detector

Purpose: To develop and demonstrate a capability for the Marine Corps in route detection and marking of buried land mines.

Background: The Marine Corps Warfighting Lab (MCWL) is evaluating and experimenting with the current state-of-the-art technologies in route detection of buried mines. The objective of this effort is to leverage ongoing Army developments to develop and demonstrate a capability for the Marine Corps in route detection and marking of buried land mines. The U.S. Army has at least two distinct ongoing initiatives; Force Protection Demining System (FPDS) and Ground Standoff Mine Detection System (GSTAMIDS). The FPDS is being developed by the Humanitarian De-mining group at the Night Vision and Electronic Sensors Directorate (NVESD). GSTAMIDS is a program of record with requirements tied to Future Combat Systems (FCS).



Description: Efforts within this task include coordination and communication with the GSTAMIDS and FPDS programs to monitor their progress and technical results. Initially, the main thrust of this initiative will consist of frequent visits to Fort AP Hill, VA, Fort Belvoir, VA, and South Royalton, VT to witness GSTAMIDS and FPDS testing. Panama City will coordinate dedicated Marine Corps testing of the FPDS system. The FPDS consists of a host unmanned ground vehicle platform, a ground penetrating radar, and an electromagnetic metal detector array. The FPDS project is also developing marking and neutralization capabilities that the Marine Corps may be able to leverage. Multiple propellant torches, employed by a robotic arm attachment to the UGV, appears to be promising neutralization capability.

Deliverable Products: Reports and fieldable prototypes.

Milestones:

TASK	FY06	FY07	FY08
Monitor US Army Progress	▲ —▲		
Design/Build Sensors		▲ —▲	
System Integration		▲ —▲	
Experimentation		▲	

POC: (703) 784-1089



Glossary

Section VI

EXPERIMENTATION CAMPAIGN PLAN -- 2006

GLOSSARY

ACA	Aircraft Coordination Airspace
ACE	Aviation Combat Element
ACTD	Advanced Concept Technology Demonstration
AD/C CD	Assistant Deputy Commandant Combat Development
AFATDS	Advanced Field Artillery Tactical Data System
AFB	Air Force Base
AJC2	Adaptive Joint Command and Control
ARG	Amphibious Ready Group
AT	Anti-Terrorism
ATA	Airborne Target Acquisition
ATF	Amphibious Task Force
AWE	Advanced Warfighting Experiment
BAA	Broad Agency Announcement
BLOS	Beyond Line of Sight
BLT	Battalion Landing Team
BUST	Basic Urban Skills Training
C2	Command and Control
C2IT	Command, Control and Information Technology
C2PC	Command and Control Personal Computer
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CAS	Close Air Support
CCI	Command and Control Integration
CCIR	Commander's Critical Information Requirements
CDR	Combat Decision Range
CDS	Combat Development System
CE	Command Element
CECOM	Communications-Electronics Command
CETO	Center for Emerging Threats and Opportunities
CID	Combat Identification
CINC	Commander-in-Chief
CJCS	Chairman of the Joint Chiefs of Staff
CMC	Commandant of the Marine Corps
COA	Course of Action
COC	Combat Operations Center
CONUS	Continental United States
COTS	Commercial of the Shelf
CPLAN	Campaign Plan
CROP	Common Relevant Operational Picture
CSSE	Combat Service Support Element
CSW	Coalition Special Warfare

EXPERIMENTATION CAMPAIGN PLAN -- 2006

CTP	Common Tactical Picture
CVBG	Carrier Battle Group
D/C CD	Deputy Commandant Combat Development
DACT	Data Automated Communications Terminal
DARPA	Defense Advanced Research Projects Agency
DASC	Direct Air Support Center
DISN	Defense Information System Network
DoD	Department of Defense
DOTMLPF	Doctrine, Organization, Training, Material, Leadership, Personnel and Facilities
EBO	Effects Based Operations
ECP	Experimentation Campaign Plan
EFDS	Expeditionary Force Development System
EFSS	Expeditionary Fire Support System
EMW	Expeditionary Maneuver Warfare
EPLRS	Enhanced Position Reporting Location System
ESG	Expeditionary Sensor Grid
ETALS	Enhanced Target Acquisition and Locating System
EUT	End User Terminal
FAC	Forward Air Controller
FAM	Familiarization
FCS	Future Combat System
FIE	Fly-In-Echelon
FM	Frequency Modulation
FO	Forward Observer
FORP	Forward Observer Review Panel
FSSG	Force Service Support Group
FTUV	Family of Tactical Unmanned Vehicles
FY	Fiscal Year
FYDP	Five Year Defense Plan
GCE	Ground Combat Element
GOTS	Government of the Shelf
GPS	Global Positioning System
HIMARS	High Mobility Artillery Rocket System
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HSV	High Speed Vessel
I&E	Innovation and Experimentation
IAS	Intelligence Analysis System
ICBT	Interim Brigade Combat Team
IFAV	Interim Fast Attack Vehicle
IP	Internet Protocols
IPB	Intelligence Preparation of the Battlefield
IPR	Intra Platoon Radio
IPT	Integrated Process Team
ISR	Intra Squad Radio

