Marine Corps Warfighting Laboratory

Millennium Dragon 02 (MD 02)

Experiment After Action Report

To improve Naval expeditionary warfighting capabilities across the spectrum of conflict for current and future operating forces.

30 July – 12 August 2002

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UNITED STATES MARINE CORPS
MARINE CORPS WARFIGHTING LABORATORY
MARINE CORPS COMBAT DEVELOPMENT COMMAND
QUANTICO, VA 22134-5096

IN REPLY REFER TO
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C52/EXOP
12 May 03

From: Commanding General, Marine Corps Warfighting Laboratory
To: Commanding General, Marine Corps Combat Development Command

Subj: FINAL REPORT ON MILLENNIUM DRAGON 02

Ref: (a) High Speed Vessel Final Experimentation Report (FY 02)
(b) Millennium Challenge 02 Joint High Speed Vessel Analysis Report

Encls: (1) Summary of MD 02 Experiment Operations
(2) MD 02 Final Analysis Report
(3) Assessment of Experimental Initiatives
(4) Urban Combined Arms Experiment Report
(5) Follow on Actions

1. Purpose. This report documents the final results of Marine Corps Warfighting Laboratory (MCWL) experimentation conducted during Millennium Dragon 2002 (MD 02) during July and August 2002.

2. Background. Enclosure (1) provides readers with an orientation to the experiment operations by describing the various experimentation venues and the activities designed to support response to the experiment objectives and hypotheses.

3. MD 02 Analysis. Enclosure (2) presents the detailed reconstruction of data, cause and effect analysis, and analytical conclusions. This report directly addresses each of the experimental objectives and hypotheses. It supersedes the previously distributed MD 02 Quick Look Report dated 16 SEP 02. Per the agreement with the Expeditionary Force Development Center (EFDC) in MCCDC, MCWL conducted data collection and produced separate analysis reports (refs a and b) on the High Speed Vessel. These reports were completed and forwarded separately.

4. MD 02 Assessment. The assessment statements found in enclosure (3) follows the data analysis by synthesizing the data analysis with the judgment of experienced military personnel who participated in MD 02 in order to arrive at qualitative statements that rate the military utility of each experimental capabilities. This portion of the report goes to the bottom line regarding the potential transition value of the various DOMLPF innovations experimented with during MD 02.

5. Urban Combined Arms Experiment (UCAX). Enclosure (4) gathers, organizes and synthesizes knowledge gained from UCAX. Although this

experiment was conducted under the aegis MD 02, the UCAX final report is included in its entirety.

6. Follow on Actions. The results of the analysis and assessment and the results of previous experiments provide the basis for determining the direction of future experimentation efforts. Enclosure (5) states the follow on actions regarding the experimental capabilities featured in MD 02.

F. Panter

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Executive Summary

Overview.
Millennium Dragon 02 (MD 02) was conducted in the closed housing area of the Southern California Logistics Airport (SCLA)—the former George AFB—in Victorville, CA, from 30 July to 14 August 2002. There was some pre-experiment training at SCLA during June 2002. The experiment focused on the applicability of a number of new technologies, warfighting concepts, and tactics, techniques, and procedures (TTPs) in an urban combat environment. MD 02 experiments consisted of a series of experimental vignettes.

These were the core objectives:
- To examine an experimental combat identification (ID) system
- To examine the net benefit of a number of unmanned reconnaissance, surveillance, targeting, and acquisition (RSTA) systems
- To examine a universal combined arms targeting system (UCATS)
- To examine a forward resuscitative surgical system (FRSS).

MCWL designed a series of experiments for each objective and asked the Center for Naval Analyses (CNA) analysts assigned to the laboratory to build data collection and analysis plans for these objectives. This report contains our analysis and reconstruction efforts in support of these tasks. This report is organized around each of the four primary systems examined. Except for the report on the Forward Resuscitative Surgical System (FRSS), this section does not address the Urban Combined Arms Experiment (UCAX). See enclosure (4) for this report.

Individual Combat ID System (ICIDS) Experiment.
The ICIDS is a laser-query system intended to limit person-to-person fratricide incidents by providing a combat identification (CID) capability to the individual shooter. ICIDS helps an individual decide whether the person they are targeting is a friend or unknown.

We found that this technology may be useful for Marines standing security or those providing sniper or observation support from alternative positions. But that it may not be as useful for Marines involved in room-to-room clearing operations, or other close-quarter combat operations.

Reconnaissance, Surveillance, Targeting, and Acquisition (RSTA) Experiment.
From 1-5 August 2002, MCWL tested the *Dragon Eye* unmanned aerial vehicle (UAV) and a suite of eight (8) acoustic and seismic sensors—unattended ground sensors (UGVs). The experiment consisted of a force-on-force combat scenario and peacekeeping scenario involving a reinforced infantry company, an infantry battalion command element, and a platoon-sized opposition force (OPFOR). The *Dragon Eye* UAV is a small, man portable, battery powered UAV, capable of transmitting a video display to a range of about 10 kilometers. The primary objective was to determine if the experimental UAV and the UGS could be tactically employed by infantry units to detect, identify, locate and/or track threat elements. A second objective was to assess the utility of the Dragon Eye imagery transmitted to the battalion combat operations center (COC).

We found that while its possible to employ tactical UAVs at the battalion level, there are some significant operational issues that have not yet been addressed. The battalion experienced difficulty processing and analyzing incoming UAV intelligence given the current infantry battalion tables of organization (T/O). In addition, there were problems exploiting tactical intelligence because of manpower deficiencies, mechanical limitations of the UAV, and training shortfalls. UGS was not all that useful either because of a number of issues associated with processing incoming data. Marines in the combat operations center (COC) said that they had difficulty interpreting many of the sounds they heard. The bottom line is that both the Dragon Eye and UGS are information delivery tools. Some technical improvements, such as a zoom and hover capability, might make future UAVs more informative for the Marines charged with processing it, but the critical functions of processing incoming data and analyzing it still needs more attention.

Precision Targeting Experiment.

Forward observers, recon Marines, and scout-snipers used a new fire-direction system—Universal Combined Arms Targeting System (UCATS)—for two days of urban combat operations and a single day of peacekeeping operations. UCATS is a fire-direction system designed to make sending artillery calls for fire easier and faster. Using UCATS, forward observers can digitally transmit calls for fire (CFF) and target grids from an observation post to a fire support coordination center (FSCC) and then to the gun line. This is expected to cut down on the number of errors that occur when grids are typed by hand or read out loud. The UCATS system consists of three pieces of hardware—a rugged handheld computer, laser rangefinder, and a digital radio. Software on the computer calculates target grids based on the users location from the target. The radio then transmits a call for fire to an FSCC equipped with an Advanced Field Artillery Tactical Data System (AFATDS), which sends them on to the gun line. Our objective was to test the effectiveness of UCATS during MOUT.

We found that UCATS appears to have only limited use in an urban environment where targets are only a short distance away from forward observers. Because most UCATS missions were conducted from fixed locations, we didn't have a chance to observe how rapidly the system could be employed. However, most Marines felt that the system was too large, too heavy, and made movement in urban terrain too difficult. We also found that by operating from fixed locations that offered some degree of concealment, Marines were not exposed to enemy direct fire when using the system. Only one Marine became a casualty when using the system and that occurred when he was packing it up, not actually employing it for a fire mission.

Enhanced Tactical Surgical Care Experiment.

During the UCAX phase of MD 02, medical detachments (dets) from 1st and 2d Force Service Support Group (FSSG) employed a forward resuscitative surgical system (FRSS). This is a new medical capability designed to augment the existing battalion aid station (BAS). The FRSS consists of eight medical personnel trained and equipped to handle triage, immediate therapy/resuscitation, salvage surgery, and post-operative care. The det consists of two surgeons, one critical care nurse, one anesthesiologist, and four corpsmen, who can treat up to 6 critically injured Marines at a single time—two in pre-op care, two in surgery, and two in post-op care. During the UCAX, the FRSS was embedded in the battalion logistics train and was transported using an M997 light HMMWV, M998 heavy HMMWV, two trailers, and a 7-ton MTVR truck.

The FRSS was co-located with the BAS throughout the UCAX. Our goal was to determine how the battalion employed the FRSS during the UCAX, focusing on what effect the FRSS had on the battalion's mobility and deployability; casualty evacuation plans; logistics considerations; and overall medical capabilities.

We found that the FRSS could enhance an infantry battalion's organic medical capabilities and that it would have, in all likelihood, help save some lives. Overall, the FRSS received 22 of the 55 severe cases that the BAS received. *However*, our data indicates serious shortfalls in the ability to treat, transport, and track casualties. By the end of the attack in UCAX, the battalion aid station was overwhelmed, out of bandages and many important medicines; and—because of the absence of helicopter landing zones and ground vehicles not committed to the fight—there was no practical way to CASEVAC the wounded. In terms of how long CASEVAC took, a majority of those wounded did not make it to the BAS or FRSS within the "golden hour" when trauma care is most critical. Another consideration is the overall logistics problem of attaching a FRSS to an infantry battalion, which did not have the assets to provide mobility to it.

Urban Combined Arms Experiment (UCAX).

MCWL, under the aegis of Project Metropolis (ProMet), conducted high and low intensity urban training in the *Military Operations on Urbanized Terrain* (MOUT) facility in Camp Pendleton, CA, and live, force-on-force experimentation against a dedicated opposition force (OPFOR) at Southern California Logistics Airport (SCLA) in Victorville CA during the period of 12 to 28 June and 5 through 12 August 2002, respectively. This experiment builds upon the tactics, techniques and procedures (TTPs) developed during previous *Block III* (lethal battle) MOUT experiments by adding specific *Block II* (peacekeeping and peace enforcement) TTPs. Our focus was TTPs employed by a Marine Air-Ground Task Force (MAGTF) built around the reinforced battalion. The force list included elements normally found in a Marine Expeditionary Unit (MEU). We also involved more than 100 civilian role players as noncombatants.

The ProMet team trained the BLUFOR at SCLA during June (12-30 Jun) using a tailored / abbreviated version of the Basic Urban Skills Training (BUST) package that featured still-evolving peacekeeping/security operations lessons. The training culminated in a practical application/final exercise.

Participants indicated that the lethal battle TTPs taught in BUST are adequate. However we need additional development—linked to experimentation—in areas as follows:

- Air Combat Element operations.
- Reconnaissance, Surveillance and Target Acquisition (RSTA) Operations.
- Casualty handling and evacuation.
- Fire support planning and execution.
- Small Unit Leadership Training; practical application.

The Battalion staff was severely strained by continuous operations and the requirement to support separate company firm base positions during the security operations phase of the experiment. It was difficult to run the battalion staffs while manning the perimeter. We saw that traditional fire support coordination measures that work well in open terrain are ill suited for the complex terrain of the urban battle space.

Individuals and units continue to have difficulty in shifting from higher intensity to lower intensity operations. The escalation from peacekeeping to battle tended to be easier. We saw that a unit other than the one that experienced heavy fighting and casualties was less on edge and better suited to "win hearts and minds."

Comments from BLUFOR and particularly the OPFOR confirm that satellite patrolling is a viable concept. For example, OPFOR stated that they had problems dealing with the dispersed, unpredictable and seemingly random movement of the patrol sub-elements. Overall, it made OPFOR operations more risky and difficult. This greatly assisted in taking away some of the *defender's* advantage.

Marine Corps reconnaissance forces and/or snipers do not receive any basic level instruction on urban reconnaissance and surveillance (R&S) unless attached to a deploying MEU. Feedback from experiment participants recommended pre-employment MOUT training to include asset management, insertion methods and coordination, link up procedures and control of fire support in the urban battlespace.

Our videotapes of rotary wing close air support showed us that properly flown existing tactics limited the potential for successful engagements by MANPADS and radar controlled guns.

UCAX Communications Experiment: AN/PRC-148 and the Personal Role Radio.
This combination proved very effective across the board—both as an enhancement to situational awareness and a replacement for the obsolescent intra squad radio (ISR).

Kilo Co 3/7 (rein) was equipped—down to the squad leader—with the AN/PRC-148C Multi Band Inter/Intra Team Radio (MBITR). It was also equipped—down to the fire team leader—with the United Kingdom Personal Role Radio (PRR) during the conduct of UCAX.

- The MBITR was used as a Type I secure platoon radio by the platoon commander, platoon sergeant, and squad leaders to communicate sensitive tactical information.
- The PRR was used as an integrated intra-squad radio that physically connected to the MBITR through the use of a standard military six-pin connector, enabling the squad leader to maintain simultaneous communications with the platoon and his fire team leaders.

ProMet has employed the AN/PRC-148 MBITR since early experiments in 2000 and reported its utility in numerous reports. It provides the missing covered link between the platoon commander and his squad leaders that is necessary for effective command and control in the urban battlespace.

ProMet took the concept a step further during our experiment and coupled the MBITR and Personal Role Radio (PRR) by using a single headset with a toggle switch so the radio the operator switch radio transmissions between radios without changing headsets. This configuration shows great promise and was praised during UCAX.

The PRR is a COTS radio and has been fielded to the UK Royal Marines who report favorable results with its use in Northern Ireland.

Experimentation has clearly demonstrated the requirement for expanded small unit communication. This radio has significantly improved the ability of the small unit leader to:

- Command and control his elements.
- Maneuver in the complex and compartmented urban terrain.
- Maintain SA on the location and status of his elements.
- Identify and engage enemy elements.

Because the ISR is an uncovered radio, many expressed concern about the enemy's ability to intercept and collect against it. However, repeated evaluation by Radio Battalion assets during experimentation demonstrated that when properly used, there is a very low probability that any *usable* information can be garnered by monitoring the squad's tactical comms. However, as the PRR has a lower probability of intercept because of design and reduced range, ProMet evaluated the PRR as a possible replacement radio for the ISR. We believe that the final solution may reside somewhere between disposable COTS ICOM and the PRR.

One observation from UCAX that we see in all experiments is that company commanders, platoon commanders, and squad leaders use the ICOM/PRR as a tactical command net. They state that they find themselves relying on the ICOM/PRR because they seem to function better in the urban environment than the MBITR and AN/PRC-119 SINCGARS. This is because these radios use the UHF frequency band. The battalion and company tactical radio nets, which are programmed on the MBITR and AN/PRC-119, use the VHF frequency band—which has proven not optimal for urban communications. Furthermore, the small size of the ICOM and PRR their ready availability make them easy radio to use. This is both a training issue as well as a potential urban design frequency issue. The PRR should not be employed as a platoon radio. It is designed to be used as a squad radio only.

Another comment from the PRR users was that it did not seem to work as well as the ICOM. Most of the comments related to its reduced range rather than its design and function. Future analysis on the balance between range and probability of intercept is needed to determine the final radio design.

The PRR is designed to be employed in conjunction with a "higher radio." Each squad is assigned one channel on the PRR for internal squad communications between squad leader and fire team leaders within the same squad. The only person to communicate outside the squad should be the squad leader, using the AN/PRC-148, to coordinate movement between squads. This should be done via the PRR *only* as a backup in the absence the AN/PRC-148. Each infantry battalion currently rates (69) AN/PRC-148s on their T/E, however, they currently only have a quantity of (18) on hand. Marine Corps Systems Command is aware of this deficiency and has taken this issue for action.

UCAX Small Urban Vehicle Experiment: Tactical Resupply and CASEVAC

US Special Operations Command (SOCOM) and the US Army have procured M-Gators—a militarized variant of the *Gator*—and reported favorably on their general employment in Afghanistan; but they have not reported on its utility in the urban area. Therefore, MCWL saw the need to experiment further with the SUV surrogate to specifically identify its value in the

urban battlespace relative to ammunition and water resupply "inbound" to the urban fight and its effectiveness in casualty evacuation "outbound" from the forward urban battlespace. All of our experimentation shows that the Combat Support Teams (CSTs) formed to support forward units are effective in MOUT.

- An important enabler for the CSTs was the small, agile, low silhouette vehicle they use to move supplies forward and casualties to the rear.
  - We used commercial-of-the-shelf (COTS) John Deere Gators as a surrogate for this capability.
- Feedback extolled the value of having a SUV that can move quickly in urban battlespace.
- CSTs reported that despite the SUV's limited carrying capacity, the effectiveness of the CST depended on such a capability.

BLUFOR infantry companies and CSTs repeatedly used gators with great success in UCAX for resupply and casualty evacuation. Each vehicle was equipped with MILES so we could collect survivability data. Our results were consistent with previous experimentation with the SUV:

- The addition of a small, mobile and agile vehicle is a force enabler.
  - Comments from the participants, particularly the Company Gunnery Sergeants, Medical Officers, and CSS personnel, were very favorable.
  - The ability of the SUV to maneuver right up to a building to off-load supplies or collect casualties was reported as particularly advantageous.
  - Medical personnel commented that when time is critical in transporting and treating casualties within the *golden hour*, the SUV might make a *significant* difference.
  - SUVs had the best survivability of any vehicle in the battlespace as confirmed by MILES 2000 vehicle kits.
    - None of the eight Gators was *hit* by enemy fire during the UCAX.
  - The Gator's survivability seems to be a result of the vehicle's small profile and ability to:
    - "Tuck-in" tightly to buildings for cover, and
    - Maneuver effectively through tight spaces.
  - This high survivability rate is consistent with all previous experiments.
- The Gator fits inside and has been internally transported in both the CH-46 and AAV P7 during experiments.
- The civilian variant is not rugged enough for continuous use and had numerous maintenance problems.
  - Despite the maintenance problems, participants stated that they really liked having the flexibility of the small, agile vehicle so they would "live with" making frequent repairs.
    - Flat tires were a particularly large problem.
  - This is consistent with previous findings.
- Users recommended the following improvements:
  - Install a weapon mount for a M249 SAW for the A-Driver/Vehicle commander.
  - Extend the bed to improve casualty handling.
  - Include run flat tires or provide an ATV type tire repair kit.

This experiment confirmed that the SUV is a valid concept. We have submitted a Universal Need Statement (UNS)—based on our findings—that such a capability be evaluated within the Expeditionary Force Development System (EFDS; formerly the Combat Development Process).

Chapter 1 – Summary of MC 02 Experimentation

Millennium Challenge 2002 (MC 02)

- US Joint Forces Command experiment.
- Largest and most comprehensive joint experiment ever conducted.
  - More than 13,500 participants in two experiment venues.
- Primary venue for *joint and component-level* experimentation was an East Coast based command post exercise (CPX) driven by a federation of computer simulations.
  - Linked seventeen 17 sites throughout the United States.
- Primary venue for *service* experimentation was a series of live force-on-force experiments that fed to varying degrees the larger joint operations CPX.

Millennium Dragon 02 (MD 02)

- Marine Corps live-forces portion of MC 02.
- Executed at Marine Corps Base Camp Pendleton and the Southern California Logistics Airport (SCLA) — formerly George AFB — located in Victorville, CA.
- MD 02 consisted of:
  - Ship to Objective Maneuver (STOM).
  - Limited objective experimentation (LOE)
    - Seven (7) days.
  - Urban Combined Arms Experiment (UCAX)
    - Four (4) days.

STOM Event. Two tiers of activity included live forces experiments and embedded experiments.

1. Live-forces.
   a. 1st Marine Regiment, 1st Marine Division, aboard USS Boxer, was the command element.
   b. Landing force was 1st Battalion, 1st Marines (1/1).
   c. Executed a two-axis raid on a weapons of mass effect (WME) site (simulated) at SCLA.
   d. Light Armored Reconnaissance (LAR) Company from 1/1 came ashore at Camp Pendleton's Red Beach on air-cushioned, landing craft (LCAC) and maneuvered inland to a blocking position to isolate the objective at SCLA.
   e. Following this, a helicopter-borne company landed and destroyed the WME site.

2. Embedded experiments
   a. Special Operations Mission Planning Environment – Maritime (SOMPE-M).
      (1) Employed aboard USS Boxer by Marines from the 1st Reconnaissance Battalion to facilitate reconnaissance mission planning that could "reach back" to a surrogate mission support center set up by MCWL in Quantico, VA.
      (2) This system provided the reconnaissance force with access to classified imagery; hydrographic and metrological data; weapons and munitions employment information; standardized briefing templates; and secure means to exchange requests for information.
   b. Preliminary – First In Command and Control System (Pre-FICCS).

(1) Served as the communications system employed by the LAR company during the STOM and subsequently used to link the battalion combat operations center to a US Army Striker unit during the UCAX.
(2) Pre-FICCS incorporated SIPRNET (classified internet routing), NIPRNET (unclassified internet routing), video teleconferencing (VTC), satellite communications (SATCOM) equipment, "Thin Client" servers and workstations, and a robust compliment of secure UHF/VHF radios.
(3) The communications suite fits in a single HMMWV and a trailer that supplies its own power.

c. High Speed Vessel (HSV).
(1) The High Speed Vessel (HSV), *Joint Venture*, conducted intra-theater logistics and operational support.
(2) Combat Rubber Reconnaissance Craft were inserted, tactical and logistical vehicles were loaded and offloaded, and CH-46E helicopter deck landing operations were conducted to and from the vessel.
(3) The HSV travels at speeds approaching 40 knots while carrying 250 Marines and 545 short tons of equipment and rolling stock.

Limited Objective Experiments. These examined enhancements in the areas of combat identification and tactical level reconnaissance, surveillance and target acquisition (RSTA). These were a series of short force-on-force scenarios conducted by elements of 3d Battalion, 7th Marines (3/7) in across the spectrum of conventional conflict intensity in military operations on urbanized terrain (MOUT).

1. Experimental combat identification (ID) system.
   a. Mounted on the M-16A2 service rifle.
   b. Uses a laser to help an individual decide whether a targeted person is a friend or unknown.
2. Technology Enablers. RSTA experiment scenarios used the *Dragon Eye* tactical unmanned aerial vehicle (UAV), unattended ground sensors (UGS) miniature handheld thermal imager, enhanced optics and improved load-bearing equipment.

Urban Combined Arms Experiment UCAX). This was conducted in these two phases.

1. Pre-experiment Training.
   a. A tailored version of the Basic Urban Skills Training (BUST) syllabus developed from lessons learned during previous MCWL MOUT experiments.
2. Live Simulation.
   a. 96 hour live simulation of force-on-force combat 3/7 (rein).
   b. In the abandoned housing area at SCLA.

