

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE
February 1999

BUDGET ACTIVITY
3 - Advanced Development

PE NUMBER AND TITLE
0603640M Marine Corps Advanced Technology Demonstrations

COST (In Thousands)	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	58467	56187	56943	59410	54814	55572	57003	58031	Continuing	Continuing
C2223 Marine Corps Advanced Technology	22333	18478	10491	11693	15772	15890	17192	17512	Continuing	Continuing
C2297 Marine Corps Warfighting Laboratory (MCWL)	26834	27905	36801	38105	38086	38729	39811	40519	Continuing	Continuing
C2362 Extended Littoral Battlespace (ELB), Advanced Concept Technology Demonstration (ACTD)	9300	9804	9651	9612	956	953	0	0	0	45276
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

(U) Mission Description and Budget Item Justification: As the land warfare component of Naval Expeditionary Forces power projection, the Marine Corps has unique and technologically stressing requirements resulting from its amphibious mission; Marine Air-Ground Task Force (MAGTF) organizational structure; and reliance on maneuver, logistic sustainability, and intensive tempo of operations in diverse environments. Critical Marine Corps requirements/imperatives being addressed in this program element (PE) are: Maneuver, Firepower, Command and Control, Logistics, and Training and Education. These are ongoing efforts to develop and demonstrate advanced technologies and system concepts in a quasi-operational environment. Multiple transitions into the Demonstration/Validation phase are planned, as well as fieldable prototyping to reduce risk in Engineering and Manufacturing Development. Joint service efforts are in line with Defense Technology Objectives (DTOs) and Joint Warfighting Objectives (JWOs). In addition, Marine Corps Warfighting Experimentation in conceptual operational assessment of emerging technologies is funded. This PE also provides Extended Littoral Battlespace efforts in the areas of: Command, Control, Communications, Computers and Intelligence (C4I); and Fires and Targeting. Efforts focus on connectivity between MAGTF and Fleet organizations and naval sea-based fire support. Specifically, this PE supports the following capabilities: promptly engaging regional forces in decisive combat on a global basis; responding to all other contingencies and missions in the full spectrum of combat operations (high, mid and low intensity) in Military Operations in Urban Terrain (MOUT), and in operations other than war; and warfighting experimentation. By providing the technologies to enable these capabilities, this PE primarily supports the goals and objectives of the Strike, Littoral Warfare and Surveillance Joint Mission Areas. This PE supports all of the Marine Corps mission areas.

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Budget Item Justification

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BUDGET ACTIVITY 3 - Advanced Development				PE NUMBER AND TITLE 0603640M Marine Corps Advanced Technology Demonstrations				PROJECT C2223		
COST <i>(In Thousands)</i>	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2223 Marine Corps Advanced Technology	22333	18478	10491	11693	15772	15890	17192	17512	Continuing	Continuing
C2223 Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0
<p>(U) JUSTIFICATION FOR BUDGET ACTIVITY: (U) This program is budgeted within the Advanced Technology Demonstration Budget Activity because it encompasses design, development, simulation, or experimental testing of prototype hardware to validate technological feasibility and utility, and reduce technological risk prior to initiation of a new acquisition program or transition to an ongoing acquisition program.</p> <p>(U) PROGRAM ACCOMPLISHMENTS AND PLANS:</p> <p>(U) FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • (U) \$ 7588 Maneuver Imperative: Conducted technology development and demonstrations to enhance the Ground Combat Element's (GCE) abilities to locate, close with, and destroy the enemy. The principle objectives were to improve tactical mobility, survivability and readiness in order to facilitate the Marine Corps-unique Operational Concept, (Operational Maneuver from the Sea (OMFTS)). Major focus areas were: technologies for future combat vehicles, incorporated hybrid electric propulsion suites; Technologies to detect minefields from deployed Unmanned Aerial Vehicle's (UAV) rapidly, at safe standoff and fully integrate with the GCE. Efforts included: Continued Future Light Combat Vehicle Technical Concept development. Completed Coastal Battlefield Reconnaissance and Analysis (COBRA) hardware/software optimization and demonstrated COBRA upgrades at the Joint Countermine Advanced Concept Technology Demonstration (JCM ACTD). Transitioned COBRA to Engineering and Manufacturing Development (EMD 6.5). Completed Source Selection and awarded contracts for Detailed Design of Reconnaissance, Surveillance and Targeting Vehicle Advanced Technology Demonstrator (RSTV ATD). Completed Critical Item Demonstrations for key and risk technologies of the RSTV program and Preliminary Design Review with both contractors. Completed System Engineering, to include modeling, analysis and simulation of key technologies and components for Light Armored Vehicle Service Life Extension Program (LAV SLEP) Technology Demonstrator vehicle. Awarded contract for Common Automatic Recovery System (CARS) under Congressional plus up. 										
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- (U) \$ 6086 Firepower Imperative: Developed and demonstrated technologies to enhance Reconnaissance, Surveillance, and Target Acquisition tasks for supporting arms (Indirect fire and close air support); fire control for direct fire and close combat. Tested and evaluated prototype Objective Individual Combat Weapons (OICW) System. Completed design studies to develop the capability to fire the Shoulder Launched Multipurpose Assault Weapon (SMAW) from an enclosed space under Congressional plus up program. Investigated the integration of Advanced Medium Range Air-to-Air Missile (AMRAAM) missiles onto High Mobility Multi-Wheeled Vehicles (HMMWVs), also known as the Complimentary Low Altitude Weapons System (CLAWS).
 - (U) \$ 769 Command and Control Imperative: Continued to develop and demonstrate technologies and concepts for the elements of the MAGTF, with a focus on the Command Element (CE). Prototype modules for an experimental Jump Command Post (CP) were designed and fabricated. These modules are capable of supporting operations out of multiple prime movers in the USMC inventory. Module designs included shelters, work space layout and ergonomics, lighting, power management, electronic enclosures and environmental control and support the fielding of advanced computer and communication technologies when transitioned to the USMC inventory. Accepted delivery of limited capability prototype ultra wideband unique waveform communication devices.
 - (U) \$ 4285 Logistics Imperative: Continued system concept development and rapid prototype of technologies to support of Combat Service Support Operations Center (CSSOC) and Mobile CSSOC field demonstrations with 1st and 2nd Force Service Support Group (FSSG). Focus of CSSOC was the Request Tracking System (RTS), and a web-based Common Database Repository (COMDAR). The prototype system was structure d to provide the logistician with a logistics command and control capability within the common operating center environment. Concluded concept demonstration of an expeditionary container handler, considered as an augmentation to the existing rough terrain container handler, and focused on providing a new capability for movement from ship to shore destination using all current landing craft/lighterage concepts. Initiated investigating of a 2-3 Kilowatt Fuel Cell, electro chemical compressors and reformat gas scrubbers under Congressional plus up program. Completed System configuration description of Logistic Vehicle System-Replacement (LVS-R) Advanced Technology Demonstrator in support of PMs acquisition strategy for LVS-R. Fabrication began and component installation on-going.
 - (U) \$ 2010 Training and Education Imperative: Developed and demonstrated technologies that enhanced the mental abilities of Marines to deal with battlefield uncertainty and chaos, to assimilate information rapidly to be decisive. Initiated the MOUT-IS (Military Operations in Urban Terrain-Instrumentation System) program and awarded the prototype development contract.
 - (U) \$ 1595 Project Albert funds the development methodologies at the Maui High Performance Computer Center (MHPCC) to run and assess large-scale analysis of the Irreducible Semi-Autonomous Adaptive Combat (ISAAC) agent based land combat model; to support the Joint Integrated Virtual Environment for Simulation (JIVES) program and conduct a proof-of-concept of generative analysis in urban warfighting environments; to assess the Swarm artificial life modeling tool in an urban environment; and to incorporate applicable emerging results from the previously mentioned ALBERT processes in the Maneuver Warfare Analytical and Research System (MWARS) structure.
- (U)Total \$ 22333