EXPERIMENTATION CAMPAIGN PLAN -- 2006

ISR	Intelligence, Surveillance and Reconnaissance
ISURSS	Interim Small Unit Remote Sensor System
ITV	Internally Transportable Vehicle
JCDE	Joint Concept Development and Experimentation
JCIET	Joint Combat Identification Evaluation Team
JFC	Joint Force Commander
JFMCC	Joint Force Maritime Component Command
JIMP	Joint Vision Implementation Master Plan
JIP	Joint Interactive Planning
JOA	Joint Operations Area
JOC	Joint Operations Center
JRB	Joint Requirements Board
JROC	Joint Requirements Oversight Council
JSIR	Joint Intelligence, Surveillance and Reconnaissance
JTFHQ	Joint Task Force Headquarters
JTRS	Joint Tactical Radio System
JV2020	Joint Vision 2020
JWCA	Joint Warfighting Capabilities Assessment
LAS	Local Area Sensors
LAV	Light Armored Vehicle
LCAC	Landing Craft Air Cushioned
LEO	Low Earth Orbit
LFOC	Landing Force Operations Center
LOE	Limited Objective Experiment
LOI	Letter of Instruction
LPP	Littoral Penetration Point
LTA	Limited Technical Assessment
MAA	Mission Area Analysis
MAGTF	Marine Air Ground Task Force
MARCORSYSCOM	Marine Corps Systems Command
MARFORPAC	Marine Forces Pacific
MAWTS	Marine Aviation and Weapons Tactics Squadron
MBC	Mortar Ballistic Computer
MBITR	Multiband Inter/Intra Team Radio
MC	Millennium Challenge
MCCDC	Marine Corps Combat Development Command
MCIA	Marine Corps Intelligence Activity
MCOTEA	Marine Corps Operational Test and Evaluation Activity
MCSC	Marine Corps Systems Command
MCSIT	Multiple C4I IMMACCS Translator
MCWL	Marine Corps Warfighting Lab
MD	Millennium Dragon
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MEFFV	MAGTF Expeditionary Family of Fighting Vehicles

EXPERIMENTATION CAMPAIGN PLAN -- 2006

MELIOS	Mini Eye Safe Laser Infrared Observation Set
MEO	Mid Earth Orbit
MEU	Marine Expeditionary Unit
MFSS	Mobile Fire Support System
MNS	Mission Needs Statement
MOUT	Military Operations in Urban Terrain
MP SIDS	Man Packable Secondary Imagery Dissemination System
MPF	Maritime Prepositioning Force
MPF(F)	Maritime Prepositioning Force, Future
MPSRON	Maritime Prepositioning Squadron
MROC	Marine Corps Requirements Oversight Council
MSBL	MAGTF C4I Software Baseline
MTVR	Medium Tactical Vehicle Replacement
MWS	Modular Weapons System
NAWC-AD	Naval Air Warfare Center Aircraft Division
NOE	Nap of the Earth
NSWC	Naval Surface Warfare Center
OAG	Operational Advisory Group
OC	Olympic Challenge
OCU	Operator Control Unit
OD	Olympic Dragon
OMFTS	Operational Maneuver from the Sea
ONA	Operational Net Assessment
ONR	Office of Naval Research
OPTEMPO	Operations Tempo
ORD	Operational Requirements Document
OSTI	Office of Science, Technology and Innovation
OTH	Over the Horizon
OTM	On the Move
PC	Pinnacle Challenge
PD	Pinnacle Dragon
PM	Program Manager
POI	Program of Instruction
POM	Program Objective Memorandum
PRE-FICCS	PRE First In Command and Control System
PTAM	Precision Target Acquisition Mobile
PWS	Pintle Weapon System
RAP	Rocket Assisted Projectile
RCSS	Robotic Combat Support System
RDO	Rapid Decisive Operations
RHC	Ruggedized Handheld Computer
RLT	Regimental Landing Team
ROCS	Recon Observation Confirming Sensors
RSTA	Reconnaissance, Surveillance and Target Acquisition
RST-V	Reconnaissance, Surveillance, Target Acquisition Vehicle Program

EXPERIMENTATION CAMPAIGN PLAN -- 2006

RW	Rotary Wing
S&T	Science and Technology
SA	Situational Awareness
SACC	Supporting Arms Coordination Center
SAR	Synthetic Aperture Radar
SATCOM	Satellite Communications
SCLA	Southern California Logistics Airport
SE&I	Systems Engineering and Integration
SECDEF	Secretary of Defense
SINCGARS	Single Channel Ground and Airborne Radio System
SJFHQ	Standing Joint Force Headquarters
SLA	Service Level Agreements
SLEP	Service Life Extension Program
SLOC	Sea Line of Communication
SOC	Special Operations Capable
SPMAGTF(X)	Special Purpose Marine Air Ground Task Force, Experimental
SRS	Standardized Robotic System
STOM	Ship to Objective Maneuver
TACC	Tactical Air Coordination Center (Navy)
TARDEC	Tank Automotive Research, Development and Engineering Center
TCO	Tactical Combat Operations
TECOM	Training and Education Command
THS (X)	Target Hand Off System (Experimental)
THR	Tactical Handheld Radio
TLDHS	Target Location Digital Handoff System
TRADOC	U.S. Army Training and Doctrine Command
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Aerial Vehicle
UCATS	Universal Combined Arms Targeting System
UCAX	Urban Combined Arms Exercise
UGS	Unattended Ground Sensor
UGV	Unmanned Ground Vehicle
UGV/S JPO	UGV Systems Joint Program Office
UHF	Ultra High Frequency
UNS	Universal Needs Statement
UOC	Unit Operations Center
USJFCOM	United States Joint Forces Command
VCNR	Vice Chief of Naval Research
VHF	Very High Frequency
VoIP	Voice over Internet Protocol
VT	Vehicle Teleoperation
WMD	Weapons of Mass Destruction
WTBN	Weapons Training Battalion
WTI	Weapons and Tactics Instructors



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