Chapter 2 – Millennium Dragon 02 Analysis Report

Overview. Millennium Dragon 02 (MD 02) was conducted in Victorville, CA, from 30 July to 14 August 2002. The experiment focused on the applicability of a number of new technologies, warfighting concepts, and tactics, techniques, and procedures (TTPs) in an urban combat environment. MD 02 experiments consisted of a series of experimental vignettes.
There were these core objectives:

- To examine an experimental combat identification (ID) system
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- To examine a universal combined arms targeting system (UCATS)
- To examine a forward resuscitative surgical system (FRSS).

MCWL designed a series of experiments for each objective and asked the Center for Naval Analyses (CNA) analysts assigned to the laboratory to build data collection and analysis plans for these objectives. This report contains our analysis and reconstruction efforts in support of these tasks. This report is organized around each of the four primary systems examined. Except for the report on the Forward Resuscitative Surgical System (FRSS), this section does not address the Urban Combined Arms Experiment (UCAX). See enclosure (4) for this report.

Individual Combat ID System (ICIDS) Experiment. The ICIDS is a laser-query system intended to limit person-to-person fratricide incidents by providing a combat identification (CID) capability to the individual shooter. ICIDS helps an individual decide whether the person they are targeting is a friend or unknown. From 29 – 31 July 2002, MCWL tested ICIDS with three force-on-force combat scenarios between an experimental force (EXFOR) of two squads and an opposition force (OPFOR) of two fire teams. MCWL ran each scenario twice, once with the EXFOR Marines employing ICIDS, and once without the technology during military operations on urbanized terrain (MOUT). The objective was to determine the net benefit to be gained by employing a CID system during MOUT.

Reconnaissance, Surveillance, Targeting, and Acquisition (RSTA) Experiment. From 1-5 August 2002, MCWL tested the *Dragon Eye* unmanned aerial vehicle (UAV) and a suite of eight (8) acoustic and seismic sensors—unattended ground sensors (UGVs). The experiment consisted of a force-on-force combat scenario and peacekeeping scenario involving a reinforced infantry company, an infantry battalion command element, and a platoon-sized opposition force (OPFOR). The *Dragon Eye* UAV is a small, manportable, battery powered UAV, capable of transmitting a video display to a range of about 10 kilometers.

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based on the users location from the target. The radio then transmits a call for fire to an FSCC equipped with an Advanced Field Artillery Tactical Data System (AFATDS), which sends them on to the gun line.

Enhanced Tactical Surgical Care Experiment. During the UCAX phase of MD 02, medical detachments (dets) from 1st and 2d Force Service Support Group (FSSG) employed a forward resuscitative surgical system (FRSS). This is a new medical capability designed to augment the existing battalion aid station (BAS). The FRSS consists of eight medical personnel trained and equipped to handle triage, immediate therapy/resuscitation, salvage surgery, and post-operative care. The det consists of two surgeons, one critical care nurse, one anesthesiologist, and four corpsmen, who can treat up to 6 critically injured Marines at a single time—two in pre-op care, two in surgery, and two in post-op care. During the UCAX, the FRSS was embedded in the battalion logistics train and was transported using an M997 light HMMWV, M998 heavy HMMWV, two trailers, and a 7-ton MTVR truck. The FRSS was co-located with the BAS throughout the UCAX.

Analysis Overview

Experiment Objectives.
Our focus was to analyze those experimental vignettes that had hypotheses associated with them—where analysis could be of the most use. We also focused on several additional topics without hypotheses where we felt we could make a contribution. Appendix A highlights all MD 02 objectives and associated hypotheses. The list below highlights those specifically addressed in this report.

Combat Identification System
Objective—Determine the net benefit to Marines of an experimental combat identification system employed during MOUT.
Hypothesis—If Marines are equipped with individual combat ID system while conducting MOUT then:

- Violations of ROE regarding non-combatants will not increase
- Casualties caused by friendly direct fires will decrease
- Casualties to enemy forces caused by friendly direct fire will increase.

Battalion (Bn) Reconnaissance, Surveillance, Targeting, and Acquisition (RSTA)
Objective—Determine if an experimental unmanned air sensor, unmanned mobile ground sensor, and unmanned stationary ground sensor can be tactically employed by infantry units to detect, identify, locate, and/or track threat elements.
Hypothesis—If an infantry battalion is equipped and trained with a suite of advanced air and ground sensors then

- Operation of the additional equipment will not prevent Marines from accomplishing other normal combat operations tasks
- The battalion will be able to emplace and move the sensors without any delay to execution of the mission
- Sensor emplacement will not reveal the intent of the battalion to the threat
- The sensors will provide information to the battalion that enables the battalion to detect, identify, and or track threat elements that support planning and execution of MOUT operations
- Marines with minimal additional training will be able to operate the sensors
- Threat elements will not be able to employ counter-tactics that negate the experimental sensors
- The battalion S-2 would be able to create a local threat picture more accurately than with current means sensors.

Objective—Assess the utility of *Dragon Eye* imagery transmitted to the Battalion combat operations center.
Hypothesis—If a *Dragon Eye* UAV responding to a battalion reconnaissance mission can capture imagery from the ground control station then:

- The Battalion S-2 can provide hard copy imagery to the battalion staff in support of planning and execution

- The battalion S-2 can use Dragon Eye to help prepare products associated with IPB
- The Battalion S-2 can better exploit the capabilities of Dragon Eye by posting UAV imagery to the common database that can be transmitted to other battalion elements.

Objective—Validate the proposed concepts of employment for each element of the experimental RSTA system. (Unmanned Aerial Vehicle, Unmanned Stationary Ground Sensor, Unmanned mobile ground, sensor, RSTA C2 System)

- No associated hypothesis

Objective—Assess the advantages and disadvantages of a suite of experimental equipment employed by reconnaissance Marines during the conduct of urban reconnaissance.

- No associated hypothesis

Universal Combined Arms Targeting System (UCATS)

Objective—Assess the effectiveness of UCATS employed during MOUT.

Hypotheses: If Marine who conduct artillery fire missions are equipped with UCATS then:

- Their ability to maneuver with the supported unit will not be compromised
- The UCATS can be assembled and used to locate targets rapidly enough to generate calls for fire that support maneuver
- Their exposure to enemy direct fire will not be affected.

Forward Resuscitative Surgical System (FRSS)

Objective—Provide a venue for experiments and demonstrations of the FRSS

- No associated hypothesis

Experiment Design.

MD 02 occurred in these five phases:

- Phase 1 consisted of predeployment training (15 February to 21 July 2002). During this phase, MCWL conducted experiment force training at Camp Pendleton and Victorville so that the experimental unit, 3d Battalion, 7th Marines, was prepared to execute the basic skills portion of the UCAX program of instruction.
- Phase 2 consisted of logistics setup and additional participant training (22 to 29 July 2002). MCWL advance parties set-up support and control operations at Victorville. From 22 to 26 July, Marines from 3/7 were trained to operate experimental equipment.
- Phase 3 involved experimental operations with various experimental technologies (27 July to 5 August 2002). This was the primary period for MCWL experimentation.
- Phase 4 was the live play, force-on-force Urban Combined Arms Experiment (8 to 12 August 2002).
- Phase 5 consisted of data analysis, experiment reconstruction, and assessment of the net military utility of the experimental technologies (13 August to 13 November).

Analysis Methodology

The methodology used during MD 02 can be broken into three phases: pre-experiment, experiment, and post-experiment. Before the LOE, experimental objectives were evaluated, and measures of effectiveness created. Table 1 describes which experimental events were used as venues to collect data for each experimental objective. Using this and other experiment design documents, we built an analysis plan consisting of analytical objectives, data collection plans, and personnel requirements. We used five analysts from the Center for Naval Analyses to collect data, observe experimental operations, reconstruct events, and then analyze the data. The remainder of this report reflects their observations and analysis.

Table 1. How Experimental Events Support Experimental Objectives

	STOM	Combat ID	Recon	RSTA	UCAX
GCE Experiments					
Combat ID system		X			
UCATS				X	
RSTA Experiments					
Employ sensors tactically			X	X	
Transmit Dragon Eye imagery				X	
Validate employment concepts			X	X	
Enhanced recon equipment	X		X	X	X
Logistics Experiments					
FRSS					X

During the experiment, observers/controllers (O/Cs) were assigned to each of the BLUFOR and OPFOR maneuver units, and role-players. The O/Cs were responsible for umpiring the event and collecting time-location-event information during the experiment. The analysts collected data through direct observation, after-action de-briefs of experimental participants, and collecting logbooks and other experimental artifacts. We used the O/Cs' activity logs, personal observations, and completed debrief forms to reconstruct the events. From these, conclusions relating to the experimental objectives were drawn and documented.

Organization of the report

We have organized this report into the following sections:

- Combat identification experiment
- Battalion Reconnaissance, Surveillance and Target Acquisition (Bn RSTA) experiment
- UCATS experiment
- FRSS experiment
- Other technologies

Each section restates our experimental objectives and hypotheses, provides a summary of the data we collected, analyzes the data, and offers a series of conclusions and recommendations based on the analysis. We also include several appendices that provide additional documentation about each experimental system and the data collected during the experiment.

Section I – Combat Identification (ID)

This experiment focused on identifying friendly dismounted forces in an urban environment. The Department of Defense (DOD) is currently working on a number of different technological programs aimed at reducing the various types of blue-on-blue fratricide that can occur in combat today. To help with identifying friendly dismounted forces in urban terrain, MCWL selected a candidate combat identification (ID) system to experiment with in MD 02.

System Description

The Individual Combat Identification System (ICIDS) is a laser query and radio frequency (RF) response system for use by dismounted combatants. It is designed to limit person-to-person fratricide incidents by providing combat identification capability to the individual shooter. ICIDS allows individuals to quickly determine whether a potential target is a friend or unknown. As shown in figure 1, ICIDS consists of these two components:

- The interrogator set, mounted on the Marine's weapon, to query targets.
- The transponder set, located on the Marine's helmet, to respond to queries.[1]

Figure 1 Individual Combat ID System

ICIDS is a laser-based system in which the laser on the weapon sends out a beam and the sensors on the helmet receive it. The beam carries an inquiry, "Are you friendly?" If one Marine's inquiry strikes the sensors on another Marine, the device on the latter's helmet sends back a radio message saying, in effect, "Yes." This message in turn, informs the system on the first Marine's weapon that he is aiming his weapon at somebody who is his friend.

Laser Intensity

ICIDS performance specifications state that the system must provide combat ID within one second of the interrogation up to a maximum range of 1,100 meters. This maximum range extends beyond that which is likely to be needed in an urban environment. During MD 02, Marines did not use it beyond approximately 150 meters.

Based on the system's range requirements, the ICIDS laser is normally set at 42 ergs/pulse. This is a fairly high-intensity but eye-safe laser beam, which is necessary to achieve the 1,100-meter maximum range. In a MOUT environment, one of the effects of this high laser intensity is a significant amount of laser reflection or bounce off different surfaces.

During the practical application day, when Marines were given an opportunity to train with ICIDS in the MOUT facility, they highlighted the negative effect laser bounce would have on the experiment, particularly inside buildings. In an effort to minimize reflection, the ICIDS laser was

[1] The entire system, including the interrogator, transponder, and helmet cover, weighs less than two pounds. It is powered by two-2/3A size, 3.0-volt lithium batteries.

reduced to 22 ergs/pulse, or medium intensity. Decreasing the laser intensity also reduced the range capability of the system, but it remained sufficient for MOUT needs.

Infrared Aim Light and MILES

In addition to its target identification capability, ICIDS has a laser that is compatible with the Modular Integrated Laser Engagement System (MILES) as well as an infrared (IR) aiming light (IAL) laser to aid in target illumination. The MILES capability was not used during MD 02. Instead, we used simunitions, which tell us not just who gets shot but where they get shot as well as who shot them.

If Marines use night vision goggles (NVGs), they can see the IAL laser emission, which occurs simultaneously with any combat ID queries. With NVGs, Marines can identify the target point of the laser beam. If ICIDS identifies the target as a friend, they would see the IR target point flash. If the target were not identified as a friend, the IAL laser would maintain a solid target point that could then be used as an aid for firing. During MD 02, the use of simunitions required that the Marines wear protective gear, including facemasks. This precluded the use of NVGs during the experiment, and therefore did not allow the Marines the opportunity to utilize the IR light although it was activated.

Aural/Tactile Signal

The transponder set, located on the Marine's helmet, includes a tactile/aural indicator that emits pulses whenever the system is queried. Because the mechanism is located inside the helmet, a Marine will receive an audible indication as well. The indicator intensity is adjustable, and can be turned off entirely.

Before this series of experiments began, we gave Marines the option of having the signal activated. We initially planned to turn it off because we thought it might prove a distraction to the Marines. However, most opted to turn the signal on so they would know when they were being queried.

Experimental Objective and Hypotheses.

The objective of the experiment was to determine the net benefit to the Marines of an experimental combat ID system employed during MOUT. This required using the candidate system, ICIDS, to consider if, when, and how combat ID supports fighting in an urban environment.

The original hypotheses stated that if Marines were equipped with an individual combat ID system while conducting MOUT, then:

- Violations of the rules of engagement (ROE) regarding non-combatants will not increase
- Casualties caused by friendly direct fires will decrease
- Casualties to enemy forces caused by friendly direct fire will increase.

Prior to the start of the experiment, we added a fourth hypothesis aimed at assessing the potential negative effects of combat ID technology on a Marine's ability to complete his mission:

- If Marines are equipped with an individual combat ID system while conducting MOUT, then casualties caused by enemy fire will not increase.

Participants and Scenarios.

The combat ID experiment consisted of six force-on-force vignettes that included both baseline and experimental iterations. In order to mitigate any learning curves that might occur, the terrain

and OPFOR disposition were slightly altered between the baseline and experiment iterations. In each, two BLUFOR squads were opposed by an OPFOR fire team-sized element. To increase realism, four Marines and approximately 20 civilians played the role of noncombatants.
The experiment designers were concerned that some Marines may have chosen not to use the combat ID system during the experiment, which would minimize the value of the results. To guard against this possibility, and to ensure that we had some data relative to operational use of the technology, one Marine from each BLUFOR squad was required to use the combat ID system every time he engaged a new target, regardless of the circumstances.[2]
There were three experimental vignettes and three baseline events. They included:

- *Experiment iteration 1*. The BLUFOR, equipped with the experimental combat ID system, cleared a three-story building occupied by an unconventional enemy force and civilian noncombatants.
- *Experiment iteration 2*. The BLUFOR, equipped with the experimental combat ID system, located and attacked an unconventional enemy force. The experiment started when BLUFOR crossed a line of departure and ended when all scripted events were completed and the force commander felt his tactical mission was completed.
- *Experiment iteration 3*. The BLUFOR, equipped with the experimental combat ID system, defended a U.S. diplomatic site from attack by an unconventional enemy force.
- *Baseline iteration 1*. Same scenario as the first experimental iteration, but BLUFOR was not equipped with the experimental combat ID system.
- *Baseline iteration 2*. Same scenario as the second experimental iteration, but BLUFOR was not equipped with the experimental combat ID system.
- *Baseline iteration 3*. Same scenario as the third experimental iteration, but BLUFOR was not equipped with the experimental combat ID system.

Analytical Results.
We tasked two analysts from the Center for Naval Analyses (CNA) and 10 to 15 Marine observer/controllers (O/Cs) with collecting observational data. Following each event, the analysts conducted debriefing sessions with the participants to collect comments and other qualitative data. Afterwards, all participants completed questionnaires about the event, including specific questions related to the use of combat ID. Finally, casualty cards were collected from all participants. Whenever they were wounded or killed, individuals filled out a casualty card providing details on when the incident occurred, where the individual was when he/she was wounded or killed, what they were doing at the time, and whether they were shot by BLUFOR or OPFOR.
For combat ID purposes, we considered all casualties, whether wounded in action (WIA) or killed in action (KIA), as a "kill." Therefore, the casualty numbers often include two "kills" of the same person. Additionally, O/Cs could reconstitute OPFOR casualties and the mandatory combat ID users at their own discretion.
To test the validity of these results, we computed the chi-squared distribution for fratricide deaths across all three scenarios. We use this statistical method to determine whether the observed frequencies differ significantly from expected frequencies. Said another way, the chi-

[2] We refer to these Marines as "mandatory combat ID users."

squared statistic describes differences between observed values (i.e., the number of fratricide deaths observed during MD02) and the numbers that would have been there if the data had come out exactly according to the null hypothesis (i.e., the expected values).
Our null hypothesis is that combat ID will have no effect on the number of fratricide deaths observed during MD02. The alternative hypothesis is that combat ID will reduce the number of fratricide deaths. We calculated a chi-squared statistic (χ^2) of 2.06 and a chi-squared "P-value" of 0.151, which indicates that the observed decrease in fratricide deaths from the baseline to the experiment could occur by chance only 15 percent of the time. Therefore, the difference between the number of fratricide deaths observed in the experiment and the baseline is not statistically significant.

Impact of Combat ID on Fratricide
The Marine Corps is experimenting with combat ID in an effort to prevent or reduce future fratricide incidents. The underlying assumption is that combat ID technology will improve the target identification capabilities of dismounted Marines, thereby minimizing the confusion that often leads to blue-on-blue encounters.
Fratricide rates are usually calculated by dividing the number of friendly fratricide casualties by the total number of BLUFOR casualties taken. That is,

Number of BLUFOR fratricide casualties =

Fratricide rate ÷Total number of BLUFOR casualties

Using this formula, a 17-percent fratricide rate means that 17 out of every 100 BLUFOR casualties are from friendly fire. This formula makes sense when there are a proportional number of BLUFOR casualties to enemy casualties. But when we take far fewer casualties than we inflict on our enemies, the rate doesn't make as much sense. This, of course, has been our experience in recent wars. As long as this trend continues and we keep using the standard formula, we likely will overstate fratricide by some degree. If instead we view fratricide as a mistake made at the shooter's end, what matters is whom the shooter intended to hit. This leads to the following formula:

Number of BLUFOR fratricide casualties =

Fratricide rate ÷Total number of casualties inflicted by BLUFOR

This approach measures fratricide as a percentage of total casualties inflicted. Using the formula, a 17-percent fratricide rate means that for every 100 enemy killed, we killed 17 of our own troops. This may be a more useful overall measure of fratricide because it gets at what the shooter intended to happen. This implies that the mistake is who you killed, not who killed you. This yields a larger fratricide rate when shooters make too many wrong decisions relative to a certain number of right decisions (e.g., they kill friendly Marines instead of killing the enemy). It leads to a smaller fratricide rate when the opposite happens (e.g., fewer friendlies are killed or wounded by BLUFOR relative to the number of OPFOR that are killed or wounded). It also gets to a question at the heart of this experiment—how many of our shots do we get wrong, with "wrong" defined as shooting a friendly?
The following tables highlight the different methods for calculating fratricide. In table 2, we show the traditional approach, with fratricide as a percentage of total casualties taken. Table 3, on the other hand, shows fratricide casualties as a percentage of total casualties inflicted. Despite the differences in the two approaches described above, there is no significant difference in our

experimental results using the two methodologies. This is the result of the small number of fratricide casualties we saw, which also makes our results somewhat suspect.
The tables highlight a basic problem with fratricide rates. In scenario 1, the actual number of fratricide casualties stayed the same between the baseline and the experiment. In the experimental iteration, the Marines took fewer casualties overall, which should be a positive point. However, the smaller number of total Marine casualties makes the fratricide rate appear slightly worse.[3]

Table 2. Fratricide Deaths as A Percentage of Casualties Taken

	Scenario 1 (Clear building)		Scenario 2 (Locate and attack)		Scenario 3 (Defend consulate)	
	Base	Exp	Base	Exp	Base	Exp
Number of BLUFOR fratricide kills	2	2	4	0	0	0
Total BLUFOR casualties	23	21	11	9	4	5
Fratricide rate	.09	.10	.36	.00	.00	.00

Table 3. Fratricide Deaths as A Percentage of Casualties Inflicted

	Scenario 1 (Clear building)		Scenario 2 (Locate and attack)		Scenario 3 (Defend consulate)	
	Base	Exp	Base	Exp	Base	Exp
Number of BLUFOR fratricide kills	2	2	4	0	0	0
Total kills by BLUFOR	15	16	12	11	0	5
Fratricide rate	.13	.13	.33	.00	n/a	.00

[3] This is the same problem experienced during the Gulf War, when it was reported that the fratricide rate had gone up significantly from earlier wars. Really, U.S. forces just took fewer casualties. If the Iraqis had inflicted more casualties, the fratricide rate would not have been as high in proportional terms.

Both tables 2 and 3 show significant improvement in fratricide incidents between the baseline and experiment iterations in scenario 2. Post-event analysis suggests this may be because the second scenario provided the most opportunities for the Marines to use combat ID in situations where they could take more advantage of the capability, and where combat ID was likely to be the most useful.

During scenario 2, the Marines identified numerous situations where combat ID seemed particularly useful, including:

- Outside
- At distances
- In low-light conditions
- From a support by fire position
- From a static and secure position
- When standing security

Despite the positive experience some Marines had with combat ID during scenario 2, the event also helped identify situations where the capability may retard operations, including:

- On the move
- In close quarter combat (CQB)
- Inside buildings
- Once an engagement begins.

These results suggest that combat ID may help prevent fratricide in certain situations but not in others.

Table 4 describes six of the seven fratricide incidents that occurred during the experiment.[4] The table includes an assessment of each incident, as well as post-event conversations with the BLUFOR Marines.

Table 4 describes several blue-on-blue engagements, most of which will likely not be affected or prevented by a combat ID capability. Of the six incidents described in the table, only two may have been prevented through the use of a combat ID system. In particular, our analysis leads to the conclusion that fratricide engagements inside small spaces will likely not benefit from a combat ID system. However, our results also indicate that, in some situations, Marines may benefit from using a system that can identify friendly targets.

Table 4. Fratricide Incidents During Combat ID Events at MD 02

	Fratricide Incident	Assessment
Scenario #1 Baseline Event	Marine A was standing security inside a room when Marine B entered the room without identifying himself. Marine A shot Marine B.	Combat ID not helpful. Marines experimenting with combat ID inside rooms found that the laser bounced too much to be trustworthy or useful.

[4] We do not have a description of the seventh fratricide incident. The Marine victim found evidence of being hit (i.e., paint color) after the event had concluded, and did not know the circumstances under which he was shot.