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**0603640M Marine Corps Advanced Technology
Demonstrations**

PROJECT

C2223**(U) FY 1999 Planned Program:**

- (U) \$ 3296 Maneuver Imperative: Continuation of the Joint Defense Airborne Reconnaissance Program Agency (DARPA)/USMC Reconnaissance, Surveillance and Targeting - Vehicle (RST/V). Fabricated and tested RST/V platform and began integration of survivability and sensor systems. Downselected to single contractor for fabrication, testing and test support for Reconnaissance, Surveillance and Targeting Vehicle. Conducted successful Critical Design Review with contractor. Purchased all critical components and began fabrication of two demonstrator platforms to be delivered 1Q FY 2000. Complete system configuration and began fabrication of technology demonstrator for the Light Armored Vehicle SLEP. Platform will be key enabler for SLEP program and will transition to Program Manager in FY 2000.
- (U) \$ 7185 Firepower Imperative: Continue design and fabrication of OICW prototype. Analyze and evaluate Contingent Low Altitude Weapons System (CLAWS), formerly HUMRAAM. Develop the capability to fire the Shoulder Launched Multipurpose Assault Weapon (SMAW) from an enclosed space under Congressional plus up program. Develop a microwave-based weapons pairing system that enables direct weapons fire simulation in realistic battlefield conditions for the K-Band Testing Obscuration Pairing System
- (U) \$ 938 Command and Control Imperative: Continue to develop and demonstrate technologies to make decisions, communicate information, and expand knowledge in a high tempo, uncertain, and chaotic battlefield. These technologies will include large screen display technologies that are scalable for Battalion through Division and their appropriate Command Post environment. They will also include horizontal integration of software capabilities/modules such that the commander and his staff see a consolidated picture of the battlespace rather than segregated applications. Continue the effort to develop unique waveform technologies that provide low probability of detection/intercept for squad level communications.
- (U) \$ 1477 Logistics Imperative: Continue to develop and demonstrate technologies to enhance MAGTF capabilities in operational and tactical logistics in the areas of CSS vehicles. The goal is to enable seabased logistics, a tailored presence ashore, and reduction in consumables. Program focus includes: CSSOC software and hardware system will be packaged for transition to the Unit Operations Center (UOC) program, to fully support the Personnel and Administration/Logistics, Supply and Embarkation (G4/G1) functionality of logistics command and control. Legacy system interfaces and joint interoperability will be demonstrated. Complete fabrication and testing of Logistic Vehicle System-Replacement (LVS-R) Advanced Technology Demonstrator in support of PMs acquisition strategy for LVS-R. Configuration and testing provided required data and reduced risk and cost while supporting future Milestone Decisions.