	Fratricide Incident	Assessment
Scenario #2 Baseline Event	While working his way down the hallway, Marine was killed by a friendly grenade (O/C adjudicated the kill.).	Combat ID not helpful. First, because Marines lasing down the hallway found that the combat ID system picked up friendly casualties and was therefore not of much use. Second, because post-event discussions indicated that the use of combat ID had no bearing on decisions to use grenades.
Scenario #3 Exp. event	Marine A was inside a dark room waiting to engage the enemy. Marine B saw movement inside, assumed it was the enemy, and shot Marine A.	Combat ID not helpful. Marines experimenting with combat ID inside rooms found that the laser bounced too much to be trustworthy or useful.
Scenario #2 Baseline Event	Marine A was standing security in a room inside the objective building. An enemy ran up and threw a grenade inside the window. Marine A ran away from the grenade, but returned to post once the grenade went off. Looking outside, Marine A saw movement, assumed it was the enemy, and fired. Marine B had been instructed by his squad leader to move around the objective in search of enemy forces. Marine B thought enemy might have entered the building via the window after throwing the grenade. He moved towards the window to check for enemy and was fired upon. Marine B returned fire. Both Marine A and B were killed.	Combat ID could be helpful. Marine A was directing his attention outside, and could have used combat ID to identify his target. Anecdotal evidence suggests the system would have accurately identified the target as a friend. Marine A would not have fired, thereby not starting the engagement.

	Fratricide Incident	Assessment
Scenario #2 Baseline Event	Marine was inside the objective, on one side of the tarpaper construction in the rear of the building. He received word via radio that a security team would be going outside to secure the exterior. He assumed the team would exit the front of the objective and work around the building. When he saw movement through the tarpaper, he fired and shot another Marine, who was a member of the security team that had in fact exited via the rear of the building.	Combat ID not helpful. Lasers do not work through tarpaper or normal building construction materials.

	Fratricide Incident	Assessment
Scenario #2 Baseline Event	Team A assaulted the objective and gained entrance via a rear window. As team climbed through window, team came under fire from team B in the living room at the end of the hallway. Team A took one casualty and returned fire until it was noticed that the paint on the wall was blue. At that point, they called cease-fire and confirmed that team B was friendly.	Combat ID could be helpful. Team B, located in the living room at the end of a hallway, might have been able to use combat ID before engagement began. Although firefight took place indoors, team B had an unimpeded line of sight to team A, and there were no friendly casualties in the hall. Therefore, it is likely that laser reflection was not an issue.

Fratricide and Scenario 3.

There were no fratricide incidents as part of this scenario. One of the reasons for this was the nature of the scenario itself. During scenario 3, there were three opportunities to engage the enemy. These involved:

- Returning sniper fire
- Responding to an ambush while on patrol
- Reacting to an assassination attempt.

It was obvious to the Marines that in each situation, the enemy was the aggressor. Therefore, there was little opportunity or need to use combat ID. The only incidents where there was much risk of fratricide involved the use of the quick response force (QRF)—first in support of the ambushed patrol and then when a roving patrol and the QRF returned to the consulate. In both situations, basic standard operating procedures, including voice communications and passwords, appeared sufficient.

Scenario 3 illustrated certain conditions for which combat ID seems well suited:

- When the action takes place outdoors
- When the action takes place in low-light conditions
- When targets are located some distance away from the Marines
- When Marines are in static or secure positions around the consulate.

At least one Marine used combat ID to identify targets encountered while on patrol. He indicated that he also used it for situational awareness. Another Marine in a security position in a tree overlooking the entrance to the consulate building successfully used combat ID to identify individuals approaching the building. Both Marines likely would have benefited even more had they been able to use night vision goggles with an infrared aim light capability.

That said, Marines appeared to use combat ID less during scenario 3 than during the other two events. This was caused by:

- Concern for the ROE, which we will discuss later in the analysis
- Sufficiency of the standard protocols, including voice comm and passwords
- Lack of confusion over engagements and targets.

Impact of Combat ID on ROE Violations

Combat ID systems are often referred to as identify friend or foe (IFF) systems. However, this is a misnomer. A combat ID system really only differentiates between friend and unknown. This

means a target that does not result in a positive response could be an enemy or a noncombatant. The ROE are intended to limit the effects of combat on civilians and noncombatants in a combat zone. If a combat ID system results in increased numbers of civilian casualties, its utility in an environment with noncombatants may be limited.

One way to assess the impact of combat ID on ROE violations is by focusing on civilian casualty rates. We calculated civilian casualty rates by dividing the number of civilian casualties caused by BLUFOR by the total number of casualties caused by the BLUFOR, which is a similar formula to the one we used to examine fratricide.[5] We highlight below the formula we used:

Number civilian casualties caused by BLUFOR=

Civilian casualty rate ÷Total number of casualties inflicted by BLUFOR

This approach answers the question: how many of our shots did we get wrong, with "wrong" defined as shooting civilians?

Table 5 compares the civilian casualty rates between the baseline and the experimental iterations of all three scenarios. In the first scenario, the civilian casualty rate actually improved when the BLUFOR used combat ID. However, qualitative analysis and event debriefs indicate that this result is more likely due to a change in OPFOR tactics than in the use of combat ID. Specifically, four of the six civilian casualties in the baseline of the first scenario were killed while being used as human shields or hostages by the OPFOR. This was not a tactic used during the experimental iteration of the event. In these four cases, the BLUFOR Marines knew the hostages were civilians, but chose to fire anyway. The ROE violation had nothing to do with the use, or lack of use, of combat ID. If we discount those four kills because of the change in tactics, then the civilian casualty rate in the scenario one baseline event would drop to 18 percent, which is roughly the same as the rate in the experiment.

Table 5 indicates that the civilian casualty rate for the second scenario worsened slightly, in that the number of civilians killed increases as a percentage of the total number of BLUFOR kills. However, we do not think this is particularly substantial because of the small number of kills. The percentage increase is questionably significant.

Table 5. Civilian Casualty Rates In The Combat ID Experiment

	Scenario 1 (Clear building)		Scenario 2 (Locate and attack)		Scenario 3 (Defend consulate)	
	Base	Exp	Base	Exp	Base	Exp
Civilian casualties	6	3	2	2	0	0
Total kills by BLUFOR	15	16	12	11	0	5
Civilian casualty rate	.40	.19	.17	.18	n/a	.00

[5] The BLUFOR caused all civilian casualties.

Next, we considered all 13 of the civilian kills in an attempt to assess if combat ID could potentially contribute to the ROE violations. We identified three causes for civilian casualties, or ROE violations, during MD 02:

- Marines knew they were shooting civilians and did so intentionally to achieve their primary goal
- Marines reacting to the speed of the engagement inadvertently shot civilians
- Marines used weapons of indiscriminate effect (i.e., grenades), which resulted in the death of noncombatant bystanders.

Analysis suggests that combat ID would have affected neither the first nor the second circumstance described above. Combat ID technology would not increase the first type of ROE violation because Marines had already identified their targets as civilians. Combat ID technology would not increase the second type of violation because Marines in the midst of an engagement are unlikely to use the system; if the speed of the engagement were so fast that they would inadvertently shoot a civilian, they likewise would not pause to lase a target. The only instance where combat ID may potentially contribute to civilian casualties is in the use of grenades. If Marines used combat ID to determine there were no friends in the area, they may have been more inclined to use grenades or other weapons of indiscriminate effect. However, post-event discussions with the Marines indicate that combat ID did not play any role in decisions to use or not to use grenades.

Once again, we tested the validity of the data using a chi-squared test statistic. In this case, we want to determine whether our combat ID results support our null hypothesis, that combat ID will have no effect on the number of civilian deaths observed during MD 02. The chi-squared statistic is 0.949, and the p-value is 0.329. This means any difference observed between the baseline and the experiment is not statistically significant, and that you could get that same difference, or more, by chance alone one-third of the time.

Based on these results, we conclude that the use of combat ID in MOUT does not appear to lead to an increase in violations of the ROE. In fact, combat ID does not appear to have any effect on civilian casualties.

However, the Marines raised another issue regarding ROE and the use of combat ID. They suggested that the use of combat ID in a peacekeeping environment might itself be considered a violation of the ROE, or at least a violation of the commander's intent. They noted that Marines on a peacekeeping mission are often instructed to maintain a non-threatening posture so as not to alarm civilians. This may involve "slinging" rifles over backs or not keeping magazines in rifles. It also implies only aiming a weapon at someone if you intend to shoot him. Some BLUFOR Marines noted that during scenario 3, they assumed the ROE of maintaining a non-threatening posture, and therefore did not raise their rifle unless they were fired upon, or unless a specific threat occurred. The Marines questioned whether ICIDS would even be useful during a peacekeeping mission, or if using it might result in an ROE violation.

Impact Of Combat ID On Casualties Inflicted On Enemy Forces

The third experimental hypothesis involves determining whether the use of combat ID leads to an increase number of enemy casualties.

We first addressed this issue by comparing the enemy casualty rates resulting from the baseline and experimental scenarios. We calculated enemy casualty rates by dividing the number of enemy casualties caused by BLUFOR by the total number of casualties caused by BLUFOR. The formula we used is listed below:

Number of enemy casualties inflicted by BLUFOR =
Enemy casualty rate ÷ Total number of casualties inflicted by BLUFOR

This approach answers the question: how many of our shots did we get right, with "right" being defined as shooting the enemy?

Table 6 compares enemy casualty rates for our baseline and experimental events. The table shows a higher enemy casualty rate in the experimental events. This tells us that BLUFOR killed more of the enemy when BLUFOR forces used combat ID than when they did not. This suggests that the combat ID capability may have contributed to higher enemy casualties.[6]

Table 6. Enemy Casualty Rates in The Combat ID Experiment

	Scenario 1 (Clear building)		Scenario 2 (Locate and attack)		Scenario 3 (Defend consulate)	
	Base	Exp	Base	Exp	Base	Exp
Enemy casualties	7	11	6	9	0	5
Total kills by BLUFOR	15	16	12	11	0	5
Enemy casualty rate	.47	.69	.50	.82	n/a	1.00

Enemy Casualties in Scenario 1.

Post-event analysis, including discussions with the BLUFOR Marines, suggests that it is unclear whether combat ID actually contributed to the increased enemy casualty rate in the building-clearing scenario. The Marines hesitate to conclude that combat ID helped them in the scenario because of the problems with using the laser system indoors. They argue that problems with laser bounce as well as the likelihood that the system will pick-up friendly casualties in rooms and hallways make combat ID virtually ineffective inside buildings. Additionally, they found that in general, the confrontations inside a building are too fast for even the 1-3 second delay required to use combat ID.

Despite the overall negative response to using combat ID inside the building, some BLUFOR Marines highlighted specific situations where they found combat ID, and even the laser reflection, useful. For example, one Marine mentioned using the combat ID from a tactical position. He stationed himself so as not to be seen by anyone approaching, and then used the laser reflection, wall angles, and shadows on the wall, to identify individuals with combat ID as they approached his tactical position. In a second example, during the baseline iteration, the BLUFOR positioned a Marine on the fire escape of the building next door. After the event, he stated that combat ID would have been useful, from his position, for identifying potential targets entering, exiting, and moving around the building.

[6] Because we didn't have much information regarding the total number of times each enemy fighter was regenerated, we could not use a statistical method to assess the validity of our results pertaining to enemy casualty data.

Overall, the BLUFOR leadership suggests that the improved enemy casualty rate in the first scenario was more likely due to how they attacked the objective and how the enemy was set-up inside the building.

Enemy Casualties in Scenarios 2 and 3

The data collected from the second and third scenarios more clearly support the theory that combat ID can contribute to higher enemy casualties. Again, that is likely because these scenarios gave the BLUFOR Marines the opportunity to experiment with combat ID in conditions that took greater advantage of the capability. Specifically, they were able to use the system:

- Outside
- At distances
- In low light conditions
- From static and secure positions
- From a support by fire position
- When standing security

For example, during the third scenario, when the BLUFOR was defending a consulate, one Marine was posted in a security position in a tree overlooking the consulate entrance. He used combat ID on suspicious individuals approaching the building. If he did not receive a positive response from combat ID, he followed with a request for voice confirmation. If the appropriate voice communication was not returned, the Marine had approval to fire. He also maintained radio communications with other BLUFOR guarding the consulate, and was able to provide early warning of approaching friends and civilians. He found the system useful, both in identifying the enemy and in maintaining situational awareness.

Overall, the data from scenarios two and three support the hypothesis that combat ID may have contributed to an increase in enemy casualties caused by friendly direct fire. The results from scenario one are less conclusive due to limitations in using the combat ID system inside buildings.

Impact Of Combat ID on Casualties Caused by the Enemy

Assessing the net benefit of an experimental system such as combat ID, must take into account whether the system retards or hinders users. Specifically, we want to determine whether combat ID inhibits, in any way, a Marine's response to a potential threat, and therefore endangers the Marine. If a combat ID system results in increased numbers of Marine casualties, its net benefit will obviously be limited.

The Marines instinctively believe that combat ID may be dangerous in some situations. They argue that it can:

- Slow them down
- Make them hesitate
- Result in incorrect, and therefore dangerous, intelligence.

Marines offered anecdotal evidence of instances where all three of their arguments against combat ID occurred, and where the use of the technology may have resulted in their becoming a casualty.

We assessed the quantitative impact of combat ID on friendly casualties by computing casualty exchange ratios and the number of BLUFOR casualties. The casualty exchange ratio compares the number of enemy killed to the number of Marines killed during the operation. Table 7 shows the casualty exchange ratios for the three scenarios. While the ratios were poor for all of the events, they improved during the experimental iterations, when Marines used combat ID. Table 7 suggests that the casualty exchange ratio improved when Marines had combat ID. This means that for each enemy casualty inflicted, the BLUFOR took fewer casualties.

Table 7. Casualty Exchange Ratio in the Combat ID Experiment

	Scenario 1 (Clear building)		Scenario 2 (Locate and attack)		Scenario 3 (Defend consulate)	
	Base	Exp	Base	Exp	Base	Exp
Enemy casualties	8	11	6	10	0	5
BLUFOR casualties	23	21	11	9	4	5
Casualty exchange ratio	0.35	0.52	0.55	1.11	0	1.00

However, if the question we want to answer is, "does combat ID get you killed more," then we also need to consider the BLUFOR casualty rate. Table 8 shows the BLUFOR casualty rate, by assessing the number of Marines killed by the enemy as a percentage of all the event casualties. The formula is:

Number of BLUFOR casualties by the OPFOR =
BLUFOR casualty rate ÷ Total number of event casualties

Table 8. BLUFOR Casualties As a Percentage of Total Event Casualties

	Scenario 1 (Clear building)		Scenario 2 (Locate and attack)		Scenario 3 (Defend consulate)	
	Base	Exp	Base	Exp	Base	Exp
BLUFOR killed by OPFOR	21	19	7	9	4	5
Total event casualties	37	36	19	21	4	10
Percent of casualties	.57	.53	.37	.43	1.00	.50

To support the hypothesis statement—casualties caused by enemy fire will not increase—we would want the percentages to stay the same or decrease between the baseline and experiment. In fact, the percentage of Marine casualties as a function of total event casualties fluctuates among

the three scenarios; it decreases in the first and third scenarios but increases for the second scenario. This may indicate that in some combat operations, combat ID could endanger the user and lead to more casualties. The overall difference in the number of BLUFOR killed in the baseline versus experiment events is not statistically significant. The chi-squared statistic is 0.153, and the P-value is 0.696. This indicates that you could get the same spread, or greater, 70 percent of the time by pure chance. Statistically, using combat ID did not get the Marines killed more often.

To add one more data point to our assessment of the potential dangers of combat ID, we asked a single Marine in each BLUFOR squad to use the combat ID system every time he engaged a target in each of the three events. We did this to determine if the combat ID system led to more Marine casualties. If so, we would expect the mandatory users to have a higher casualty rate than other BLUFOR members. However, our dataset did not indicate that these Marines were wounded or killed with any more frequency than other BLUFOR Marines.[7]

Overall, the data is inconclusive as to whether combat ID leads to more casualties. There is some data, both quantitative and anecdotal, to suggest that it may be detrimental in certain situations, particularly:

- During an offensive maneuver or on the move, where combat ID is likely to slow down the movement
- Inside a building, where laser reflection is at its worst
- In close quarter combat, where false positive identifications can occur (because of close proximity of friendlies and laser bounce).

Conclusions and Recommendations: Combat ID

MD 02 provided the Marine Corps with its first opportunity to conduct tactical experimentation with individual Marine combat ID capability for the dismounted Marine. While the analytical results of the three scenarios do not allow us to state conclusively that combat ID prevents fratricide, the experiment did help the Marines identify situations where the capability may add to their warfighting effectiveness. Combat ID may be helpful to Marines:

- When used in a static situation, such as from a defensive or security position
- Across mid- and long distances
- Across open areas
- Down hallways or stairwells, as long as there are no friendly casualties
- Outside, or when directed outside
- In low light conditions.

The Marines were also able to identify situations where combat ID may retard their effectiveness, or detract from their ability to fight effectively. Combat ID may not be helpful to Marines:

- During an offensive maneuver
- On the move
- Inside a room, or from room to room

[7] It is unclear how well the mandatory users followed our instructions. We assigned an O/C to each mandatory user for data-collection purposes and to remind the Marines to use their combat ID in all circumstances.

- Inside a building
- Near friendly casualties
- In close quarter combat
- Once shooting begins.

Overall, we found that combat ID in an urban environment is most applicable to users in a static position, either outside a building or facing outdoors. That translates to Marines who are either standing security or providing fire support from alternate positions. Combat ID is of limited use, however, inside a building, either for room clearing or close-quarter combat. Similarly, combat ID does not appear to be useful once the shooting begins. The action is too fast and Marines need to be able to make quick decisions, regardless of technology. On the other hand, combat ID is less necessary once the shooting begins—i.e., after the decision to fire has already been made.

The objective of the MD 02 experiment was to determine the net benefit to Marines of an experimental combat ID system employed during MOUT. Unfortunately, the net utility of the combat ID capability remains uncertain. Primarily, this is because it is still unclear whether combat ID actually helps reduce fratricide in general, which is the system goal. The Marines suggest that combat ID may help reduce or prevent fratricide in certain situations, and they indicate that it can improve situational awareness overall, thereby possibly leading to a reduction in blue-on-blue encounters.

The second reason the net benefit of the system is uncertain is the inconclusiveness of the data as to whether combat ID endangers the user. If using combat ID endangers a Marine, the net value of the system is diminished. However, if more is known about the system and its effectiveness, various tactics, techniques, and procedures (TTPs) could be developed that might minimize some of the risks of using the technology while maximizing the system capabilities.

The MD 02 experiment does suggest that combat ID may contribute to other combat benefits beyond reducing fratricide, specifically, increased enemy casualties and an improved combat exchange ratio. Also, combat ID does not appear to lead to either an increase, or a decrease, in civilian casualties or violations of the ROE. However, the Marines' point about using combat ID in a peacekeeping environment, when aiming a rifle at a civilian may be an ROE violation in itself, requires further consideration.

We recommend further experimentation with combat ID, both in MOUT and other operating environments. Additionally, we encourage experimentation with combat ID in low light conditions, when Marines are able to use NVGs or other night vision devices. Further experimentation will likely help identify more situations where combat ID can or cannot be useful, what TTPs can contribute to its utility, and whether the system's benefits are worth additional investment.

Finally, we suggest that Marines be given more training, rehearsals, and acclimation time with the candidate system. Using combat ID requires a significant level of trust in the technology as well as an understanding of where and when the system functions well and functions poorly. Future analysis can only benefit from working with Marines who are comfortable with the system and can provide input based on substantial use of the combat ID technology.

Section II – Battalion Reconnaissance, Surveillance, Targeting, and Acquisition (RSTA)

This experiment addressed whether a combination of reconnaissance Marines, unmanned aerial vehicles, unmanned ground sensors, mobile ground sensors, and target acquisition systems improves a commander's ability to make critical combat-related decisions. This includes the degree to which a RSTA grid composed of these elements can help a unit identify tactical objectives, opposing forces, and danger areas.
In this section, we reconstruct and analyze the BN RSTA portion of the MD 02 experiments. We begin with a description of the experimental systems used as part of this experiment. We then address experimental objectives and hypotheses, to include a discussion of the tactical movement of units in support of these objectives. We conclude with summary answers to several operational questions about the RSTA systems used during MD 02.

System Description
The battalion RSTA system employed in MD 02 consisted of Dragon Eye unmanned aerial vehicles (UAVs), unmanned ground sensors (UGS), and reconnaissance Marines.

Dragon Eye
Dragon Eye is a battery-powered, lightweight (under 5 pounds), man portable unmanned aerial vehicle (UAV) that can be broken into five pieces and carried to the field. Dragon Eye payload consists of a camera, which relays imagery to a Marine on the ground. Dragon Eye is intended for employment at the battalion, company, and platoon level. In figure 2, we show an illustration of Dragon Eye. Dragon Eye is designed to sustain a minimum airspeed of 30 miles per hour at a minimum altitude of 200 feet above ground with a combat radius of at least 5 kilometers from the control station.

Figure 2 Dragon Eye UAV

It generally has between half an hour and an hour of endurance. MCWL envisions Dragon Eye to be operated by a three-man UAV team with two airframes per team for greater system reliability.

Unattended Ground Sensors (UGS)
SenTech Corp developed a suite of acoustic and seismic sensors to detect, track, and identify ground combat vehicles and personnel. We highlight the particular sensors used in figure 3. The sensors transmit information to intelligence analysts working in a combat operations center (COC). The sensors provide information about noises, which can be categorized by type and used to assist intelligence analysts about threat conditions and troop and vehicle activity in a given area. SenTech advertised the UGS used during MD 02 as having the following characteristics:

- Target Detection
  - Can detect vehicles from 1 kilometer away under average conditions (less than 4 kilometers under good conditions).
  - Can detect personnel from 30 meters away under average conditions (100 meters under good conditions).
- Target Identification
  - Can identify over 30 vehicle categories.
- Communications
  - Uses a VHF-compatible radio with 6 to 10 kilometers range (more range is possible through the use of repeaters).

Figure 3 SenTech Unattended Ground Sensor

Experimental Objectives and Hypotheses

There were three major analytical objectives and two hypotheses associated with the RSTA experiment. The primary objective was to determine if the experimental gear (the UAV and UGS) could be tactically employed by an infantry company to detect, identify, locate, and track threat elements. We hypothesized that if an infantry battalion was equipped and trained with these systems, then:

- The battalion would not in any way be prevented from accomplishing its other normal combat tasks
- The battalion would be able to position and move the sensors without any delays to mission execution
- The positioning of the sensor would not in someway alert the OPFOR of battalion objectives
- The sensors would help the battalion detect, identify, and track the enemy threat
- Marines would be able to operate the new systems with minimal training.

We also wanted to assess the overall utility of the Dragon Eye imagery transmitted to the battalion COC. This led us to hypothesize that if Dragon Eye imagery was provided, the battalion S-2 should be in a position to:

- Provide hard-copy imagery to the battalion staff in furtherance of planning objectives
- Use Dragon Eye to help prepare intelligence products
- Transmit UAV imagery to other elements of the battalion

The remaining objective associated with this experiment was to validate the proposed concepts of employment for the two experimental systems.

Experiment Design

The Battalion RSTA phase of experimentation was conducted over a 5-day period from 1-5 August and consisted of four experimental vignettes. Day one was a rehearsal event, which provided an opportunity for the experimental forces to familiarize themselves with the play box and the experimental equipment. Days two through five comprised the actual experiment. There were four primary events:

- 1E, Battalion in the attack with RSTA components (2 August)
- 2E, Security ops with RSTA components (3 August)
- 1B, Battalion in the attack without RSTA components (4 August)
- 2B, Security ops without RSTA components (5 August)

Forces for the Bn RSTA experiment was a live, force-on-force experiment involving a BLUFOR reinforced company conducting operations against a reinforced opposing force (OPFOR) platoon. During events 1E and 2E, BLUFOR used the experimental RSTA systems, which augmented their standard reconnaissance capabilities. During events 1B and 2B, the battalion executed its mission using only legacy RSTA equipment.

Analysis Results.

During each event, we collected activity logs, handwritten messages (often referred to as "yellow canaries" because they are written on yellow note cards), recon team logs, Integrated GPS Reconstruction System (IGRS) position data, after-action surveys, and Dragon Eye flight-track data. We supplemented this with observations by a CNA analyst in the playbox (with the company commander), two CNA analysts with the battalion S-2 and S-3 (in the combat operations center (COC)), and a CNA analyst with the experimental control group. Using the data gathered, we were able to reconstruct much of what happened during the bn RSTA experiment, including information about the location of the UAVs relative to ground vehicles and enemy personnel. We also analyzed the net results of the sensor feeds—i.e., what the intelligence analysts did with the data they received. The following sections highlight that reconstruction effort. We first begin by discussing Dragon Eye employment during MD 02.

<u>Dragon Eye Employment During MD 02</u>

During the two experimental days, both the company commander and the battalion S-3 exercised control of two sets of Dragon Eye UAVs (total of four airframes). By control, we mean that they retained authority to decide where the Dragon Eye would fly and when and if operators should re-task the UAV flight path.

During event 1E, the company commander controlled Dragon Eye for the first two of seven flights (the COC controlled the UAV for the remaining five missions). During event 2E, the company commander controlled Dragon Eye for all four flights. The Dragon Eye was not used during events 1B and 2B because they were baseline events and experimental equipment was not used.

Marines who piloted the Dragon Eye system received almost two full weeks of training on how to fly and fix the UAV. Neither the company commander nor the COC staff received any training on the system prior to their arrival at Victorville.

During the experimentation period, we noted that the infantry battalion headquarters staff was generally interested in using the UAV to locate enemy logistics/operating bases during the attack phase and for security purposes during peacekeeping operations. The staff used Dragon Eye to help identify critical intelligence information that it could exploit tactically during the experiment or would somehow indicate the need to take immediate defensive actions. Overall reconnaissance objectives were more specific and tended to focus on objectives beyond the immediate fight. They included finding

- Enemy forces of platoon size or larger
- Any violations of the Law of War
- Enemy forces entering an area en masse
- Requirements for BLUFOR reinforcement
- Enemy forces withdrawing from an area

The company commander, however, was more interested in tactical objectives closer to his immediate front. During event 1E, the company commander used the UAV for recon purposes prior to his company crossing the line of departure (LOD). He did this to assess areas of *immediate* interest based on previous intelligence reports—to ascertain just what he was up against.

The battalion's plan was to use the UAV to search for and locate enemy positions and movement. The battalion staff hoped to fill-in information gaps from other sources using the UAV. This was accomplished by flying the UAV around the perimeter of the playbox, focusing on pre-determined areas of interest. The battalion staff would then re-task the UAV when they had reports of enemy activity in the area (from Marines on the ground). Video imagery from the UAV was then viewed (either through goggles worn by the company commander or on a large video screen in the COC) to confirm and evaluate these reports. No hard- copy imagery from Dragon Eye was produced or submitted to any battalion or higher agency during the course of this experiment.

Dragon Eye Flights

In table 9, we show information about the 11 Dragon Eye flights that occurred during the first two days of the BN RSTA experiment. We do not include flights that occurred outside of experimental events—e.g., before or after the day's experimental period.

Table 9. MD 02 Dragon Eye flight Summary, 7-8 August 2002

Flights	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	# 10	# 11
Event	1E	1E	1E	1E	1E	1E	1E	2E	2E	2E	2E
Launch time	*0931*	*1018*	*1125*	*1208*	*1303*	*1357*	*1429*	*0957*	*1120*	*1204*	*1345*
Flight time	34	40	36	35	42	37	20	34	31	4	27
Avg. speed (knots)	37	37	37	37	35	35	22	35	37	33	37

Based on our calculations, Dragon Eye flew a total of 340 minutes in support of experimental objectives. The average flight time for a Dragon Eye mission was approximately half an hour.

Two flights, 7 and 10, were shorter than was expected. This was the result of mechanical difficulties—low battery power is suspected in both cases.

We also calculated the average flight speed of Dragon Eye based on where it traveled within the playbox and its overall flight time. Using the terrain as a reference point, we were able to determine the UAV's average ground speed in knots—approximately 35 knots. This is a relative speed and should provide some indication of how fast Dragon Eye was going as it passed key points of interest. This is significant because many of the Marines using the Dragon Eye imagery felt that the UAV was flying too fast to identify personnel and vehicles on the ground. Marines stated that Dragon Eye allowed them to see people and trucks, but they could not easily differentiate between OPFOR and BLUFOR forces. Other possible factors that could have contributed to the battalion staff *not* clearly identifying what they were seeing include:

- Dragon Eye altitude, which was viewed as too high
- Training shortfalls in personnel assigned to exploit Dragon Eye imagery
- OPFOR counter tactics, such as hiding inside buildings and camouflaging vehicles

Exploiting Dragon Eye Imagery

One of our analytical goals was to determine whether the Dragon Eye's flight path put it in the right place at the right time to capture what was happening on the ground—i.e., what were the detection opportunities available to it as it passed over a given sector? We viewed this as a key indicator of how effectively Dragon Eye was being employed. We were able to accomplish this by comparing Dragon Eye position data to reported OPFOR and BLUFOR position data, which we were able to reconstruct using the IGRS playback.

We found that while the Dragon Eye was often in the right place at the right time, it usually wasn't there for very long. For example, during event 1E, the OPFOR base camp was located in the B sector. We compared what was happening in the B sector of the playbox at the time that Dragon Eye was flying over it and found that Dragon Eye's flight path took it over that sector several times when OPFOR personnel and vehicles were present. In each instance, Dragon Eye was never over that sector for more than 16 seconds at any one time.

As noted, we also found that during most flights, Dragon Eye only made a few passes over each sector and that most of these were generally relatively close to one another in terms of time. During flight 1, for instance, Dragon Eye passed over the B sector seven times, which was where the OPFOR base camp was located. The shortest pass lasted about 2 seconds, while the longest lasted approximately 8 seconds. Six of these seven passes happened between 0953 and 0957, a span of only four minutes. During flight 6, Dragon Eye flew a total of 34 passes over the B sector. These passes spanned approximately 30 minutes. We also looked at two flights flown during event 2E. We noticed that a series of firefights occurred in the K sector around 1120, which lasted until the end of that day's operations (about 1430). Dragon Eye flights 9 and 10 were flown while these engagements were taking place, but were relatively short in duration. All told, Dragon Eye made 23 passes over the K-sector during one 30-minute period and another 6 passes over a 4-minute period later in the day.

Table 10 highlights the amount of time Dragon Eye spent over each sector of interest as a percentage of total UAV flight time. The sector chosen for each flight corresponds to the battalion's area of interest on that given day. In other words, we focused on sector B for event 1E (when the battalion was looking for the OPFOR logistics base) and sector K for event 2E (when

the battalion was engaged in a series of firefights). The table indicates that there were only a few, limited opportunities for Dragon Eye to observe enemy ground activity.

Table 10. Percentage of Flight Time Spent over K-sector During Events 1E and 2E

Flight Number	Sector coverage (in seconds)	Total Flight Time (in minutes)	Percentage of flight time over sector
1	29	38	.01
2	0	38	.00
3	0	37	.00
4	47	40	.02
5	141	45	.05
6	208	33	.10
7	31	25	.02
8	66	32	.03
9	80	34	.04
10	57	6	.15
11	196	29	.11

What the Battalion Learned Using Dragon Eye

We next address what Dragon Eye provided the battalion in the way of intelligence and how it was applied. We have already discussed who had tactical control of the UAV—the company commander for several flights during event 1E and all flights event 2E; the battalion S-3 for the other flights. This section discusses how the company commander used the Dragon Eye when under his direct control and what he received from it in the way of useful intelligence. We then discuss how the battalion COC used and processed incoming Dragon Eye data.

The company commander gave guidance directly to the Dragon Eye operator team about which sector he wanted Dragon Eye to examine. He then received activity reports directly from the Dragon Eye operator team, usually after every Dragon Eye flight. When possible, the company commander would leave his command post headquarters and go over to the UAV ground control station (GCS) to view the Dragon Eye video feed. Typically, he used the UAVs to gain some useful tactical intelligence about enemy activity in and around his immediate position. During attack phases of the experiment, he had less opportunity to control and coordinate UAV flights than when in a defensive/firm base setting. After-action reports from the company commander suggest that other than a few vehicle and personnel sightings, little of tactical use was reported to him from Dragon Eye operators.

At the battalion level, when a battalion COC staff officer saw something deemed significant, information was written on a message pad and passed to the S3, the S2, and India Company. During event 1E, there were 83 UAV report messages filled out, 14 of which dealt with information acquired via Dragon Eye, which translates to about 17 percent of all COC messages. During event 2E, there were only 2 hand-written messages. That means that Dragon Eye contributed to only 4 percent of the total message traffic in the COC. In figures 4 and 5, we show the sources of intelligence information for each RSTA experimental event. As the figures indicate, the majority of information sent to the COC came from reconnaissance and scout/sniper teams (i.e., human intelligence sources).

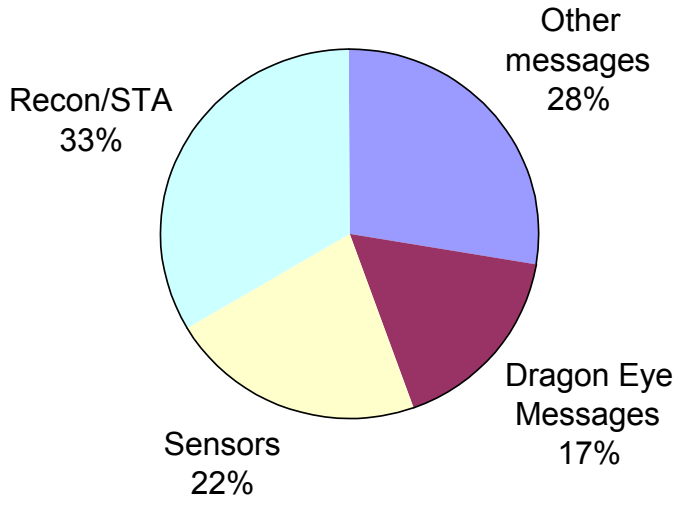


Figure 4 COC Messages by Source (Event 1E)

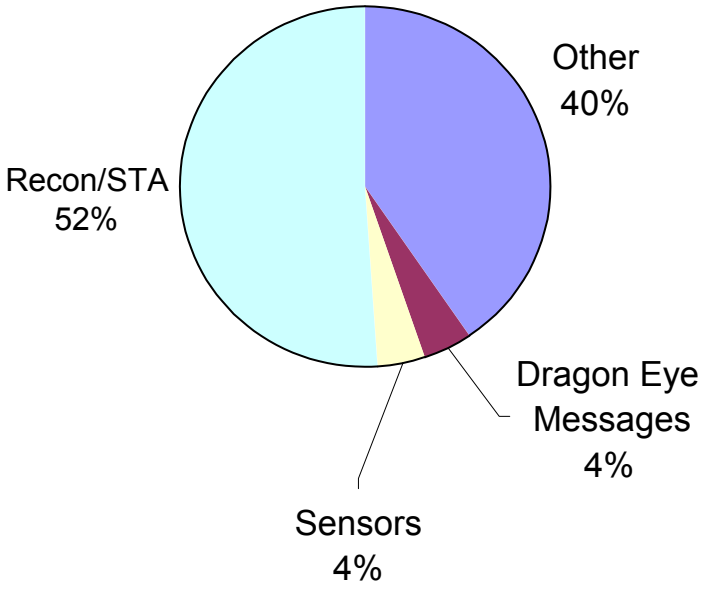


Figure 5 COC Messages by Source (Event 2E)

One reason why there was so much more information from human sources than UAVs was the quality of information conveyed. When we compared the content of both recon and RSTA component reports to that of Dragon Eye, we found that recon team reports had far greater detail to them than the Dragon Eye reports—e.g., they provided information on whether troops and vehicles were enemy or friendly, what direction they were headed in, and often had estimates about force size—something the company identified as one of their critical information requirements. However, because only three recon/STA teams were in use during each event, they could only report on what was happening on a small part of the battlefield and their success depended largely on whether observation posts and hide sites were well selected. Dragon Eye had the advantage of being able to cover a wide swath of the playbox in a relatively short period of time.
The following describes how Dragon Eye was used during each RSTA experimental event.

Dragon Eye use during event 1E
The S-2 used Dragon Eye imagery as a starting point for building situational awareness. During event 1E, at approximately 0945, the S2 detected what he thought was a logistics base north of Landing Zone 3 (LZ3) during the first Dragon Eye flight. He then queried recon teams and watched for India Company reports for OPFOR activity in that area. At 1001, the S-2 thought the enemy base was in the delta sector. He based this on reports from recon teams in the field. Unfortunately, the S-2 was unable to get the Dragon Eye to return to Area 3 of the playbox until nearly two hours had passed. That was because the company instead of the COC controlled the first two Dragon Eye flights. By 1249, however, the S-2 had determined using Dragon Eye imagery and human intelligence reports that the enemy was in B3.

Dragon Eye use during event 2E
During event 2E, the company commander controlled Dragon Eye, so the battalion COC had no direct re-tasking authority over it. As a result, acquired intelligence could not be as easily exploited as it was in event 1E—requests for re-tasking would have to go through the company commander. Because a company commander has very limited intelligence processing capabilities, he was not in a position to easily exploit the information he received nor was he or his staff trained to analyze the imagery they saw. What made this even more difficult was the fact that every time the commander wanted to know what Dragon Eye was seeing he had to leave his command post and go to the Dragon Eye control station. The control station was located in a small hut about 50 yards outside the CP and consisted of a small laptop computer that users could use to direct Dragon Eye and observe UAV imagery. (There was no video imagery playback of Dragon Eye flights within the company CP so to exploit Dragon Eye information, the company commander had to go back and forth between his CP and the control station.) This arrangement had implications for how useful Dragon Eye was within the context of the scenario. During this experiment, the UAV was more responsive to the company commander's tactical requirements (because it was under his direct tactical control). This translated into more of an emphasis on supporting maneuver units and identifying immediate threats and less on identifying the location of the OPFOR headquarters and the safe houses that the OPFOR were hiding in, which were both stated battalion objectives. We believe that the small number of UAV report messages we found dealing with Dragon Eye information during this experiment is directly tied to who controlled it, and we suspect that it evidence of general problems in processing Dragon Eye intelligence.

Unattended ground sensor (UGS) employment during MD 02

In this section we discuss how the SenTech unattended ground sensors (UGS) were employed during battalion RSTA experimentation. In figures 6 and 7, we show how the battalion employed the sensors in the two experiments. In both experiments, UGS were placed in two suites of four sensors each.

Figure 6 shows two sensor strings—one facing west of E3, north of F5, south of G4, and north of B3; and one facing north of L6, west of B1, south of A5, and east of D5.

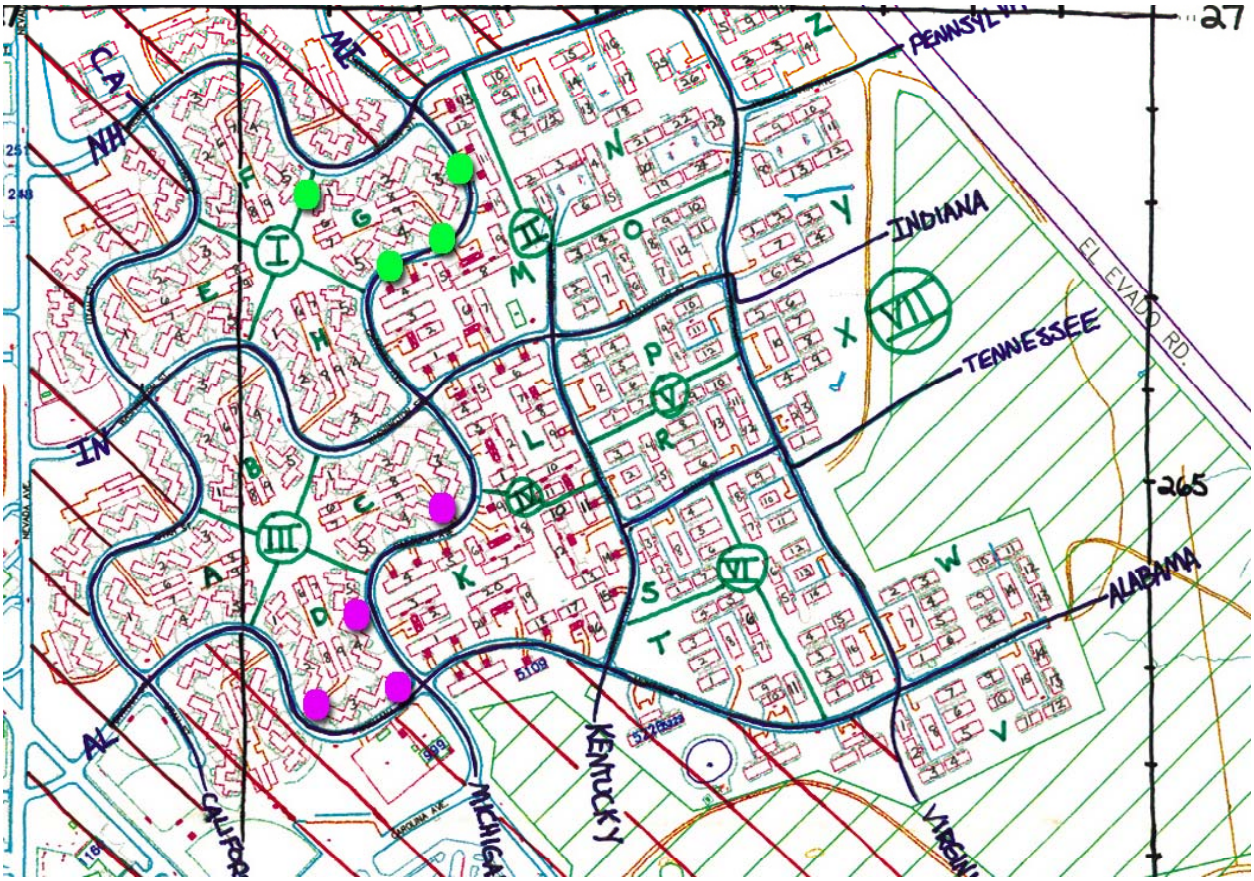


Figure 6 Sensor Emplacement Event 1E

Figure 7 shows two sensor strings as well—one ringing the F5, G1, G3, G4, and G5 quadrants; and one located in the vicinity of the C and D sectors of the playbox.

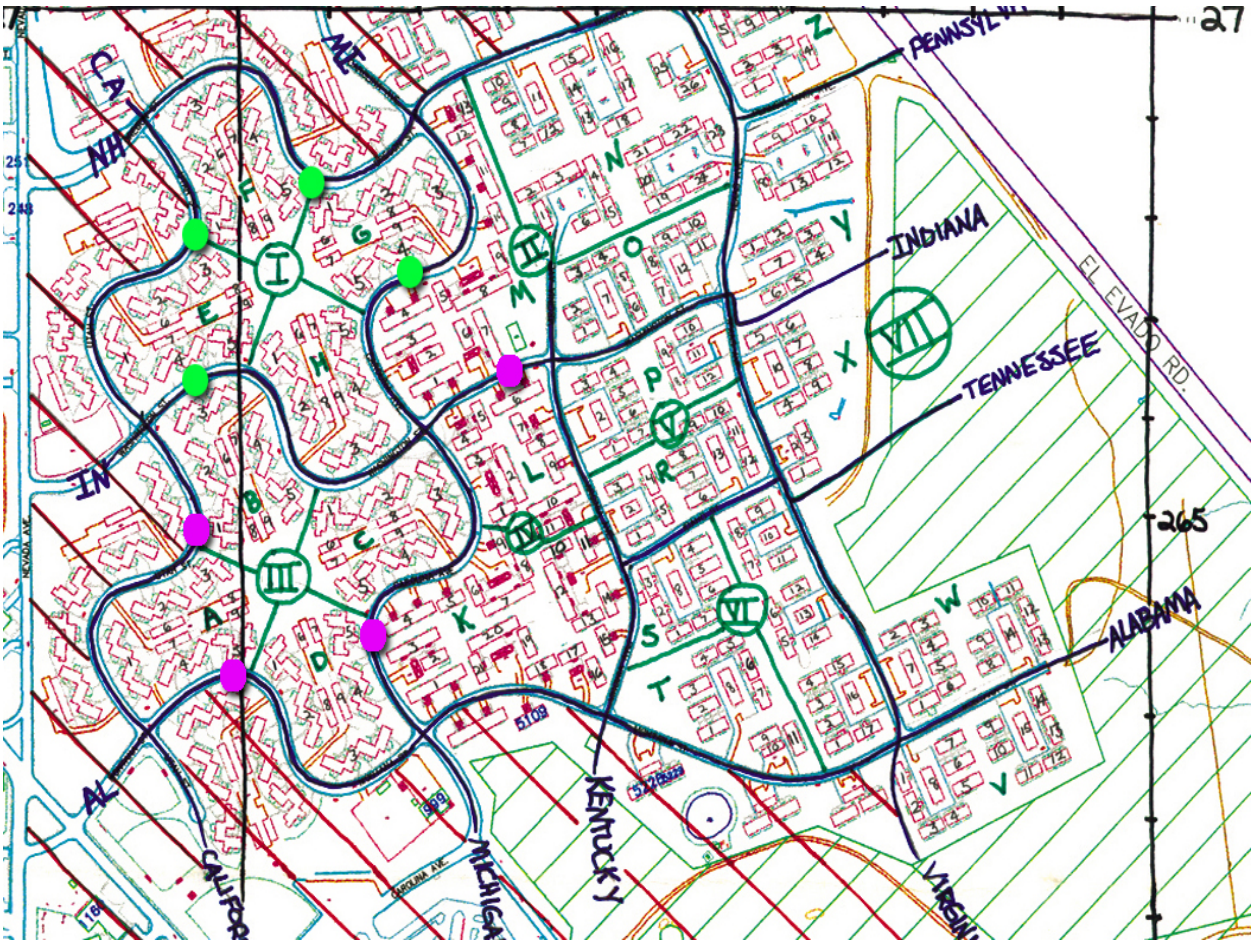


Figure 7 UGS Emplacement Exp 2E

During both 1E and 2E, the UGS were set up in similar patterns, although in different areas. Two sub-suites of four sensors each were emplaced around suspected avenues of OPFOR approach or movement. The recon platoon commander and the battalion S2 conceived the plan of employment. Prior to their arrival in Victorville none of the Marines had been trained to use the UGS.