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• (U) \$	1311	Training and Education Imperative: Continue to develop and demonstrate technologies to enhance the cognitive and higher-order abilities of Marine Warfighters. Efforts include: Development of the Closed Loop Artillery Simulator System (CLASS). Development of the Military Operations In Urban Terrain-Instrumentation System (MOUT-IS); conducted DT and transitioned technology to MOUT ACTD and Marine Corps Urban Warrior Advanced Warfighting Experiments (AWE). Continued to support transitions to acquisition.
• (U) \$	4000	Project Albert funds the development of data, concepts and tools of 21 st Century Operations Analysis especially in the areas of non-linear and asymmetric warfare. The goal is to generate data to support warfighting hypotheses with emphasis on questions relating to urban warfare.
• (U) \$	271	Portion of extramural program reserved for Small Business Innovation Research (SBIR) assessment in accordance with 15 USC 638.
(U)Total \$	18478	
(U) FY 2000 Planned Program:		
• (U) \$	3575	Maneuver Imperative: Continue to develop and demonstrate technologies that enhance operational mobility and survivability of platforms of Marine units. Efforts include: Continue the Joint DARPA/USMC Reconnaissance, Surveillance and Targeting - Vehicle (RST/V). Conduct contractor testing and risk reduction through test-fix-test strategy of Reconnaissance, Surveillance and Targeting Vehicles. Testing will encompass Mobility, Survivability, Sensor, and Communications. Conduct Fabrication Review and Test Readiness Review for 2001 delivery to government. Continue testing of Technology Demonstrator for the Light Armored Vehicle SLEP. Conduct testing and transition findings to acquisition manager.
• (U) \$	1955	Firepower Imperative: Investigate technologies to increase accuracy, range, lethality, integration and timeliness of direct, indirect and close fires. Continue development and evaluation of Enhanced Target Acquisition and Location System (ETALS). Continue evaluation and integration of CLAWS. Begin development, integration and evaluation of Objective Crew Served Weapon (OCSW) System, a joint Army/USMC program.
• (U) \$	1350	Command and Control Imperative: Conduct demonstration of USMC Concept of Operations (CONOPS) and participate in Joint Testing for deployment of tactical digital radios. Continue the development and demonstration of advanced Human Computer Interfaces (HCI) devices for use in Command Operations Centers (COC's) and Command Centers (CC's) for workstations and handheld data processing and communication equipment. Continue horizontal integration of software modules/functionality for an aggregate view of the battlespace. Continue developing unique waveform squad level communications devices and extend it to company level for intra-level communications.

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- (U) \$ 1900 Logistics Imperative: Continue to develop and demonstrate technologies to enhance MAGTF capabilities in operational and tactical logistics in the areas of CSS vehicles. The goal is to enable seabased logistics, a tailored presence ashore and reduction in consumables. Program focus includes: transition of the CSSOC and mobile CSSOC system concept insertion efforts. Efforts include the technology demonstration of new concepts in expeditionary bulk liquids distribution systems, focused on Naval seamless operation from ship to objective. Insert advanced technology into Logistic Vehicle System Technology Demonstrator platform to demonstrate embedded diagnostics and reporting, enhanced mobility, and improved trafficability and payload handling. Perform system analysis and modeling of future assault support capabilities and assets. Conduct survey, initial analysis and preliminary design of advanced payload handling systems for USMC Logistic Vehicle System and Medium Tactical Truck, to include trailers and load management systems.
 - (U) \$ 1711 Training and Education Imperative: Continue to develop and demonstrate technologies to enhance the cognitive and higher-order abilities of Marine Warfighters. Efforts include: Development of the Closed Loop Artillery Simulator (CLAS). Development of the Military Operations In Urban Terrain-Instrumentation System (MOUT-IS).
- (U)Total \$ 10491

B. (U) Project Change Summary

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
(U) Previous President's Budget	22392	8520	10701
(U) Adjustments to Previous President's Budget	-59	+9958	-210
(U) Current Budget Submit	22333	18478	10491

(U) Change Summary Explanation:

(U) Funding: Reductions in FY1998 are due to Small Business Innovative Research (SBIR) and a funding realignment to another Marine Corps program. FY99 increases and decreases reflect Congressional increases in the amounts of five \$5 million for SMAW, \$4 million for Project Albert and \$974 thousand for K-Band and economic and general adjustments, respectively. FY 2000 decrease is due to revised economic assumption and general adjustments.