Recon Marines monitored the UGS from the COC and were told to report constant or heavy activity (e.g., sustained foot traffic in an area for five minutes or more). The system was used mainly as a cueing system for the recon teams and for Dragon Eye. When identifiable noises were detected that information was passed via a hand-written report up the chain of command and the recon and Dragon Eye Teams were alerted to possible presence of enemy units in the area.

Unfortunately, not all the sensors worked. There were never more than four sensors working at a single time, which made it hard to know how well the sensor grid itself worked. Additionally, recon Marines lacked the pattern analysis skills needed to fully interpret/assess incoming sensor information, which led some to suggest that if these sensors were used again, it would be better

to have Marines from a sensor control and management platoon (SCAMP) help with pattern analysis.
The Marines we spoke with also observed that the sensors themselves were merely information collection tools. It was still up to the COC to process the raw information into intelligence. This raised the issue of whether there was sufficient manpower available to do this within the current battalion COC structure. The issue that was surfacing was one of priority and weight—given limited manpower which information sources deserved the greatest attention and priority of effort for analysis. Had the experiment lasted longer (up to 24 hours) this problem would have likely been even greater.
Overall, there were 18 formal sensor reports filed during event 1E. This reflects the information that was gleaned from the working sensors in place for that event. In event 2E, there were only two sensor reports submitted. We believe this was a result of the location of the sensors relative to much of that day's action—in the kilo sector. In this scenario, the location of the battle may have rendered the UGS ineffective, which highlights one of the potential limitations of this system.

Conclusions and Recommendations: RSTA Experiments

MD 02 provided an opportunity to examine how effectively a new UAV system and UGS suite performed in an urban combat environment. Our intent was to determine if the experimental gear (the UAV and UGS) could be tactically employed in support of an infantry battalion to detect, identify, locate, and track threat elements. We found that there are limitations and challenges to successful employment of these systems that require resolution. The following paragraphs highlight some of these.

Concept of Employment

Company versus battalion- level operations. During several experimental events, Dragon Eye was under the tactical direction and control of the infantry company commander. We conclude that employment of a Dragon Eye UAV by an infantry company has limited value. Infantry companies don't have the dedicated staffing necessary to provide adequate command and control and oversight of a UAV. Also, the inability to operate UAVs on-the-move limits their use by a company to the defense. During offensive operations, the company commander and his headquarters staff were continually moving from building to building, which precluded spending much time coordinating Dragon Eye flights. When the company went into the defense, the company commander was able to devote more time and attention to the UAV, but there were no intelligence analysts available to process the raw data he was receiving and turn it into useful intelligence. Thus, operating tactical UAVs at the battalion level appears to provide the most practical employment option.
Mission profiles. The experimental force flew several different mission profiles using Dragon Eye. The most common was an area recon mission—flying Dragon Eye over a wide swath of the playbox and asking the UAV operators to report on whatever they saw. This was problematic in that it amplified many of the other problem areas observed— the difficulties experienced in processing Dragon Eye data and turning raw intelligence into useful, actionable courses of action. Because there was no pattern to the way Dragon Eye flew, it was harder to synthesize and categorize the data that was received. This made it harder to analyze the incoming data. This leads to a general conclusion: Of the proposed UAV mission profiles (route reconnaissance, area

surveillance, and point reconnaissance), the Dragon Eye appears least suitable for the area surveillance mission.

Remote feed to battalion COC. The battalion staff placed a large monitor in the COC, which was used to display Dragon Eye imagery in real time. This allowed intelligence analysts within the COC to see in real-time what the Dragon Eye operators saw. The battalion COC is probably the only place where such information can be exploited. This did not necessarily happen during the experiment largely because of difficulties the staff had analyzing and exploiting the incoming information.

Analysis and Exploitation of Sensor Feeds

The Dragon Eye UAV provided significant additional surveillance data to both the battalion and the supported company. However, there is no evidence that the enhanced data resulted in a more accurate threat picture. Similarly, UGS provided some additional intelligence data, but in this case was even less exploitable. For example, during event 1E (with UAV and UGS), the S2 deduced that the OPFOR base was in the B sector. At 1249 that day he told the COC he thought the OPFOR base was in building B3. It was actually in building B4. During event 1B (without UAV and UGS), the OPFOR base was located in building G4. Recon teams passed several reports of enemy forces in and around G4. And although the S2 never stated that the OPFOR base was at G4, a barrage of artillery fire nonetheless destroyed the location by approximately 1300.

What do we attribute this inability to use UAV-UGS data more effectively? We believe that the primary answer involves the limited number of dedicated personnel in an infantry battalion available and trained to analyze incoming intelligence data. In particular, the streaming video feeds from a UAV present a dense flow of data that must be interpreted in real time and with periodic reports to decision makers. During UAV operations this is a full-time responsibility. In order to exploit these systems, the Marine Corps should consider increasing the number of S-2 Marines needed to process and analyze incoming intelligence data.

Dragon Eye Characteristics

Another operational challenge was the UAV's inherent performance characteristics. Because the UAV uses a fixed camera, the video image itself is displayed across the screen at the same speed as the aircraft travels (minimum airspeed for Dragon Eye is approximately 30 miles per hour). Once a suspected target is identified on the video display, the UAV can be directed to keep the target in view, but if this is not done quickly, the suspected enemy location moves out of sight and is difficult to reacquire. When the Dragon Eye UAV was operated in general support of the battalion, the S-2 had problems directing the UAV operator to orient on a target since the UAV operator was not in the COC.

Another consideration is the physical size of Dragon Eye. While the system can be broken into several parts and carried in a field pack by two Marines, the total support equipment needed to keep Dragon Eye in the field is greater than what can be easily carried. When Dragon Eye teams operate in support of field units, we believe that the team will likely need a dedicated HMMWV, which can carry its spare parts package as well as the UAV. This would not preclude carrying Dragon Eye in field packs for short distances but would facilitate long-distance movement and field support.

Impact on Battalion Manpower

The sensor reports from UGSs and UAVs require a dedicated Marine trained to interpret the data hits. An infantry battalion does not have personnel to dedicate to this task, even if they were trained to do so. Our conclusions regarding UGS are somewhat muddled because normally the infantry battalion S-2 would not be tasked with sensor management, as was the case during our experiment. The MAGTF sensor unit would perform this task and send processed intelligence to the battalion operations staff. Consequently, we conclude that without the attachment of UGS sensor analysts to an infantry battalion, direct UGS feeds to it do not appear to be a viable concept. With regard to UAVs, we recommend that future tactical UAVs include a variety of technical improvements that will make the acquired intelligence easier to exploit. These improvements include a zoom capability, improved camera, and a hover capability. Such improvements do not necessarily minimize the additional manpower requirements that we have identified, but it may make them more palatable.

Another manpower-related consideration is the reassignment of Marines from their regular duties. Two three-man teams drawn from the scout/sniper platoon (also referred to as the STA platoon) were tasked with piloting the Dragon Eye UAVs. As a result, there were six fewer scout-snipers (the equivalent of three teams) available to the battalion to help in reconnaissance and surveillance operations. The scout-sniper platoon Marines assigned to UAV teams were precluded from occupying forward OPs as they normally would.

Yet another manpower problem was how the battalion chose to analyze UAV imagery—via a remote monitor in the COC. This caused more Marines (beyond the three-man UAV operator teams) to be shifted from their normal combat duties to support UAV operations. This leads to a fundamental yet unsolved manpower issue—where will the Marines come who will be trained and tasked with executing UAV operations?

Counter Tactics

In an urban environment, a tactical UAV similar to Dragon Eye is easy to defeat. The OPFOR was able to purposely avoid detection from the Dragon Eye UAV by seeking concealment in the form of nearby buildings. There were no counter tactics developed or attempted for the UGS because the OPFOR was never able to locate any of the emplaced sensors. However, the urban terrain itself limited UGS operations. The particular sensors used relied on line-of-sight to detect targets, and the urban structures in the area limited their effective range.

Section III – Enhanced Reconnaissance Experiment)

This experiment focused on the advantages and disadvantages of a suite of experimental equipment employed by reconnaissance Marines. There are two parts to this experiment. Part 1 involved an assessment of a new software system for recon Marines—the Special Operations Mission Planning Environment–Maritime (SOMPE-M) planning software package. This software was experimented with during a ship-to-objective maneuver (STOM) by I MEF forces off the Camp Pendleton coastline. Part 2 of the experiment involves the employment of a set of experimental equipment by recon Marines during urban combat operations. The point of this was to facilitate a user assessment of the experimental items. We begin this section with a discussion of SOMPE-M and how it was used during the STOM event. We then go on to describe some of the experimental gear that was evaluated by the recon Marines during subsequent experiments at SCLA.

Special Operations Mission Planning Environment–Maritime (SOMPE-M) Experiment
The Special Operations Mission Planning Environment–Maritime (SOMPE-M) system was developed approximately four years ago by Navy Special Warfare (NAVSPECWAR) for use by SEALs and is based upon their Mission Planning Guide, commonly referred to as the "Blue Book." SOMPE-M essentially automates the Blue Book. The system provides users with a standardized format for planning and briefing, reach back capability, as well as a collection of resources. SOMPE-M hardware, as envisioned for Marine Corps use includes two laptop computers, printer, scanner, hub/switch and a projector. The complementary software suite brings together in one package a number of legacy applications, such as the Falcon View mapping package.
Under the auspices of MD 02, a I MEF experimental task force comprised of Marines from the 1st Battalion, 1st Marines (1/1) was tasked to conduct a ship-to-objective maneuver (STOM) from the USS *Boxer*. Their mission was to destroy a weapon of mass effects site at the former George AFB in Victorville, CA, a distance of approximately 200 miles. As part of the experiment, a platoon from 1st Recon Battalion used the SOMPE-M System, which bundles software and hardware together as a mission -planning aid.
MCWL's objective was to find out whether pre-insertion mission planning by deployed forces could result in greater use of reach back staff and theater and strategic intelligence products. We also wanted to determine whether the software resulted in a more efficient and effective planning process for Marine recon units.
MCWL deployed a CNA analyst and a recon Marine to the USS *Boxer* to observe how Marines used SOMPE-M and what impact or benefit the system had on the mission-planning process.

During the 3 days of experimentation with SOMPE-M, Marines used SOMPE-M not as a replacement for their planning process, but rather as a planning aid. SOMPE-M is designed to improve the planning process by bringing together manuals, doctrinal publications, imagery, and standardized briefing templates under the umbrella of a single system. The Marines used a chat room-like function and a real-time, collaborative planning tool embedded in the software to facilitate the planning process. This allowed platoon members to trade information and files instantaneously while conducting mission analysis and course-of-action development. The file transfer protocol enabled the recon platoon commander and team leader to exchange files even when the ship's network was down.

In addition to the system software, SOMPE-M also includes a collection of doctrinal publications, mission-brief templates, and mission checklists. This is expected to cut down on the amount of material Marines have to bring aboard ship for planning purposes.

Our plan was to do detailed analysis of SOMPE-M, but because of general communication problems on the USS *Boxer*, where the recon planning cell was located, we were not able to fully test the system. SOMPE-M relies on a SIPRNET backbone to take advantage of its chat and collaborative planning tools. With SIPRNET down, it was difficult to ascertain how well the collaborative planning tools worked.

Other Recon Technologies

During the Urban Combined Arms Exercise (UCAX) portion of the MD 02 experiment, multiple reconnaissance teams evaluated the utility of several pieces of optic and communications equipment in support of urban operations. Each recon team during the experiment was outfitted with the following equipment:

Miniature Infrared Camera (MIRC)

- Handheld, lightweight, high-quality infrared passive sensor.
- Provided by Defense Advance Research Projects Agency (DARPA)
  - 17 degree field of view optics
  - 160 x 120 infra-red detector
  - 20 x 240 display
  - 3.5 inches long x 2.75 inches wide x 1.75 inches high
  - Powered by AA battery with expected life of five hours during continuous use.

The reconnaissance Marines complained of a spilt screen and that the screen would often black out on them for short periods of time. The range of this equipment is limited to approximately 150 to 200 meters. The MIRC is fragile and not "Marine proof". The MIRC is small, lightweight, easy to operate, and uses AA batteries, which are all positives. The MIRC could be useful in the urban environment when ambient light is insufficient for the use of NVGs. The MIRC is intended for use by reconnaissance teams on patrol in dark alleys, and in room- clearing prior to the occupation of urban observation posts.

AN/PRC-117 Radio (PRC-117)

- Multi-band, multi-mission man-pack radio
- Covers the entire 30 to 512 MHz frequency range
- Embedded communications security (COMSEC), satellite communications (SATCOM) and ECCM capabilities.
- Interoperable with SINCGARS.

Using the PRC-117 is expected to decrease a reconnaissance team's battle load by replacing the PRC-119 (VHF), PSC-5 (SATCOM) and PRC-113 (UHF) radios currently in use. The PRC-117 was used by the Reconnaissance Operations Center (ROC) and by one of the recon teams. Because this multi-band radio encompasses the UHF, VHF and UHF SATCOM frequency spectrums it reduces the number of radios reconnaissance teams have to carry on patrol. With this radio, a reconnaissance team can eliminate carrying the AN/PRC 113 (UHF Radio), the AN/PRC 119 (VHF) radio and the PSC-5 SATCOM radio. They could potentially carry two

PRC-119 radios as a primary and alternate and still carry fewer radios on patrol. The radio is easy to learn and operate and operated with (2) BA-5590 batteries or it can function with a Zinc-air battery with a lead acid assist adaptor.

Iridium Phone

Marines used the Motorola 9505 Iridium phone, which was used in conjunction with a laptop to transmit written and photographic data. The Iridium Satellite System allows users to transmit from around the world by using low earth orbiting satellites as the principal relay infrastructure, a feature that is especially useful in remote areas.

The iridium phone is not a substitute for poor communications with legacy systems, which is typical in an urban environment. There will continue to be problems with legacy systems because they rely on line of sight, which is often obstructed therefore creating weak signal strength and the loss of transmissions. Iridium phones are an excellent piece of communications equipment when line of sight to the satellites is unobstructed such as in the desert environment. It is relatively small compared to most conventional military communications equipment but it is somewhat fragile. The ability to transport data and digital images over the iridium phone is an excellent feature, but again it relies on unobstructed line of sight. Marines reported that battery life on the Iridium phone is also an issue. These phones need extended life batteries for extended operations.

Man-Packed Secondary Imaging Device (MP-SIDS)

The MP-SIDS system is comprised of three (3) out stations and one (1) base station. The out station consists of: a digital camera, a field computer, and a radio data controller interface for transmission over organic Marine Corps field radios. There is also one generation III night intensifier tube per MP SIDS suite that can be used on any of the three cameras.

The MP-SIDS upgrade allows for excellent clandestine communications. The ability to send digital images over tactical communications nets creates better situational awareness on the battlefield and assists commanders in making informed decisions. The MP-SIDS allows for the Reconnaissance Operations Center to keep an electronic log of all communications sent via the MP-SIDS on the hard drive of the computer and this can be easily networked to other users such as the S-2 or other units. The cameras and long-range lenses allow for the reconnaissance teams to take quality digital photos providing hard copy information that can be analyzed for intelligence. There is a considerable amount of training necessary to make the reconnaissance Marines proficient with the camera. The system as a whole easily interfaces with the VHF, HF and SATCOM radios used by reconnaissance units today.

Section IV – Precision Targeting Experiment

This experiment focused on the utility of a new, digital targeting and communications system. The Universal Combined Arms Targeting System (UCATS) is designed to make sending artillery calls for fire easier, faster, and more accurate. The point of this experiment was to determine the system's applicability in an urban combat environment.

System Description

There are three basic UCATS components. They are:

- Rugged handheld computer with a built-in GPS card.
- Laser rangefinder.
- SINCGARS radio.

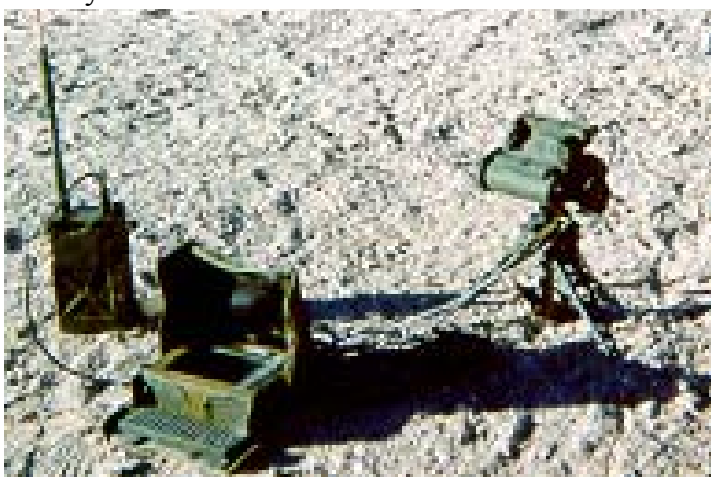


Figure 8 UCATS Hardware Components

Figure 8 shows these of these components. The UCATS takes inputs from the laser range finder and onboard GPS and transmits a call for fire to a fire-support coordination center (FSCC) via the radio. A forward observer uses the laser rangefinder to determine a target's azimuth and elevation relative to his observation post (OP). The software calculates a target grid based on the user's GPS reading and the target's location relative to the observation post. The UCATS digitally transmits a fire mission to an Advanced Field Artillery Tactical Data System (AFATDS) at the FSCC. The AFATDS can then send digital calls for howitzer fire directly to the gun line. This is expected to decrease the time required to prosecute a call for fire and to eliminate errors that occur when grids are read aloud or typed by hand. Although, at present, mortars cannot receive digital calls for fire, forward observers can use UCATS to digitally transmit calls for mortar fires to the FSCC. In addition to calls for fire, UCATS transmits and receives other fire-support coordination messages sent between the forward observer and FSCC

Experimental Objective and Hypotheses

MCWL's objective was to test the effectiveness of UCATS during military operations in urban terrain (MOUT). We hypothesized that Marines equipped with UCATS could

- Assemble and use the system rapidly enough to generate calls for fire in support of maneuver.
- Maneuver effectively with the supported unit.
- Not increase their exposure to enemy direct fire.

Marines experimented with UCATS during the battalion RSTA experiment. This venue provided data collection opportunities during a variety of tactical situations and permitted a baseline comparison for analysis. Forward observers (F/Os) equipped with UCATS were told to employ the system for all fire missions, even when doing so might mean exposing themselves to enemy fire. Observer-controllers (O/Cs) were told to reactivate UCATS users adjudicated as casualties, in order to ensure sufficient fire missions were generated.

UCATS Employment During MD 02

During MD 02, Marines identified target grids using UCATS. They transmitted voice calls for fire to the FSCC using an AN/PRC-119 or AN/PRC-148. This was done in lieu of transmitting the data from the rugged handheld computer. (The two radios can transmit either voice or digital data.) We asked the Marines to use voice calls for fire because of the difficulty of setting up digital communications between UCATS and AFATDS.[8] Because the primary goal of this particular experiment was to assess the use of the UCATS' laser-range finder, we did not want difficulties in trying to establish a digital link with AFATDS to get in the way of obtaining the data we needed to assess UCATS as a precision targeting device.

The laser rangefinder used in this evolution was the AN/PVS-6 Mini-Eye Safe Laser Infrared Observation Set (MELIOS). This rangefinder, like other laser rangefinders that can be used with UCATS, has a magnetic compass that requires calibration. In order to get accurate readings from the magnetic compass the user must perform a calibration sequence that involves standing and pointing the rangefinder in several directions. This calibration should be repeated each time the magnetic environment changes.

Forward observers from 3/7 used UCATS on 1 August, a rehearsal day, and then again on the initial experimental day (1E). At the end of event 1E, 3/7 decided to give UCATS to a surveillance and target acquisition (STA) team and one recon team during event 2E (the security operations scenario), and to two different recon teams during event 1B (urban combat scenario). This left us with two baseline groups—the event 2B group of forward observers and the event 1E group of recon Marines, neither of whom had ever used UCATS prior to these events. This meant that they were going to report calls for fire the current way—via radio to the FSCC to the gun line.

While forward observers received several hours of UCATS training, the recon and STA teams received less than an hour of training. During event 2E, the recon and STA teams used only UCATS for notional calls for fire before play began. UCATS use during events 1E and 1B was also quite limited.