(U) Schedule: Not applicable

(U) Technical: Not applicable

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C. (U) <u>Other Program Funding Summary</u> (APPN, BLI #, NOMEN)	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) Not applicable (U) Related RDT&E (U) PE 0602618A (Ballistics Technology) (U) PE 0603004A (Weapons and Munitions Advanced Technology) (U) PE 0603005A (Combat Vehicle and Automotive Advanced Technology) (U) PE 0603606A (Landmine Warfare and Barrier Advanced Technology) (U) PE 0603607A (Joint Service Small Arms Programs) (U) PE 0603619A (Landmine Warfare and Barrier Advanced Demonstrations) (U) PE 0603772A (Battlefield Force Integrations) (U) PE 0604207A (STINGRAY) (U) PE 0604710A (Night Vision Systems - Engineering Development) (U) PE 0604806A (Chemical/Biological Defense Equipment - Engineering Development) (U) PE 0604808A (Landmine Warfare and Barrier Engineering Development) (U) PE 0602301E (Computing Systems and Communications Technology) (U) PE 0602702E (Tactical Technology) Technology Demonstrations (ATDs) (U) PE 0603226E (Experimental Evaluation of Major Innovative Technologies) (U) PE 0206623M (Marine Corps Ground/Supporting Arms Systems) (U) PE 0602131M (Marine Corps Landing Force Technology) (U) PE 0603612M (Marine Corps Mine/Countermeasures Systems) (U) PE 0603635M (Marine Corps Ground Combat/Support System) (U) PE 0204163N (Fleet Communications) (U) PE 0602315N (Mine Countermeasures, Mining and Special Warfare Technology) (U) PE 0603555N (Undersea Superiority Technology Demonstrations) (U) PE 0603782N (Mine and Expeditionary Warfare Advanced Technology) (U) PE 0603794N (Command, Control, Communications, Advanced Technology) (U) PE 0206313M (Marine Air Ground Task Force Command/Control/Communications/Computers & Intelligence MAGTF C4I) (U) PE This program is in compliance with Tri-Service Reliance Agreements D. (U) <u>Schedule Profile:</u> Not applicable.										
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BUDGET ACTIVITY 3 - Advanced Development				PE NUMBER AND TITLE 0603640M Marine Corps Advanced Technology Demonstrations				PROJECT C2297		
<i>COST (In Thousands)</i>	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2297 Marine Corps Warfighting Laboratory (MCWL)	26834	27905	36801	38105	38086	38729	39811	40519	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0
<p>A. (U) <u>Mission Description and Budget Item Justification:</u></p> <p>(U) The Marine Corps Warfighting Laboratory (MCWL) is the centerpiece for the operational enhancement of the Marine Corps. Using the Special Purpose Marine Air-Ground Task Force (Experimental) (SPMAGTF(X)) as its “test bed” organization, MCWL demonstrates the usefulness and necessity of integrating new technological developments and advanced concepts into the Fleet Marine Forces. MCWL focuses on developing and field testing future operational and technological concepts to enhance warfighting capability. The organizational thrust is to provide an institutional mechanism for continuously generating new ideas for warfighting capabilities. Concepts of operation “Sea Dragon” are validated by means of various Warfighting Experiments.</p> <p>(U) Sea Dragon is a process of experimentation which is designed as an ongoing mechanism to insure the relevance of Marine forces in the face of change. Sea Dragon encompasses inquires into multiple technology and warfighting areas, including: C4I; fires; biological, chemical and non-lethal technologies; expeditionary logistics; and advanced training and education techniques.</p> <p>(U) Using experimental operational forces, beginning with the SPMAGTF(X) as the forward element of a future Naval Expeditionary Force (NEF), the MCWL will conduct a number of Advanced Warfighting Experiments (AWEs) supported by several Limited Objective Experiments (LOEs) and Limited Technology Assessments (LTAs). An AWE is defined as a large scale operational experiment where advanced warfighting concepts and enabling technologies are evaluated to determine the military utility, operational effectiveness, and operational suitability in as realistic an environment as possible. These AWEs will examine an operational concept that envisions a greatly expanded, lethal, fluid, chaotic, and more opportunistic battlefield within a maneuver warfare approach. LOEs are considerably smaller in scope than AWEs and concentrate on specific aspects of an operational concept. These experimental forces will be highly trained, technologically infused, highly lethal, and intellectually prepared to fight in this chaotic and opportunistic environment. LTAs focus on specific technologies and assess their usefulness by means of analysis or experimentation.</p> <p>(U) Under the guidance of the extended Five Year Experimentation Plan (FYEP), MCWL’s current plans include five AWE “build-up” phases culminating in actual AWE execution:</p>										
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Demonstrations**

1) Hunter Warrior: (March 1996 through April 1997) Experimented with advanced operational concepts and technologies on an extended and dispersed battlefield, in open and mountainous terrain at the mid-intensity operational level.

2) Urban Warrior: (April 1997 through June 1999) Focuses on developing new tactics, techniques, and procedures; and supporting technologies for operations in urban, close terrain, and near urban littoral areas.

3) Capable Warrior: (June 1999 through 2001) Uses lessons learned in Hunter Warrior and Urban Warrior to integrate the full capability of a Marine Air-Ground Task Force (MAGTF) with naval units operating at the numbered fleet level of a Joint Task Force from the sea.

4) Information Warrior (FY 2002 through FY 2003) Builds on Defense Advanced Research Project Agency's (DARPA's) Small Unit Operations (SUO) program and Massachusetts Institute of Technology's (MIT's) program for voice interface with computer databases to explore the impact of assured communications and large scale computer access to tactical employment of forces.

5) Coalition Warrior (FY 2004 through FY 2005) Focuses on the integration of 21st century sea-based technologies into coalition warfare.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

(U) **FY 1998 Accomplishments:**

- (U) \$ 4332 MCWL Operations (Support): Expanded search for, location, development and evaluation of advanced warfighting operational and organizational concepts and enabling technologies for LOEs, LTAs, and AWEs. Continued research planning; model and simulation development; preparation; execution; and analysis and assessment to extend exploration of critical components. Provided for Marine Forces (Atlantic and Pacific) Battle Laboratories to conduct experimentation. Established temporary MCWL sites at Camp Lejeune and Camp Pendleton to facilitate planning and execution of Urban Warrior LOEs, LTEs, and AWE.