Analytical Results

Table 11 shows the number of calls for fire that took place during MD 02 RSTA experiment by scenario. The table shows that UCATS was used during three of the four scenarios to request 155mm artillery fire. There were three instances where Marines used UCATS without prompting. In all other instances, the Marines were directed by experimental control to use UCATS, a total of 13 times. We did this to get sufficient data to determine how well UCATS could identify and report targets in an urban environment. During this same time period, Marines made eight calls for artillery fire using traditional methods. Marines did not use UCATS to call for mortar fire at all, possibly because UCATS had been described to them as being an artillery targeting system.

The following sections analyze different aspects of UCATS based on the 13 fire missions we have data for (three of the unprompted UCATS missions were never radioed into the FSCC so we don't have any data on them). We begin our analysis by discussing target location error (TLE), which denotes how accurate the UCATS system was in estimating target distance during the experiment.

[8]This had been a problem during earlier UCATS experimentation at Camp Pendleton in May 2002.

Target Location Error (TLE)

For the 13 target missions that observer-controllers directed Marines to send, we had two sets of position grids—those determined by UCATS and those determined by the O/Cs using differentially corrected Integrated GPS Radio System (IGRS), which we considered to be ground truth. We asked the O/Cs to move to the intended target's location and take GPS readings using the IGRS. We considered the distance between the UCATS and IGRS grids to be the TLE. In addition, we asked the O/Cs to log the numbers of the building from which UCATS was used so that we could determine typical target-OP distances and examine the accuracy of UCATS target readings.

Table 11. Calls for Fire by Scenario, 2-4 August 2002

	Calls for fire (155mm howitzers)		Calls for fire (80mm mortars)
Experiment	With UCATS	Without UCATS	Without UCATS
Event 1E	2 of 5 without prompting	3	6
Event 1B	1 of 1 without prompting	5	3
Event 2E	10 of 10 with prompting	0	0
Event 2B	0	0	0
Total	13 of 16 with prompting	8	9

In table 12, we highlight the average distance to target and TLE for our three experimental groups. As the table indicates, there were large differences in the TLEs for different groups. The STA team had the smallest average TLE—19 meters, which was substantially less than those of the forward observers and recon teams. On average, the STA team also had the longest distances between UCATS user and target. We do not know why the STA team did so much better than the forward observers and recon team in terms of targeting accuracy.

Table 12. UCATS Targeting Data During MD 02, 2-4 August 2002

UCATS Users	Obs	Avg. distance to target (in meters)	Avg. TLE (in meters)
Forward observers	3	142	787
Recon team	5	90	60
STA team	5	152	19
Combined totals	13	126	212

In figure 9, we summarize TLE data for each observation in our dataset. The figure shows quite a range of targeting error—from 6 to 1,230 meters. Less than one-half of the targets engaged had target location errors less than 25 meters. We don't know the exact cause for such wide-ranging TLEs, but we suspect three major contributing factors: a lack of familiarity with UCATS,

difficulties in establishing GPS locks, and problems lasing targets. The GPS and laser rangefinder problems are discussed below. The large spread of TLEs suggests that UCATS was not very useful in this experiment.

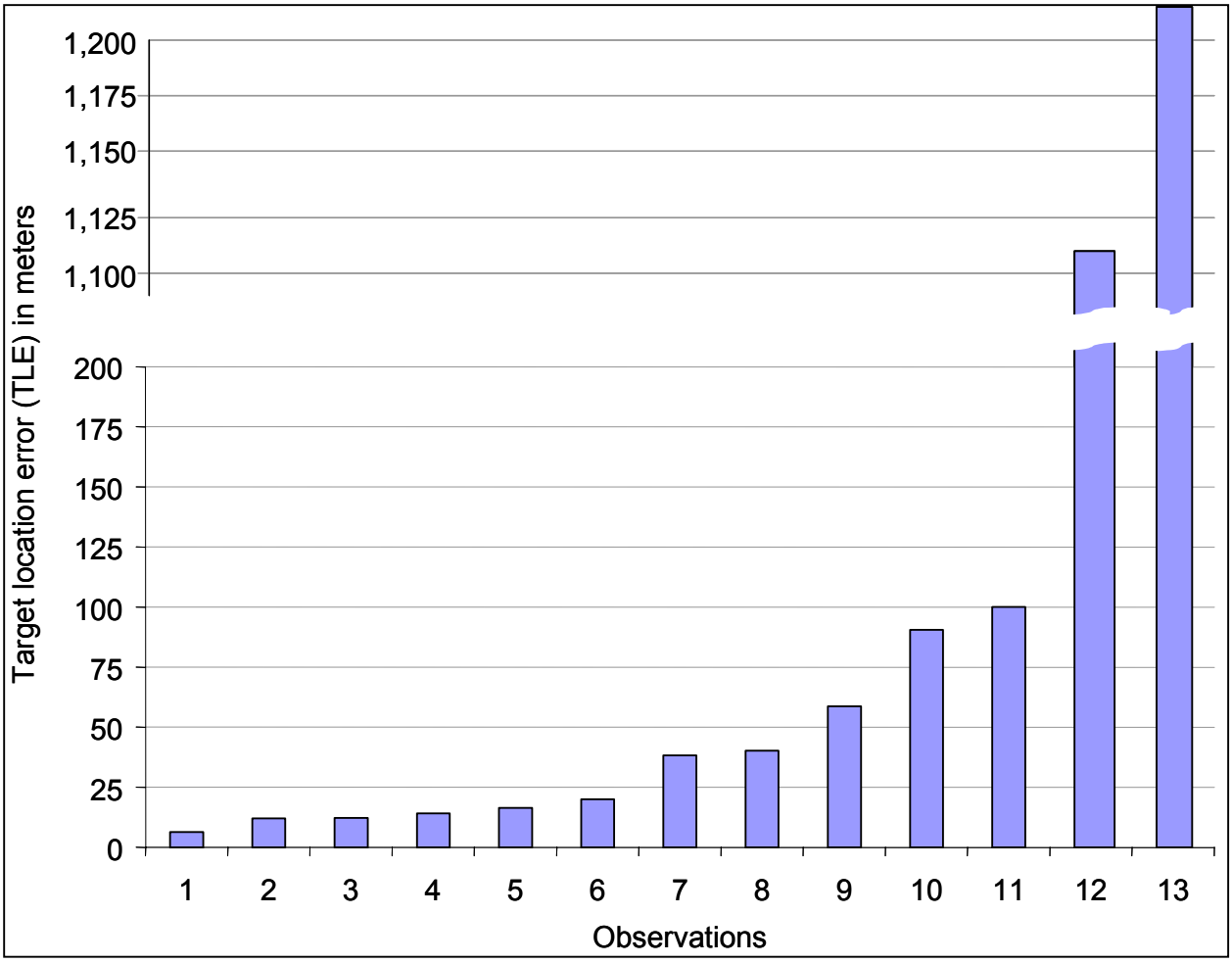


Figure 9 Target Location Error (TLE) Observations, 2-4 August 2002

Target Distances

We now turn to the distance between UCATS operators and the targets they were attempting to engage. Because it was impossible to see targets more than 100 to 200 meters away, most targets were rather close to the UCATS operators. The proximity of abandoned housing units, sometimes only 10 to 20 meters apart, and rules prohibiting Marines from climbing on buildings contributed to the low target distances.

In figure 10, we show these distances for each of the 13 target observations in our dataset. Overall, the distances ranged from 50 to 260 meters, with a median of 110 meters.

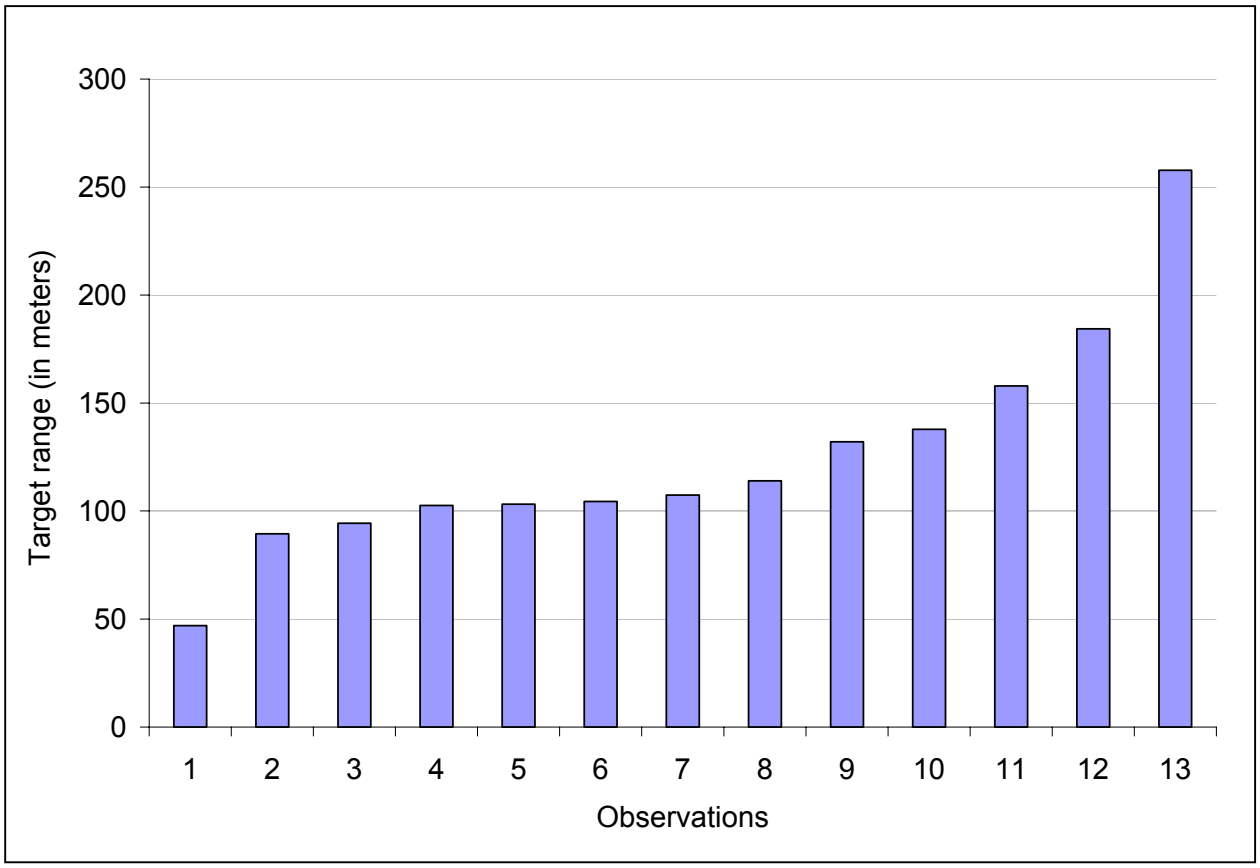


Figure 10 Target Ranges During Bn RSTA Experiment, 2-4 August 2002

The lethal radius of a 155mm HE shell is 50 meters, and the "danger close" region is 500 meters. This meant that every single UCATS observation fell within the danger close region and that one observation fell within the lethal radius of a 155mm HE shell. Given these short distances,

Marines might have used UCATS to call for mortar fires, but chose not to. It is also interesting to speculate on what might have happened had the playbox had larger buildings in it. For instance, if Marines had been able to place an OP in a location from which they could have seen more distant targets, perhaps on the top floor of a tall building or on a water tower, a longer field of view might have been established, which would have increased UCATS applicability. But this did not happen, as the playbox used for the experiment consisted entirely of one- and two story buildings.

Combining Target Accuracy and Target Location Data

In figure 11 we combine target accuracy and target location data to graphically illustrate how well UCATS did in identifying target grids. The data points denote both the distances between UCATS users and the targets that were being lased and how accurate the target designation was relative to an IGRS reading. To illustrate all 13 targets on the same map, we shifted the three OP locations to grid coordinates 0-0. This point is denoted by a gray triangle in the center of the

chart. We then plotted the location of each target relative to the OP from which it was observed, which allows us to see approximate distances from the OP to the target.

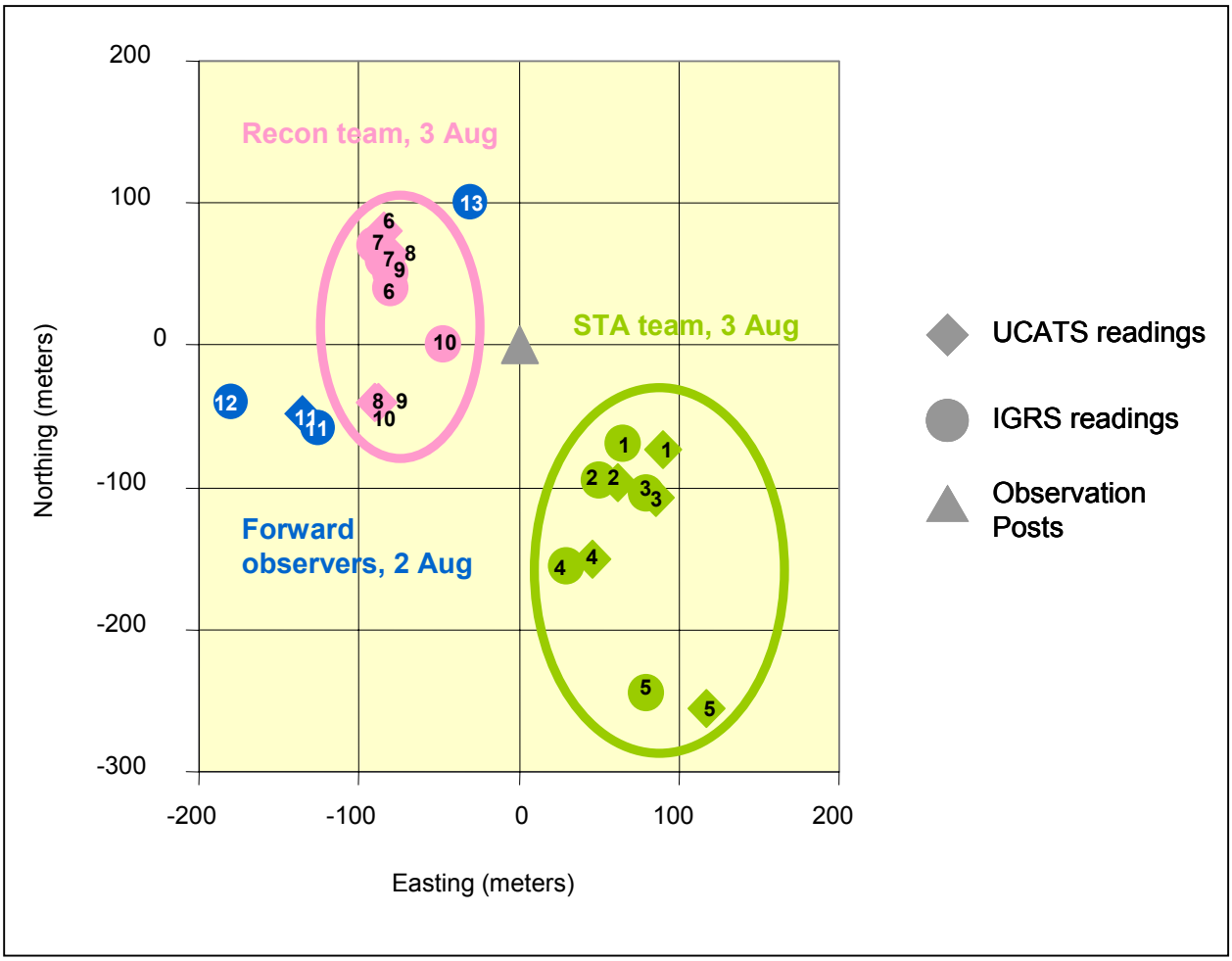


Figure 11 UCATS Target Locations in Relation to Observation Posts

In order to highlight accuracy, we used symbols to differentiate between targets called into the FSCC by UCATS users (the diamonds) and those recorded by the O/Cs using IGRS (the circles). The IGRS readings were meant to establish ground truth about the exact location of the target the UCATS user was attempting to hit. We numbered each symbol so it is easier to tell which UCATS readings match which IGRS readings.

We color-coded the data points in order to differentiate between different groups of Marines using UCATS. The pink oval and all pink data points show the targets lased by the recon team on 3 August. The green oval and green data points show the targets lased by the STA team on 3 August. The blue data points, which are outside the two ovals, show the UCATS and IGRS grids; i.e., those targets lased by the forward observer team on 2 August.

Overall, the figure illustrates the large differences in the TLEs for different UCATS users. The STA team, for instance, had the smallest average TLE—19 meters, which was substantially less than those of the forward observers and recon teams. The STA team also had the longest distance between UCATS user and target. This is interesting but inconclusive because we do not know why the STA team did so much better than the other UCATS users—i.e., the forward observers and recon team. What's also puzzling is that the UCATS grids for all STA team targets were all east of the IGRS locations. We do not know what could cause this kind of systemic error.
The forward observers, on the other hand, had rather large targeting errors associated with two of the three UCATS grids they called in. These correspond to the blue circles labeled "12" and "13" in the figure and represent the location of the targets that the UCATS users were trying to designate. The actual target grid passed back to the FSCC was well outside the playbox, and also well outside the region shown in the figure. We suspect that these large errors are the result of inherent problems with GPS (a failure to lock on), which makes targeting in urban areas somewhat unpredictable.

We believe that the inaccuracy of the recon team's grids may have something to do with the tendency of the laser used to reflect off obstacles rather than the intended target in a number of cases. The following sections describes in more detail some of the typical problems that UCATS users experienced and which may help explain some of our analytical results.

GPS Problems

As we have noted, Marines frequently found it difficult to get a good GPS reading. We received a number of pertinent comments:

- "GPS took a while to lock on—even after we put the antenna on the window sill."
- "The GPS reading was inaccurate, thus throwing off target locations."
- "UCATS GPS reading was jumping all over the grid."

Why did users have such problems with the UCATS GPS? GPS receivers need to pick-up signals from at least four satellites to compute a grid. Whether the receivers can detect the satellite signals inside buildings depends on what physically gets in the way of the GPS antenna and the satellite. Receiver sensitivity also plays a role.[9] The comments we received indicate that UCATS GPS reception was sporadic. The GPS receiver occasionally picked up GPS satellite signals within the wood-frame buildings of Victorville, but without much reliability. Putting GPS antennas on windowsills did not guarantee that a good grid would result because the building itself may have blocked line of sight to the satellites. In response to this problem, one O/C suggested replacing the UCATS GPS antenna, which consisted of a hockey puck at the end of a wire, with a retractable antenna or Slinky-like device that could provide better reception. A longer antenna, however, may actually decrease accuracy of the system because the rugged handheld computer thinks it is located where the antenna is located.

Laser Rangefinder Problems

In addition to GPS, UCATS users also experienced a variety of laser rangefinder problems. During the experiment, calls for fire tended to come from Marines hiding inside buildings. To avoid detection, forward observers and recon Marines stayed away from windows and used

[9]We observed similar problems during Joint Combat ID Evaluation Team (JCIET) experiments in wooded terrain, which were held at Camp Shelby, MS.

screens to block the view into the buildings where they were hiding. They then attempted to use the laser rangefinder through these screens. They preferred this to exposing their heads above the windowsills. The problem with using the screens, however, was that light from the laser rangefinder sometimes was reflected back toward the person using the UCATS device. This caused the rangefinder to return the wrong grid coordinates; i.e., the coordinates of the person using the UCATS. This might have created a fratricide problem had the Marines using the rangefinder not realized it was happening, which is quite possible in a fast-paced combat situation. One way to avoid this problem would be to make a hole in whatever screen was being used—big enough to laser targets but still small enough to prevent compromising the forward observer's position.

In addition to the problem of reflected light, obstacles often got in the way of lasing a distant target. This made it difficult to get an accurate grid using the laser rangefinders. We have already discussed this problem at length—i.e., the limited fields of view from observation points because of the proximity of so many surrounding buildings and the occasional tree. We note it again as a limiting factor in the utility of UCATS in an urban environment.

Another problem was the laser rangefinder's tripod, which proved unsuitable for use in the urban terrain. The tripod itself is only a few inches high, while the windowsills of the buildings were much higher. As a result, there were no instances that we were aware of where Marines actually used the tripod. This may have affected the accuracy of the grids, because it is more difficult to get an accurate target grid when the rangefinder is hand-held.

Another issue is calibration. During MD 02, Marines rarely calibrated the UCATS laser rangefinder during the experiment. This may have resulted from lack of instruction on how UCATS works and on general system requirements. The Marines who calibrated the compass were the ones who had received the most UCATS training prior to the event. We have not been able to determine how well Marines who calibrated their devices did relative to those who did not. We do know, however, that the recalibration process itself generally took a few minutes and was done from inside whatever building Marines were hiding in.

BA5600 Battery Reliability

UCATS operators experienced a battery problem similar to the kind observed during previous experiments and thus not specific to the urban environment. One rugged handheld computer's battery failed early on 4 August, the last experimental day before the baseline events began. During the experiment, we replaced the computer's battery every night, so we know that the battery had seen little use. This failure as well as similar ones observed during earlier experiments may be the result of problems with the internal fuse in the BA500 battery. A newer version of this battery is forthcoming and will not have an internal fuse, which may eliminate this problem altogether.

Too Many Datums

Finally, UCATS operators had to contend with a number of different datums. A geodetic datum gives an approximation to the shape of the Earth and defines a coordinate system based on that approximation. There are many different datums, some intended to represent the shape of the Earth in a specific region. The standard datum for U.S. military maps is World Geodetic System 1984 (WGS 84). Most GPS targeting systems default to WGS 84 standards. However, many maps based on older datums are still in use. This raises the possibility that coordinates for the same point may differ by several hundred meters given the different datums being used.

Figure 12 superimposes the WGS 84 datum (in red) for the playbox area over the datum on the Southern California Logistics Airport (SCLA) playbox map (in black). The SCLA map was created by MCWL and distributed to 3/7 prior to the experimental events. This map had the benefit of listing all the buildings within the playbox by number and sector, thereby facilitating targeting and reconnaissance efforts. As the figure highlights, the displacement between one datum and the other is about 325 meters. That means that a point with grid coordinates x, y on the SCLA playbox map is 325 meters from a point with coordinates x, y on a map with a WGS 84 grid. When we compare the SCLA playbox map to the North American Datum 1927 (NAD 27), still used for many U.S. installation maps, we find a difference of about 165 meters. When we compare the grids of a U.S. Army Space Command map of Victorville, CA and a National Imagery and Mapping Agency map of Victorville, we find that the difference between the two is more than 100 meters, although both maps are labeled WGS 84.