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Demonstrations

- (U) \$ 12001 Command, Control, Communications, Computers, and Intelligence (C4I): Purchased, integrated and supported fundamental hardware and software which will be used to support the Integrated Marine Multi-Agent Command and Control System (IMMACCS) Engine and communications backbone allowing situational awareness and the Common Operational Picture (COP) at all levels of the MAGTF. Continued systems engineering and integration efforts and provided technical support for the Enhanced (Experimental) Combat Operations Center (ECOC). Continued two-dimensional (2D) Viewer requirements, which uses rapid decision making in order to facilitate human understanding of operational plans, to support the IMMACCS concept. Continued to expand and enhance the Shared Net and Internet-Node-in-the-Sky (INITS), Unmanned Aerial Vehicle (UAV) transportable communications system, initiatives. Continued investigations into "Clear Thinking" training and pattern recognition. Continued to develop the single integrated air and ground picture and integration of all sensors to enhance fire support and planning. Developed and implemented the Object-Oriented (OO) database required by the IMMACCS using National Imagery and Mapping Agency (NIMA) data as input. Developed and implemented the required ability to allow updates of the OO database with inputs provided by "intelligent agents". Analyzed configuration recommendations, based on modeling and simulation, for the Urban Warrior communication network.
- (U) \$ 2472 Drones and Aviation: Continued enhancing the Expendable Drone (Exdrone) UAV to perform battle damage assessment; data targeting; reconnaissance and surveillance; and accurate deployment of unattended sensors. Began Dragon Drone integration on board a ship in a manner that allows the system to be easily removed at the end of the deployment. Expanded investigations into Hummingbird, suitcase-portable UAV which operates like a helicopter, concepts. Provided mission planning and visualization capabilities, simulation of urban terrain and digital ground-to-air connectivity in support of urban aviation experimentation. Experimented with the impact of providing digital common tactical picture to the individual aircrew by equipping a representative number of systems with a common tactical picture in the cockpit. Supported modifications, integrating, installing, calibrating, and testing the Tactical Airborne Communications Electronic Support (TACES) system onboard the Dragon Drone UAV. Evaluated the utility of using powered parafoils to insert and extract small teams. Conducted "Real Time Targeting", "Reachback", and "Network-Centric" experiments which provided on-call real-time targeting and situational awareness imagery and text to airborne Fighter and Attack (F/A-18s) aircraft via the Walleye AWW-13 datalink pod.
- (U) \$ 3206 Fires and Targeting: Expanded development of the Dragon Fire Mortar System experimental prototype. Continued development of a laser rangefinder targeting system which will provide ground forces with accurate target acquisition. Explored the means for small units to designate and illuminate targets for engagements by direct fire and indirect fire assets against sniper target. Expanded investigations for urban direct fire technologies for remote delivered munitions and identified means to conduct urban breaching for the exterior of structures. Provided a means to conduct virtual close air support through digital data links between controllers and pilots. Provided a means for small units to send and receive video and still images for battlefield surveillance. Explored means to automate the fires systems for use in the joint environment. Investigated available and emerging digital camera/video surveillance technologies.

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Demonstrations

- (U) \$ 2164 Seabasing, Logistics, Combat Service Support (CSS), and Combat in Cities (including Training and Education): Searched for and evaluated emerging commercially available technologies that could significantly improve urban CSS mobility. Searched for, evaluated, and performed seabasing analysis. Participated in an experiment to centralize personnel administration at the group, regiment, major subordinate command, and Marine Expeditionary Unit (MEU) Command Element (CE) level. Investigated the impact of MCWL experimental results on manpower reductions. Supported experimentation with aerosolized foams for reinforcing structures as well as bridging and counter-mobility operations. Continued investigations into Guided Precision Air Delivery System (GPADS) and powered parafoil capabilities. Experimented with electronic/urban markers used in complex terrain to help small units maneuver quickly and safely. Provided the sea-based logistician with a multi-faceted logistics support package which includes alternative power sources, small urban movers, delivery systems for ship-to-shore, mobility/counter-mobility foams, enhanced CSS operations center, cargo tagging/recording/tracking technologies, etc. and analyze efforts. Experimented with Carbine Rifle optics to improve the ability to engage with direct fires. Experimented with counter-sniper technologies focusing on increasing the survivability of Marines operating in the urban environment. Leveraged ongoing work in the Day/Night Small Unit Target Acquisition field, of several advanced technology programs and provided field user evaluation/feedback through experimentation. Integrated clothing and equipment that will enhance Marines' survivability in urban combat. Conducted high visibility experiments using existing training rounds at the Military Operations in Urban Terrain (MOUT) training facility. Provided a training munition that allows for live fire training in existing and upgraded urban warfare training facilities that does no damage to buildings and is relatively safe to use.
 - (U) \$ 2659 Chemical/Biological (Chem/Bio), Analysis, and Non-Lethals: Continued Reachback Communications Systems (RCS) efforts to link chem/bio scientific and medical experts with the Chem/Bio Incident Response Force (CBIRF). Explored capabilities to quickly and safely treat and evacuate casualties from the urban battlefield, with the smallest possible support load on the maneuver commander. Completed integration of an air sampler-biosensor system on a drone for the remote identification of biological warfare agents. Provided an instrumentation capability that will support MCWL experimentation in the urban environment. Expanded efforts to improve upon the automated data collection system designed and implemented during Hunter Warrior. Provided overall systems engineering and integration support for ongoing experimentation. Began development and demonstration of a liquid dispensing upgrade to the Powered Parafoil UAVs in support of non-lethal experimentation.
- (U)Total \$ 26,834

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PROJECT
C2297

(U) FY 1999 Planned Program:

- (U) \$ 2690 MCWL Operations (Support): Continue searching for, locating, developing and evaluating advanced warfighting operational and organizational concepts and enabling technologies for LOEs, LTAs, and AWEs. Continue research planning; model and simulation development; preparation; execution; and analysis and assessment to extend exploration of critical components. Continue to provide for Marine Forces (Atlantic and Pacific) Battle Laboratories to conduct experimentation.
- (U) \$ 9415 C4I: Continue systems engineering, integration and technical support for ECOC and IMMACCS. Continue to build the capability to provide situational awareness to all levels of the MAGTF. Continue INITs, Shared Net, and 2D Viewer development efforts. Continue "Clear Thinking" technology pattern recognition efforts. Continue the integration of single integrated air/ground picture for mission planning and fire support. Provide forward-deployed forces with the real-time access to RCS and CBIRF staffs, experts and the supporting establishment.
- (U) \$ 8004 Drones, Aviation, and Sensors: Continue development of the Broad Area Unmanned Retail Resupply Operations (BURRO) (helicopter/UAV capable of carrying heavy loads) by initiating conversion of the commercial manned K-MAX helicopter into an unmanned platform, utilizing dynamic response modeling. Continue enhancing the Exdrone UAV (Dragon Drone) to perform battle damage assessment; data targeting; reconnaissance and surveillance; and accurate deployment of unattended sensors. Complete Dragon Drone ship integration. Complete "Real Time Targeting", "Reachback", and "Network-Centric" experiments. Investigate the capabilities of Unmanned Ground Vehicles (UGVs) equipped with an unattended sensor suite, including video to improve battlefield situational awareness. Provide the Marine Expeditionary Unit with a complete battlefield sensor capability to improve battlefield situational awareness. Expand investigations/experimentation in aviation technologies and aviation employment in the urban environment. Search for new and emerging technologies.
- (U) \$ 1569 Fires and Targeting: Continue development of a Box Mortar System experimental prototype. Continue development of a laser rangefinder which will provide ground forces with accurate target acquisition. Continue development of small unit day/night surveillance target acquisition devices. Continue development of automated fires system. Initiate sensor to weapons links for increased responsiveness to calls for fire. Investigate suppressed combat rifle initiatives.
- (U) \$ 1121 Seabasing, Logistics, CSS, and Combat in Cities (including Training and Education): Provide small units and individual Marines with an equipment kit that will enhance maneuver in the urban environment. Continue investigations into GPADS capabilities. Continue experimentation with counter-sniper technologies. Continue integrating clothing and equipment that will enhance Marines' survivability in urban combat. Continue to search for, evaluate, and perform seabasing analysis. Continue to experiment with electronic markers. Continue to provide sea-based logistical support. Continue to leverage ongoing work in the Day/Night Small Unit Target Acquisition field. Evaluate combat service support for emerging and developing weapons as they apply to operational concepts of logistics support and sustainment for various non-standard scenarios. Investigate existing and emerging training enhancements and simulation equipment and devices. Continue to search for and evaluate emerging commercially available technologies that could significantly improve efforts in this area.

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Budget Item Justification

(Exhibit R-2, Page 12 of 19)

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BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603640M Marine Corps Advanced Technology Demonstrations	PROJECT C2297
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- (U) \$ 4483 Chemical/Biological (Chem/Bio), Analysis and Non-Lethals: Continue RCS efforts to link chem/bio scientific and medical experts with the CBIRF. Continue medical investigations. Continue to provide an instrumentation capability that will support MCWL experimentation in the urban environment. Continue efforts to improve upon the automated data collection system. Continue to provide overall systems engineering and integration support for ongoing experimentation. Continue development and demonstration of a liquid dispensing upgrade to the Powered Parafoil UAVs in support of non-lethal experimentation. Seek Non-Lethal technologies which can affect an opponents infrastructure without necessarily destroying it. Investigate the use of Non-Lethal technologies to deter, delay, deny, disrupt, and destroy opponents or their material.
 - (U) \$ 623 Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.
- (U)Total \$ 27,905

(U) FY 2000 Planned Program:

- (U) \$ 4701 MCWL Operations (Support): Continue searching for, locating, developing and evaluating advanced warfighting operational and organizational concepts and enabling technologies for LOEs, LTAs, and AWEs. Continue research planning; model and simulation development; preparation; execution; and analysis and assessment to extend exploration of critical components. Continue to provide for Marine Forces (Atlantic and Pacific) Battle Laboratories to conduct experimentation.
- (U) \$ 15422 C4I: Continue systems engineering, integration and technical support for ECOC and IMMACCS. Continue to build the capability to provide situational awareness to all levels of the MAGTF. Continue INITS, Shared Net, and 2D Viewer development efforts. Continue "Clear Thinking" technology pattern recognition efforts. Continue the integration of single integrated air/ground picture for mission planning and fire support. Continue to provide forward-deployed forces with the real-time access to RCS and CBIRF staffs, experts and the supporting establishment.
- (U) \$ 5171 Drones, Aviation, and Sensors: Continue enhancing the Dragon Drone UAV to perform battle damage assessment; data targeting; reconnaissance and surveillance; and accurate deployment of unattended sensors. Complete "Real Time Targeting", "Reachback", and "Network-Centric" experiments. Continue to investigate the capabilities of UGVs equipped with an unattended sensor suite, including video to improve battlefield situational awareness. Continue search for new and emerging technologies.