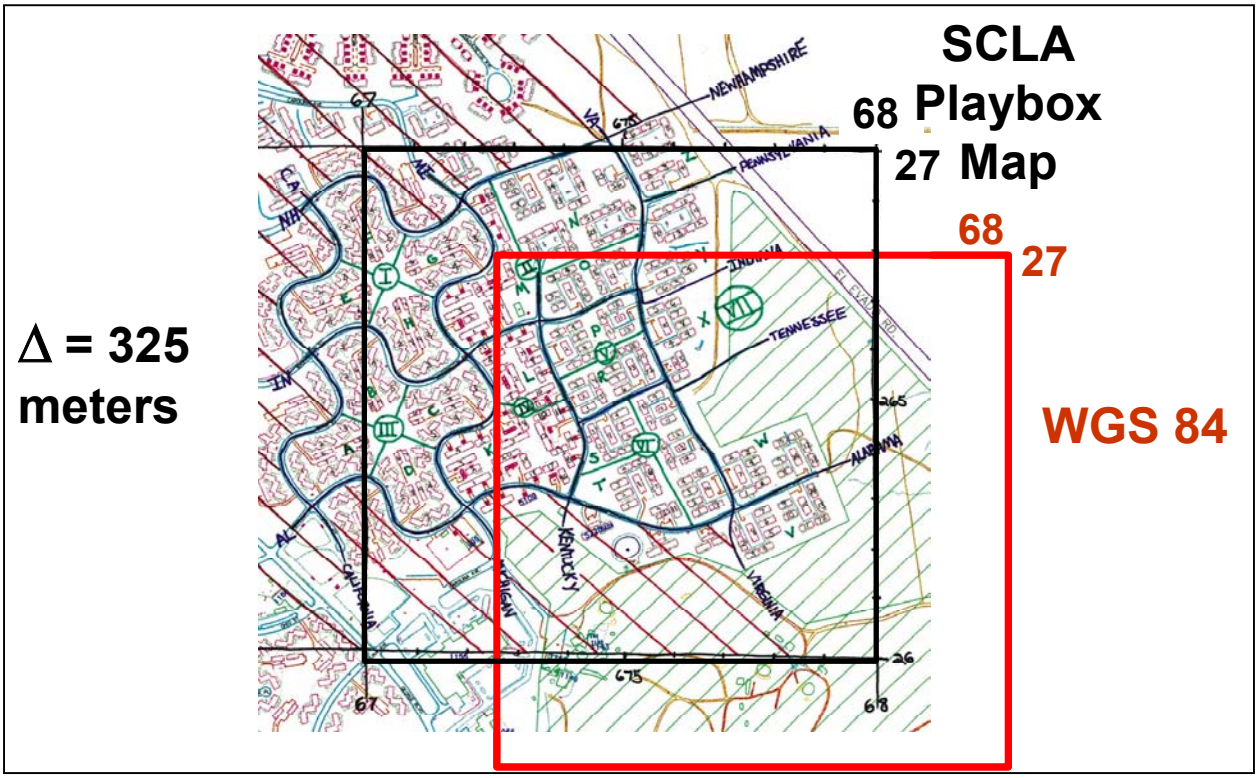


Figure 12 Comparison of SCLA Playbox Map Datum with WGS 84 Datum

All this goes to the general problem of coordinating targeting procedures with Marines who may be using maps with different datums. If all Marines have maps with the same datum, it does not matter which datum is used. However, when Marines are using maps with different datums, supporting fires easily could be aimed at the wrong target.

Conclusion and Recommendations: Precision Targeting Experiments

We now return to the hypotheses posed at the beginning of this section. The first hypothesis was that Marines could assemble and use UCATS rapidly enough to generate calls for fire during urban operations. In general, we found that GPS and laser-based target location devices were not that useful in urban terrain.

The second hypothesis was that Marines using UCATS could maneuver effectively with the supported unit. We observed that Marines were able to maneuver while carrying UCATS, but it was an extra burden. Most Marines who used UCATS were able to carry the rugged handheld computer and the laser rangefinder in their packs when they displaced. One Marine, however, had trouble fitting the extra gear into his pack and had to carry it with a shoulder strap. Although they managed to carry UCATS, Marines said that it was too large, too heavy, and made movement in urban terrain more difficult. The rugged handheld computer and rangefinder added another 12 pounds of gear to the 80 or more that a recon Marine typically carries.

The last hypothesis was that Marines using UCATS would not increase their exposure to enemy direct fire. Most Marines used UCATS from fixed locations—in buildings that offered some degree of concealment. This largely protected them from exposure to enemy direct fire, although those not behind screens still had to expose their heads to "lase" a target. During MD 02, only one Marine became a casualty while using UCATS, and this occurred when he was packing up the system, not actually employing it for a fire mission.

The bottom line: UCATS was not that useful in MD 02. Because the one-story buildings that Marines were operating from were so close together, forward observers could see only those targets within 200 meters of their OPs. For concealment purposes, OPs tended to be set up inside buildings, which limited the field of view. Use of laser rangefinders in this type of terrain is problematic because the laser beam may be reflected or absorbed by obstacles between the laser and the target. The GPS that is part of the system is also less likely to lock onto satellite signals when inside a building, which has significant implications for how reliable the acquired targeting information is.

Because of these inherent limitations to any laser-designated targeting system in an urban environment, we recommend the following:

1. *If available, use small-scale maps with numbered buildings for targeting in MOUT.* MCWL provided small-scale maps of the SCLA area to 3/7. These maps assigned numbers to each building. (Figure 11 shows a portion of one such map.) Marines felt that these maps provide a near-ideal way of identifying targets during MOUT. As long as everyone has the maps, all a forward observer has to do to target a building is to call in its building number. However, it is not clear that small-scale maps that give every building its own number will be available when needed. Using equipment at MCB Quantico, it took MCWL three weeks to make the maps distributed during MD 02. Thus, it is worth considering other methods of conducting targeting in an urban environment.

2. *If small-scale maps are unavailable, use one of the following targeting methods:*
    a. *Maps, compass and GPS:* Because there were so many building in the SCLA area, forward observers could not see targets more than 100 to 200 meters away. This raises several questions: When targets are that close, what is the best way to identify them? What is the most accurate way of doing so? It could be that the most effective method is to use maps, compass, and GPS vice a high-tech, laser designation system. Until we do more experimentation, we are not going to know for sure which is the case.

b. *UCATS with imagery from the controlled image base (CIB)*. The controlled image base (CIB) is a set of digitized and orthorectified black and white images produced by NIMA. The rugged handheld computer running UCATS software can display CIB images of target areas. If the appropriate CIB images are loaded onto the computer, Marines can zoom in on the images with enough resolution to distinguish individual buildings. If Marines can identify a target building this way, UCATS can provide a target grid. This would greatly facilitate targeting when small-scale maps with numbered buildings are unavailable.

Section V – Enhanced Tactical Surgical Care Experiment

During the UCAX phase of MD 02, medical detachments (dets) from 1st and 2d Force Service Support Group (FSSG) employed a Forward Resuscitative Surgical System (FRSS). This is a medical package designed to augment an existing unit's organic medical capabilities. During MD 02, we examined the effect of attaching the FRSS to the battalion log train and operating it in an urban environment in direct support of an infantry battalion.

System Description

Medical professionals describe a "golden hour," which occurs during the first 60 minutes after a trauma event. It is assumed that severely traumatized patients who receive intensive-care treatment during this golden hour have a greater chance of survival and recovery than those who don't. Currently, this kind of life-sustaining surgical intervention is not possible until a battlefield casualty is evacuated far from where he was originally injured—probably to a fleet hospital or hospital ship, which may be hundreds of miles from the wounding site. The FRSS is designed to plug into warfighting units, thereby providing a forward surgical intervention capability. Because of its relatively small logistics footprint and forward positioning, the FRSS is expected to speed-up the process of getting advanced surgical treatment to the most severely injured and provide the necessary surgical capability required to stabilize casualties who might otherwise die or lose limbs before reaching treatment.

Personnel Requirements

The FRSS consists of eight medical personnel trained and equipped to handle triage, immediate therapy/resuscitation, salvage surgery, and post-operative care. There are two surgeons, one critical care nurse, one anesthesiologist, and four corpsmen in the FRSS. They have facilities to treat up to five critically injured Marines at a single time—two in pre-operative care, one in surgery, and two in post-op care.

Logistics Requirements

During the UCAX, the FRSS was stocked to handle up to 18 patients in a 48-hour period and had a logistics footprint consisting of:

- An M997 light HMMWV
- An M998 heavy HMMWV
- Two M101A trailers
- A 7-ton MTVR
- Extended boom forklift
- Two environmental control units (ECUs) and generators

The forklift, the ECU, and the generator do not come with the FRSS. Instead, they have to be provided by the supporting unit, in this case by 3/7, which in turn had to request the equipment from its parent regiment, the 7th Marines.

Concept of Employment

The current concept of employment is to deploy the FRSS in support of maneuver elements upon request. These requests would normally be channeled through the MAGTF combat service support element (CSSE), which would collaborate with the ground combat element (GCE) to determine the number, location, and command relations for required FRSS units. An FRSS-

equipped surgical team would be assigned to a requesting unit in either a general support, direct support, or an attached role.

For purposes of experimentation, we assumed that the experimental FRSS unit was assigned in direct support of an infantry battalion. Our analysis and the subsequent comments of experiment participants are based on this relationship. Because there was no higher headquarters play or any pre-planning process before the start of the experiment, our analysis is limited to what was observed during the experimentation period at the battalion and company levels.

The net result of this was that the experimental FRSS had to rely on the infantry battalion for all its T/E equipment, like trucks, generators, a forklift, and all consumable material. We anticipate that in actual combat operations the supporting FRSS will acquire all T/E assets for a given operation from the parent CSSE, as well as establish the means to replenish FRSS medical supplies. Had that been possible within our experimental framework, it might have lessened some of the participant's confusion about general support relationships, particularly those dealing with logistics. That said, it might be that common items, such as fuel, chow, and water, could best be provided via the supported unit's logistics chain instead of the CSSE's.

Doctrinally, issues like force protection remain the responsibility of the element providing direct support, but because of the unique nature of the FRSS, the supported unit may be forced to take a more active role to ensure security of this unit particularly during a STOM or in urban terrain where no secure rear areas exist.
It has yet to be determined the most appropriate combat unit that a single FRSS can best support.

Current Status
The FRSS is fully funded with production and fielding of 15 units to occur during the FY03 timeframe. Both I Marine Expeditionary Force (MEF) and II MEF are to receive four FRSSs each (one for each surgical company and one per MEB). III MEF is also scheduled to receive two FRSSs. The remainder will be allocated to MARFORRES and to maritime pre-positioning squadrons (MPSRons).

Analysis Objectives and Experimental Design
The goal of this experiment was to determine how well the FRSS operates in direct support of an infantry battalion and how useful it is in an urban combat environment. This led to our focus on casualty evacuation procedures (i.e., the timelines associated with moving casualties from one location on the battlefield to another). We viewed these as critical indicators of the effect that a forward-surgical capability would have in an urban combat setting. We also focused on issues of mobility and deployability, which are critical to understanding how the FRSS could be employed in an urban environment.

There were no hypotheses developed for this experiment.

Data Collection

We based our analysis of the FRSS on several sources of information. These included:

- *Multiple Integrated Laser Engagement System (MILES) data*. Each Marine participant during the UCAX was outfitted with MILES. We used this system for information about initial time of wounding.
- *The BAS log book*. The records found in this log provide information about BAS throughput, the disposition of patients received, and the time that a patient was received by the BAS. It also contains information about the eventual disposition of the patients.
- *The FRSS log book*. The FRSS log provides similar information as that found in the BAS log but for those patients forwarded to the FRSS.
- *Observer/controller (O/C) notes*. The O/Cs assigned to the FRSS took detailed notes of what happened at and around the FRSS throughout the UCAX. At any point in time, there was at least a single O/C (and usually two O/Cs) co-located with the FRSS.
- *Ad hoc after-action reports*. There were a number of after-action reports written by the experimental unit and various O/Cs.

Analytical Results

We begin by examining the number of "hits" registered by MILES during the UCAX. We use this to establish the number of casualties the battalion aid station (BAS) and FRSS had to treat. MILES is a force-on-force training system, which uses coded laser beams to simulate the effects of line-of-sight weapons. Each weapon fired emits an invisible eye-safe coded laser beam. A number of laser detectors mounted on helmets and h-harnesses are used to sense incoming fire.

The detectors register incoming laser beams and determine whether they have scored a near miss or kill. By examining the total number of times the system registered a hit on a player wearing a set of detectors, we can then determine the approximate number of casualties associated with a particular event. The system also allows us to match "hit" data to the time of day that a contact occurred and the shooter.

In figure 13, we highlight total MILES hits during each hour of the 72-hour UCAX. The figure shows the numbers of hits registered against blue force (BLUFOR), opposing force (OPFOR), and civilians by time of day. As the figure indicates, most of the casualties occurred within the first 10 hours of contact—when the infantry battalion was on the attack. This represents nearly half of all total casualties for the entire experiment. It also reflects first-day BLUFOR casualty losses of 20 percent.

In table 13, we highlight total casualties for BLUFOR, OPFOR, and civilians by day. The table shows a sustained casualty rate for BLUFOR of 30 percent for the UCAX period. This reflects an initial battalion strength of 950, which was augmented in subsequent days by the Marines who were casualties in preceding days. This refers to those Marines who were rejuvenated by O/Cs and allowed to rejoin their units. This practice increased total infantry battalion strength to 1,296 effectives for the UCAX period (950+197+67+82)

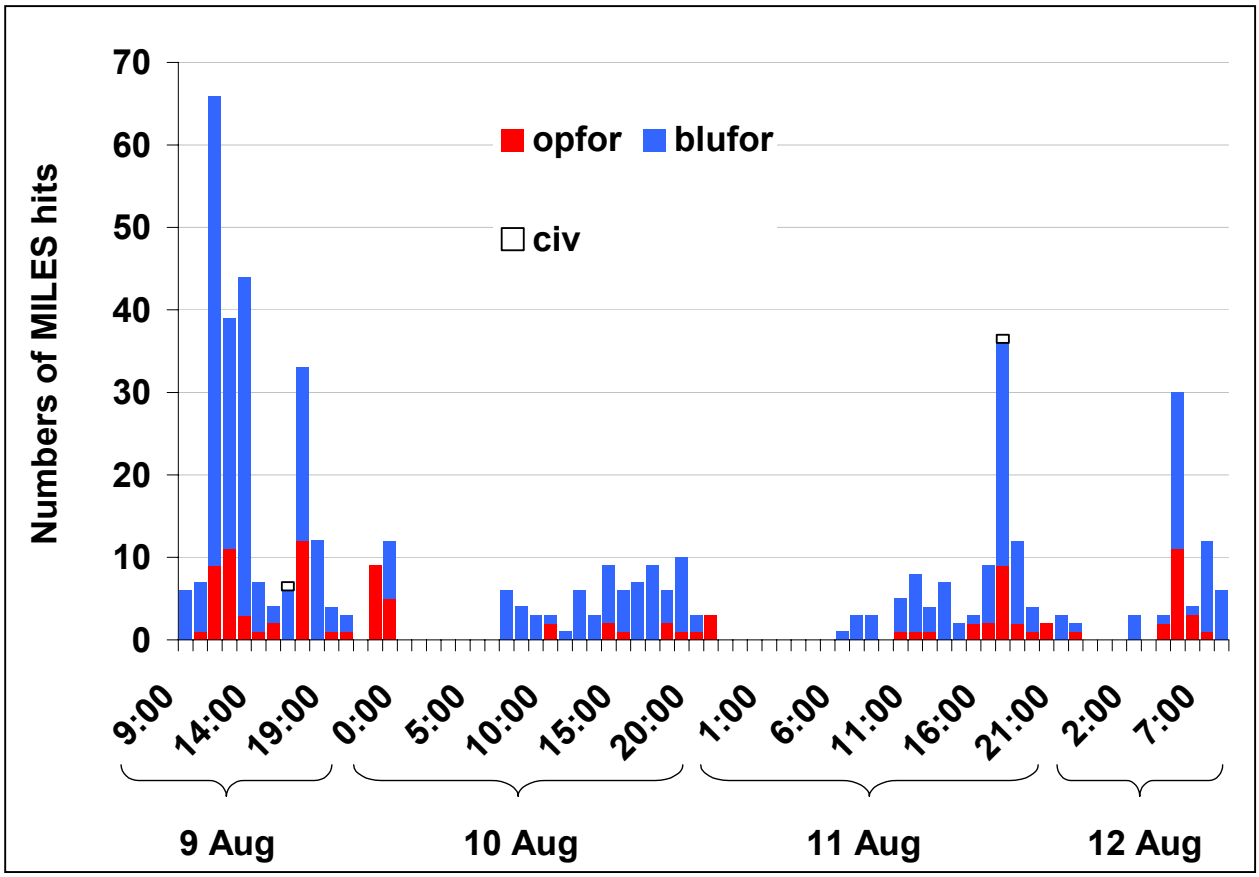


Figure 13 Number of MILES Hits During UCAX, 9-12 August 2002

Table 13 highlights the numbers of casualties during each phase of the experiment. Each day of the UCAX was intended to test a unit's capabilities to conduct certain missions within all three blocks of urban warfare. Day 1 consisted of an infantry battalion in the attack and a transition into a firm base, defensive posture. Days 2 and 3 mostly consisted of satellite patrolling from the firm bases followed on day 4 by a counterattack by opposing forces. Although the most number of single-day casualties was the first day (while the battalion was on the attack), subsequent days produced more cumulative casualties to both the experimental battalion and OPFOR.

Table 13. Total Casualties During UCAX, 9-12 Aug 2002

Player ID	Day 1	Day 2	Day 3	Day 4	Totals
BLUFOR	197	67	82	41	387
OPFOR	55	12	22	17	106
Civilian	1	0	1	0	2
Totals	253	79	105	58	495

We use this dataset to highlight the pool of casualties that battalion medical assets might face in an urban combat environment. We recognize that these numbers may be somewhat inflated, owing to the artificiality of any exercise/experiment. We suspect that had real bullets been flying, Marines likely would have paid more attention to the risks they undertook, thereby reducing casualties by some unknown amount. That said, the dataset provides us an estimate of the total casualties that an infantry battalion might experience in this type of environment.

Casualty Play During UCAX

During the UCAX, casualties were initially treated by corpsmen assigned to each rifle company (approximately one per platoon and maybe four per company). The injured and dead were transported via 4-wheeled *John Deere* Gators—*see enclosure (4) UCAX for expanded write-up on the use of the Gator*—HMMWVs, trucks, assault amphibious vehicles (AAVs), and when possible on foot back to casualty collection points. From there, they were moved to the BAS using the same modes of transportation.

Figure 14 contrasts the number of casualties that were received by the BAS during the course of the UCAX (in black) with the total numbers of total casualties based on the MILES data. The figure shows that far more Marines were wounded or killed during the UCAX than were logged into the BAS—only about a half of all casualties and only about 60 percent of all BLUFOR casualties. What do we attribute this to? This could be the result of the way MILES hits were adjudicated by O/Cs. It could also be a product of the lack of available transport back to the BAS or some other experimental anomaly.

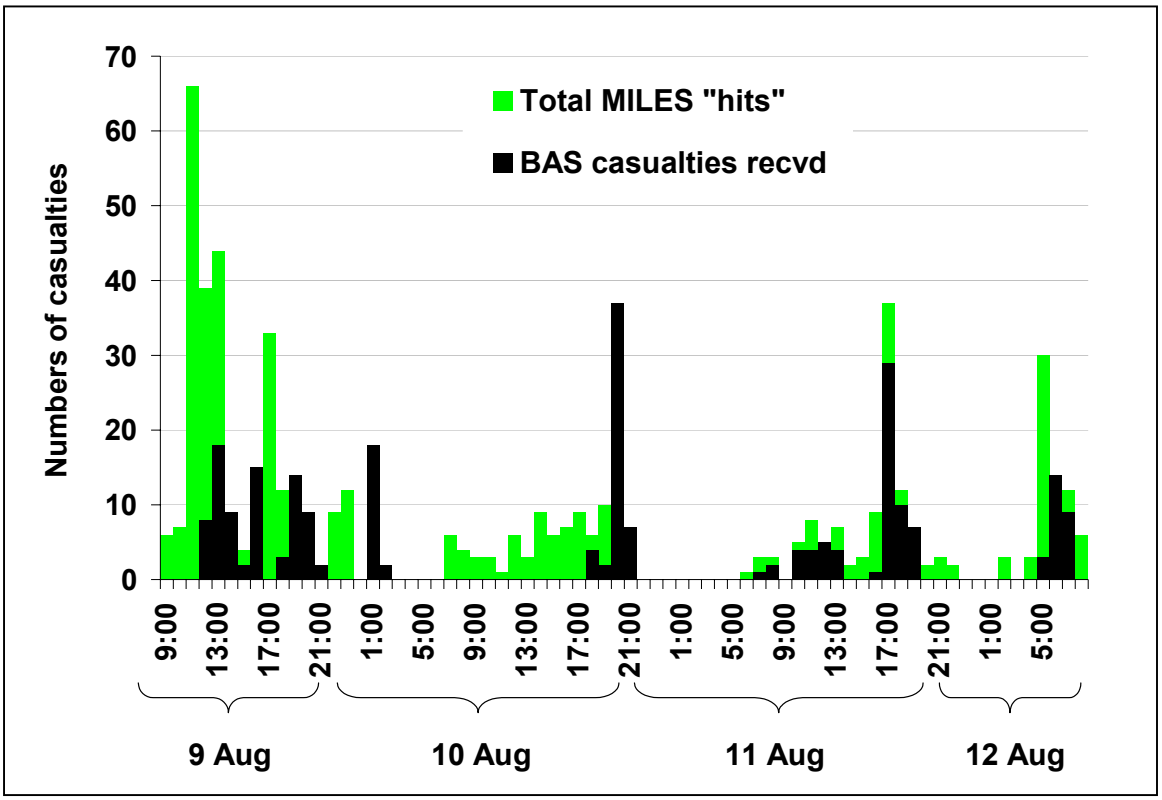


Figure 14 Numbers of Total Casualties Versus Casualties Received by the BAS

The BAS sorted incoming casualties into three basic groups:

- Marines killed-in-action (KIA)
- Seriously wounded Marines
- Marines whose injuries were not so severe that treatment could be delayed.