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BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603640M Marine Corps Advanced Technology Demonstrations	PROJECT C2297
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- (U) \$ 2332 Fires and Targeting: Complete development of a Box Mortar System experimental prototype. Continue development of a laser rangefinder which will provide ground forces with accurate target acquisition. Continue development of small unit day/night surveillance target acquisition devices. Provide a means to “tagging” targets so that they can be tracked and attacked later. Continue development of automated fires system. Continue sensor to weapons links for increased responsiveness to calls for fire. Continue to investigate emerging fires and targeting technologies.
 - (U) \$ 1763 Seabasing, Logistics, CSS, and Combat in Cities (including Training and Education): Provide small units and individual Marines with an equipment kit that will enhance maneuverability. Continue investigations into GPADS and powered parafoil capabilities. Continue experimentation with counter-sniper technologies. Continue integrating clothing and equipment that will enhance Marines’ survivability. Continue to search for, evaluate, and perform seabasing analysis. Continue to experiment with electronic markers. Continue to provide sea-based logistical support. Continue to leverage ongoing work in the Day/Night Small Unit Target Acquisition field. Continue to evaluate combat service support for emerging and developing weapons as they apply to operational concepts of logistics support and sustainment for various non-standard scenarios. Continue to investigate existing and emerging training enhancements and simulation equipment and devices. Continue to search for and evaluated emerging commercially available technologies that could significantly improve efforts in this area.
 - (U) \$ 7412 Chemical/Biological (Chem/Bio), Analysis, and Non-Lethals: Continue RCS efforts to link chem/bio scientific and medical experts with the CBIRF. Continue medical investigations. Continue to provide an instrumentation capability that will support MCWL experimentation in the urban environment. Continue efforts to improve upon the automated data collection system. Continue to provide overall systems engineering and integration support for ongoing experimentation. Continue development and demonstration of a liquid dispensing upgrade to the Powered Parafoil UAVs in support of non-lethal experimentation. Continue to seek Non-Lethal technologies which can affect an opponents infrastructure without necessarily destroying it. Continue to investigate the use of Non-Lethal technologies to deter, delay, deny, disrupt, and destroy opponents or their material.
- (U)Total \$ 36,801

B. (U) Project Change Summary

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
(U) Previous President’s Budget	36388	23584	23985
(U) Adjustments to Previous President’s Budget	-9554	+4321	+12816
(U) Current Budget Submit	26834	27905	36801

(U) Change Summary Explanation:

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February 1999

BUDGET ACTIVITY
3 - Advanced Development

PE NUMBER AND TITLE
0603640M Marine Corps Advanced Technology Demonstrations

(U) Funding: FY 1998: Transfer of the Extended Littoral Battlespace (ELB) program to project C2362 within this PE, SBIR tax, and economic and general reductions.
FY 1999: Increase due to Congressional Plus-up of \$5M in support of the Broad Area Unmanned Retail Resupply Operations (BURRO) project and various undistributed adjustments.
FY 2000: Reflects increase in Department priorities and revised economic and general adjustments.

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

C. (U) <u>Other Program Funding Summary</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	To	Total
(APPN, BLI #, NOMEN)									<u>Compl</u>	<u>Cost</u>

(U) Not applicable

(U) Related RDT&E:

- (U) PE 0603640M (Marine Corps Advanced Technology Demonstrations), Project C2223, Advanced Technology Demonstrations
- (U) PE 0603640M (Marine Corps Advanced Technology Demonstrations), Project C2362, Extended Littoral Battlespace, Advanced Concept Technology Demonstration
- (U) PE 0305204M (Marine Corps Tactical UAV), Project C2672, Marine Corps Close range Tactical UAV (Dragon Warrior)

D. (U) Schedule Profile: Not applicable.

UNCLASSIFIED

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1999		
BUDGET ACTIVITY 3 - Advanced Development				PE NUMBER AND TITLE 0603640M Marine Corps Advanced Technology Demonstrations				PROJECT C2362		
<i>COST (In Thousands)</i>	FY 1998 Actual	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	Cost to Complete	Total Cost
C2362 Extended Littoral Battlespace (ELB), Advanced Concept Technology Demonstration (ACTD)	9300	9804	9651	9612	956	953	0	0	0	45276
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0
<p>A. (U) <u>Mission Description and Budget Item Justification:</u></p> <p>(U) Concept of Operations for the Extending the Littoral Battlespace (ELB) Advanced Concept Technology Demonstration (ACTD) responds to the top level military need to rapidly deploy a Naval Expeditionary Task Force with an embarked Marine Air Ground Task Force (MAGTF) as part of a larger Joint Task Force to any region of the world's littorals and conduct military operations from a sea base across the spectrum of conflict to implement national military strategy. Forces employed ashore will be light, agile, distributed and disaggregated and capable of optimizing remote fires, to effectively deter aggression, halt attacks and secure critical areas as a precursor to a much larger force. Forces will be empowered by unprecedented situation understanding via a robust information infrastructure that is fully coupled to a decision/planning/execution system on a shared battlespace network (sea/land). The objective of the ACTD is to demonstrate an enhanced integrated command and control/fires and targeting capability to enable rapid employment, maneuver, and fires to support joint dispersed units operating in an extended littoral battlespace. Two Major System Demonstrations (MSDs) are planned for FY 1999 and FY 2001. The ELB ACTD was approved by DUSD(AT) on 16 January 1997.</p>										
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BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603640M Marine Corps Advanced Technology Demonstrations	PROJECT C2362
<p>(U) PROGRAM ACCOMPLISHMENTS AND PLANS:</p> <p>(U) FY 1998 Accomplishments:</p> <ul style="list-style-type: none"> • (U) \$ 560 Completed baseline Command, Control, Communications, Computers, Intelligence, Surveillance & Reconnaissance (C4ISR) system design in sufficient time to develop modeling and simulation, verification and validation, integration and evaluation/assessment criteria to meet FY 1999 demonstration schedule. Initial design will allow for message-based and limited database and object interoperability between emerging technology and legacy systems, provide a common tactical picture for collaborative decision making, and accommodate technology advancements in command and control all within a framework of a tailorable/scaleable Enhanced Combat Operations Center (ECOC). • (U) \$ 2407 Conducted enabling technologies efforts to select, incorporate and integrate commercial state-of-the-shelf technologies in areas of communications, combat operations center, sensor integration, and fires and targeting into the initial demonstration. Enabling technologies include command and control collaborative planning tools, visualization enhancement for battlefield assessment, and communications enhancement for an IP-based battlenet. • (U) \$ 2992 Initiated planning for conducting Integrated Feasibility Demonstrations (IFDs) to provide an early operational assessment and to collect data relative to technologies/systems for purpose of defining technical risks and refinement of hardware/software design configurations. Showed technical feasibility of beyond line-of-sight communications using airborne relay and commercial wireless LAN. • (U) \$ 1423 Selected, purchased, and installed initial set of system and subsystem hardware, software, for FY 1999 demonstration. Initial buy of hardware/software has been installed at various testbed sites to accommodate training, early testing and validation, as well as the distributed C4ISR system for MSD I in FY 1999. • (U) \$ 1918 Initiated system interface and integration of commercial off-the-shelf and legacy systems and subsystem components supporting the ECOC and command center variants; performed initial system integration tests at systems integration laboratory and major distributed command center nodes. <p>(U)Total \$ 9,300</p> <p> </p> <p>(U) FY 1999 Planned Program:</p>		
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BUDGET ACTIVITY
3 - Advanced Development

PE NUMBER AND TITLE
0603640M Marine Corps Advanced Technology Demonstrations

- (U) \$ 6038 Continue pre-demonstration activities to include system installation, integration, test, software verification and validation, ship installation, operator training, system scenario tests and dry runs. Complete the integration of selected enabling technologies into the C4ISR system. The C4ISR system will be deployed on ELB testbeds and integrated with other distributed command center nodes, integrated feasibility demonstrations will be performed, and demonstration training will commence along with final preparations for MSD I.
 - (U) \$ 1272 Conduct a demonstration of C4ISR system architecture in a realistic combat scenario utilizing operational forces from the Fleet and the Fleet Marine Force. Demonstration will provide the means for operators and developers to evaluate the operational utility, technological feasibility, and life cycle implications of new technologies.
 - (U) \$ 1442 Initiate demonstration/post demonstration analysis for evaluating the system concept and assessing its military utility.
 - (U) \$ 310 Initiate planning for MSD II.
 - (U) \$ 500 Initiate planning for transition sets of MSD I technology to appropriate users for military utility assessment.
 - (U) \$ 242 Portion of extramural program reserved for Small Business Innovation Research assessment in accordance with 15 USC 638.
- (U)Total \$ 9,804

(U) FY 2000 Planned Program:

- (U) \$ 900 Continue planning and augment/scope the C4ISR system design for MSD II in FY 2001 based on results of MSD I in sufficient time to develop necessary interface/integration of hardware and software, verification and validation, and assessment criteria.
 - (U) \$ 2861 Conduct enabling technologies efforts to incorporate and integrate newly emerging commercial state-of-the-shelf technologies in areas of communications, combat operations center, sensor integration, and fires and targeting into the second demonstration. Provide full database and object interoperability between emerging and legacy systems.
 - (U) \$ 2820 Initiate selection, purchase, and installation of "next generation" mature commercial off-the-shelf system and subsystem components for the FY 2001 demonstration.
 - (U) \$ 2000 Plan and conduct integrated feasibility demonstrations to provide an operational assessment and to collect data relative to technologies/systems for purposes of defining technical risks and refinement of hardware/software design configurations.
 - (U) \$ 570 Conduct engineering, technical and operational assessments to define system demonstration scenarios.
 - (U) \$ 500 Complete the demonstration/post demonstration analysis. Determine, provide, and support transition sets of MSD I technology to appropriate users for further military utility assessment.
- (U)Total \$ 9,651

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BUDGET ACTIVITY 3 - Advanced Development	PE NUMBER AND TITLE 0603640M Marine Corps Advanced Technology Demonstrations	PROJECT C2362
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B. (U) <u>Project Change Summary</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>
(U) Previous President's Budget	0	9,827	9,790
(U) Adjustments to Previous President's Budget	+9300	-23	-139
(U) Current Budget Submit	9,300	9,804	9,651

(U) Change Summary Explanation:
 (U) Funding: FY 1998 adjustment is due to the transfer of the ELB program to this project from project C2297, SBIR tax, and economic and general reductions. FY1999 and FY2000 adjustments are due to revised economic assumption and general adjustments.
 (U) Schedule: Not applicable.
 (U) Technical: Not applicable.

C. (U) <u>Other Program Funding Summary</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	To	Total
(APPN, BLI #, NOMEN)									<u>Compl</u>	<u>Cost</u>

(U) Not Applicable

(U) Related RDT&E

- (U) PE 0603238N (Precision Strike and Air Defense Advanced Technology)
- (U) PE 0602315N (Mine Countermeasures, Mining and Special Warfare Technology)
- (U) PE 0603782N (Mine and Expeditionary Warfare Advanced Technology)
- (U) PE 0603750D (Advanced Concept Technology Demonstrations)
- (U) PE 0603217N (Air Systems and Weapons Advanced Technology)

D. (U) Schedule Profile: Not applicable.