These assignments were based on an assessment of the likely effect that a particular weapons system would have on a targeted Marine, as made by an O/C shortly after a Marine's MILES sensor went off. After assigning an injury type, O/Cs placed a rough description of the injury in the left front pocket of a Marine's utilities. Medical personnel would then use that description as the basis for their decisions about who was in need of immediate medical care and who could be delayed. The description was also used in determining the proper medical treatment for the patient.

In figure 15, we highlight BAS patients by the severity of injury and by time. The figure shows that approximately 30 percent of all patients received by the BAS were recorded as KIAs. The figure also shows that about one-quarter of all the patients received by the BAS who were *not* KIAs were deemed in need of immediate medical attention. This is significant because it reflects the pool of patients that the FRSS was designed to support.

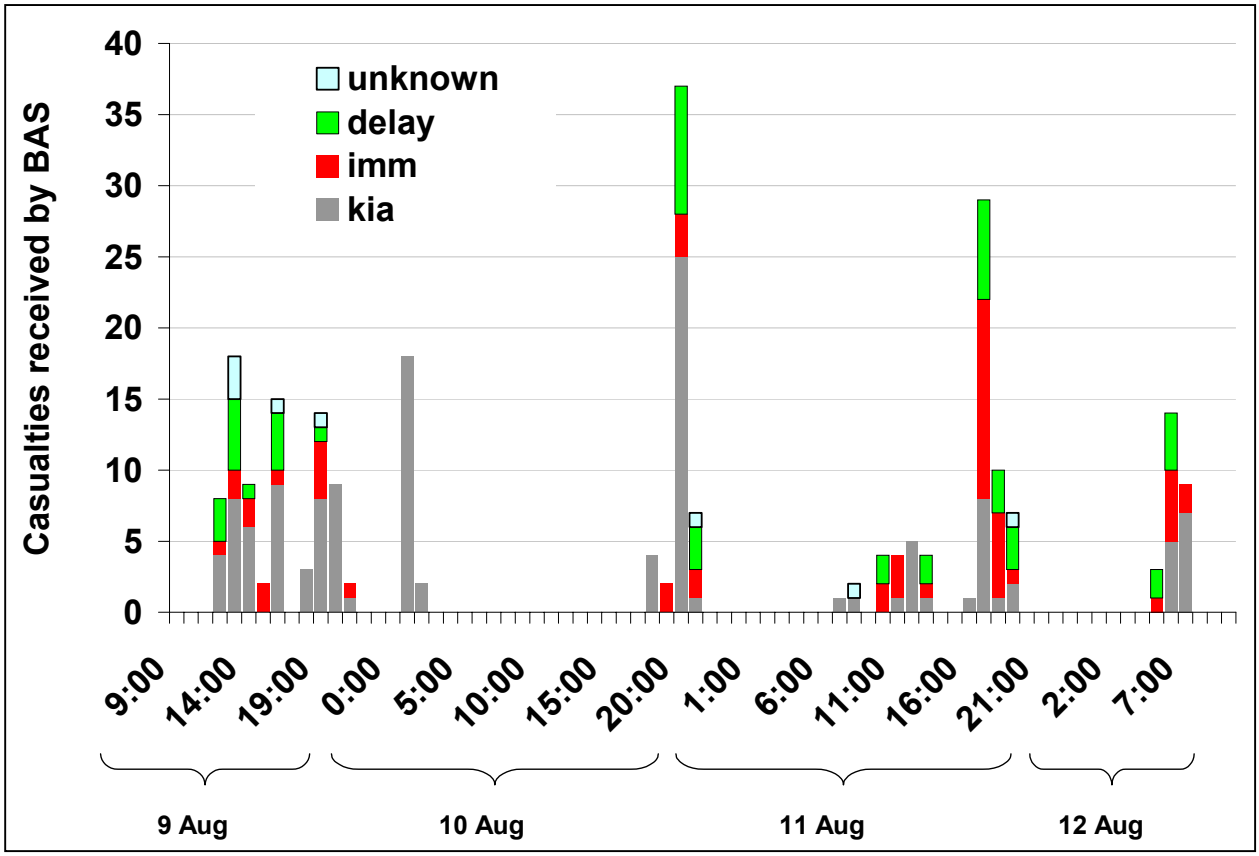


Figure 15 Casualties Received by BAS by Time and Severity of Wound

In figure 16, we highlight the total number of BAS patients forwarded to the FRSS for trauma surgery. Of the 55 casualties recorded by the BAS as being in need of immediate attention, only 40 percent of these were actually forwarded to the FRSS. That means that during this particular experiment, the FRSS treated only the most serious casualties, which accounted for about 5 percent of all BLUFOR casualties.

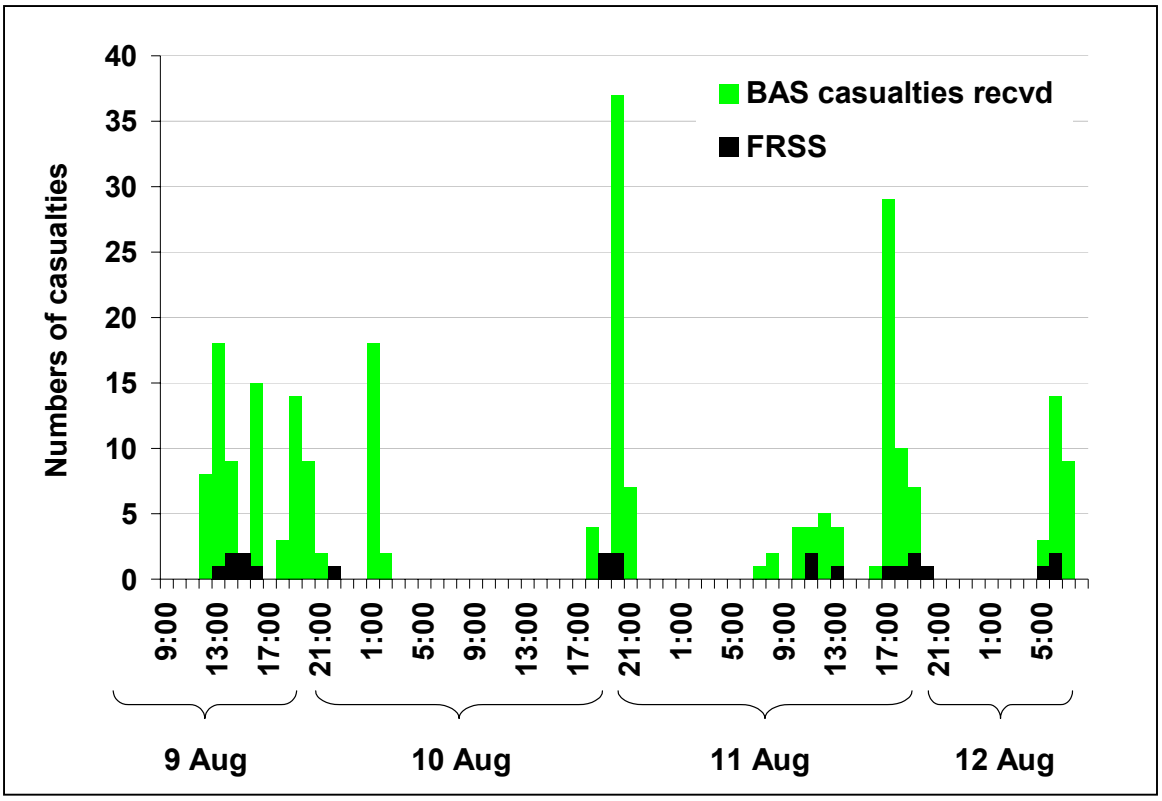


Figure 16 Casualties Received by BAS by Time

The FRSS is stocked to handle up to 18 patients in a 48-hour period—five at a time. During the UCAX, the FRSS saw its first 18 patients within the first 59 hours of the experiment, which meant that by the evening of the 11th, the FRSS would need to be resupplied. That was not done as part of this experiment. Another issue was FRSS capacity. The FRSS cannot handle more than five patients at a single time. Yet there were times when there were more FRSS candidates at the BAS than the FRSS had space available for them. This occurred on four separate occasions—every time the BAS received a large number of wounded Marines. This placed a premium on coordinating incoming-outgoing patients between the BAS and FRSS, which was largely accomplished by placing a FRSS team member at the BAS to help select FRSS candidates and monitor the numbers of patients that were being evacuated to the FRSS. This was only possible because of the close proximity of the FRSS to the BAS during the experiment.

Casualty Evacuation (CASEVAC)

We examined how long it took for wounded Marines to arrive at the BAS and FRSS from the time of initial wounding. Was the battalion able to evacuate troops fast enough to get them to the BAS/FRSS within the critical "golden hour"? We found that, on average, a significant amount of time elapsed between when a Marine was wounded and when he showed up at the BAS. The average was about 170 minutes. When we looked at the same dataset without those Marines who were deemed to be KIAs, the average dropped to 110 minutes, which suggests that wounded Marines received a higher evacuation priority than KIAs.

Next, we examined CASEVAC timelines to determine how long it took to evacuate the most critically wounded Marines. When we did this, we found that, on average, it took slightly less time to evacuate the most seriously injured than all wounded collectively—116 minutes compared to 119 minutes, which is probably not that significant. This suggests that the battalion *did not* focus its CASEVAC assets on the most seriously wounded, which is not surprising given the extreme difficulty of discriminating between the most serious injuries from to less severe ones (i.e., there were no visible reminders that someone had been injured, killed, or otherwise incapacitated other than how that role-playing Marine acted). Figures 17, 18, and 19 highlight CASEVAC timelines for a variety of cases.

Figure 17 shows how long it took the battalion to evacuate casualties to the BAS. This figure includes the movement of troops killed in action (KIA) and wounded in action (WIA).

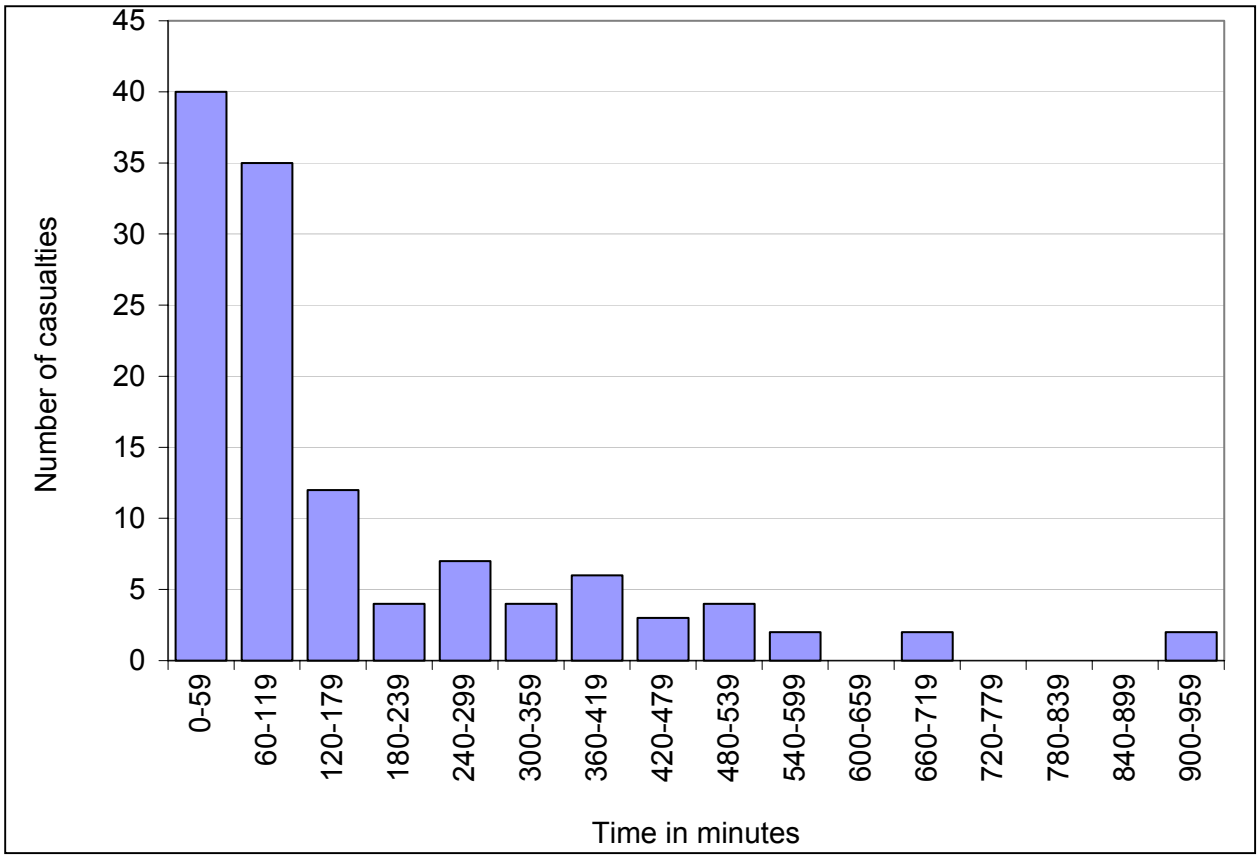


Figure 17 CASEVAC Timelines - Time of Wound to BAS (All Data)

In figure 18, we show the same timeline but exclude data related to KIAs. This drops the average amount of time to evacuate casualties from 170 minutes to 119 minutes, which suggests that the battalion was giving priority of CASEVAC to its wounded.

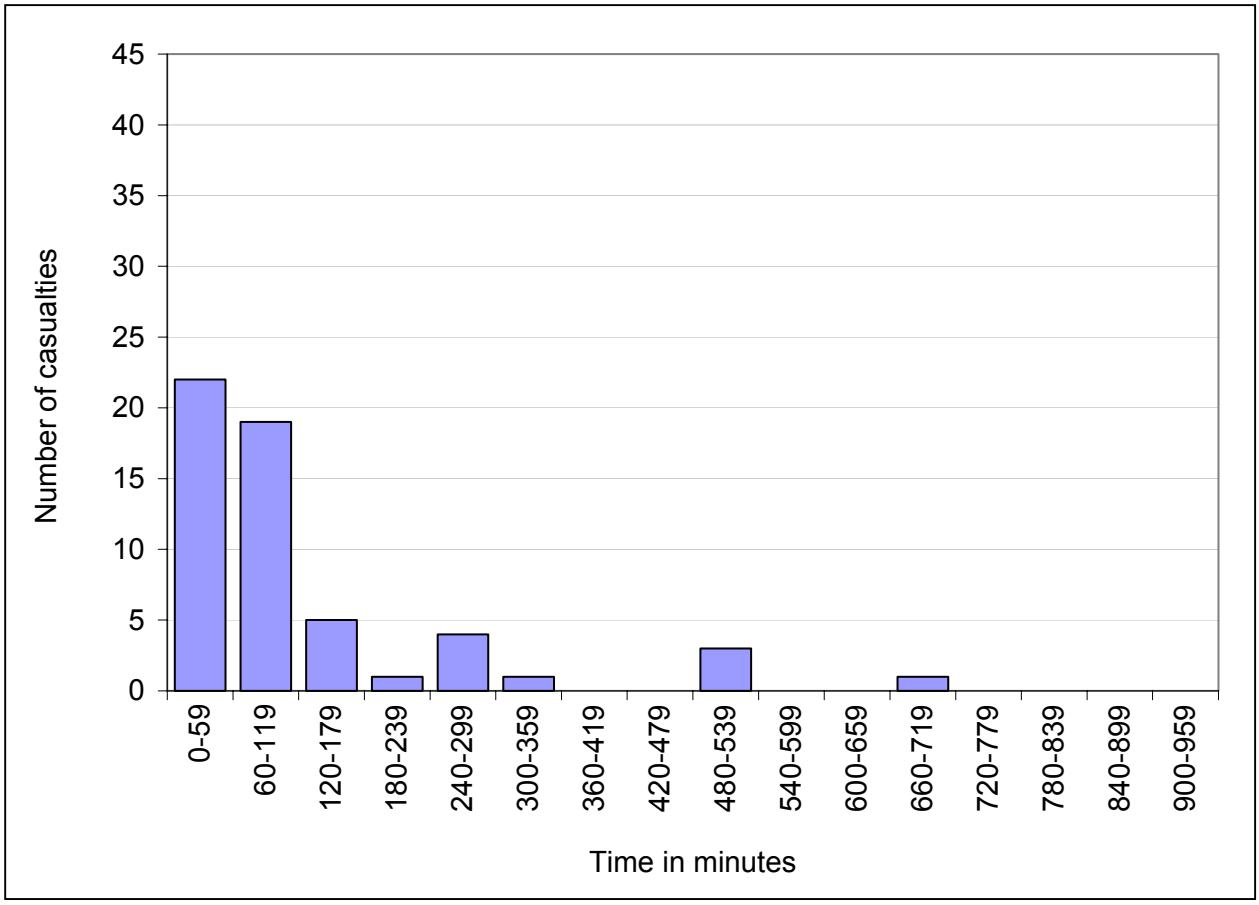


Figure 18 CASEVAC Timeline - Time of Wound to BAS (Just Wounded)

In figure 19, we show how long it took the battalion to evacuate casualties to the FRSS, which represents a smaller subset of the data population, basically the most severely wounded. This figure shows that only 40 percent of all Marines evacuated to the FRSS made it there within an hour of initial wounding. This is significant depending upon one's view of the criticality of the golden hour. The most time it took to get a Marine to the FRSS was 196 minutes. The shortest amount of time was 10 minutes. The average was 82 minutes.

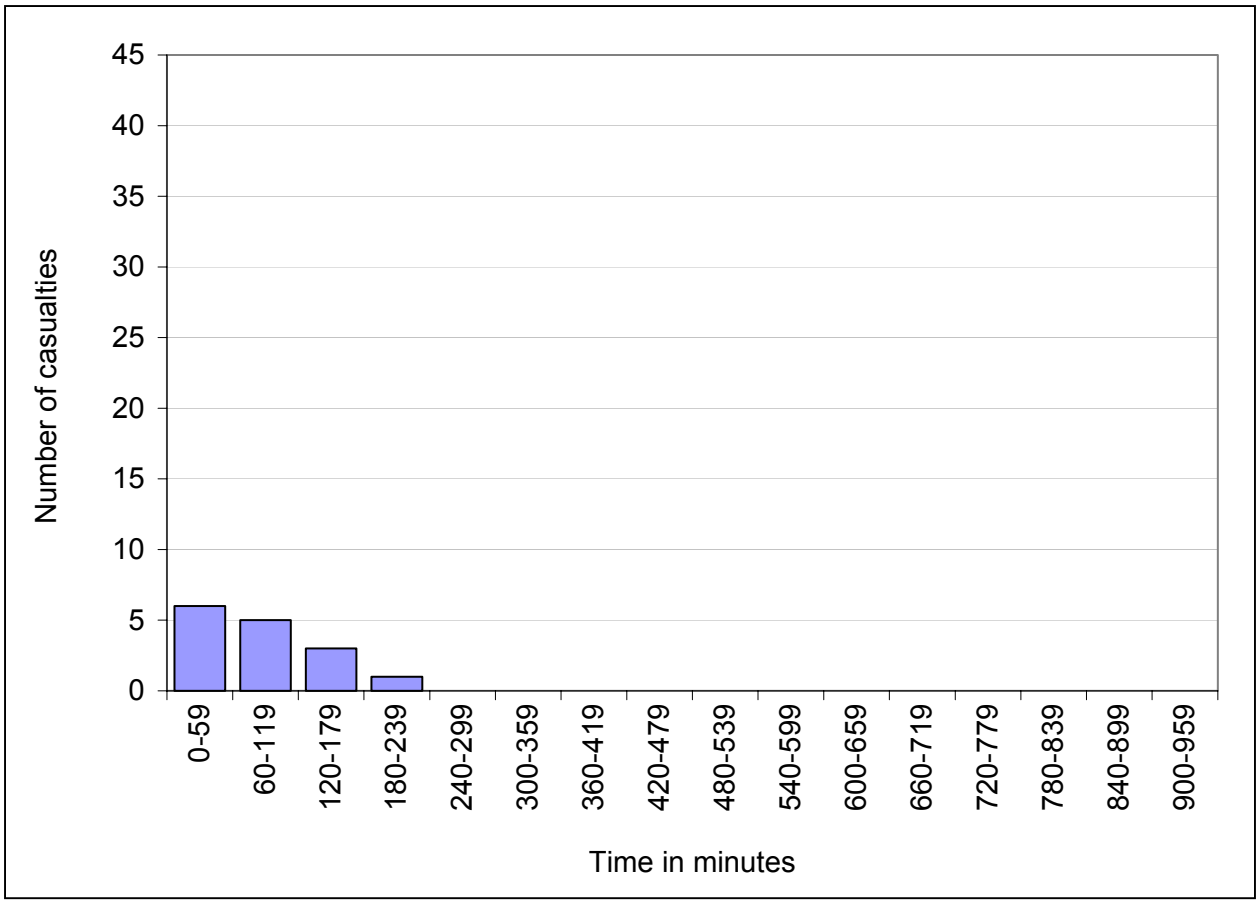


Figure 19 CASEVAC Timeline - Time of Wound to FRSS (Just Wounded)

A key issue that the figures highlight is that in the vast majority of cases, few casualties are getting to either the BAS or FRSS in a timely enough manner, at least as defined by the golden-hour standard we have been discussing.

Mobility / Deployability

Over the course of the 4-day UCAX, the FRSS displaced once—from their initial operating area out of the playbox in an area across from Michigan Avenue to the victor sector on the opposite side of the playbox. The BAS displaced twice during this same time period—once to a forward location just outside of landing zone hawk (LZ I) and then to a consolidated position inside the battalion command post area in the victor sector. Figure 20 illustrates this movement.

When play began, the FRSS was about 50 yards from the BAS in an abandoned one-story building just outside of the playbox. This was the rallying point for the logistics train of the battalion. On the afternoon of 9 August, the first day of the UCAX, a forward BAS was deployed from this location to the echo sector of the playbox, just outside of LZ I. A small, 7-man BAS (four corpsmen, two drivers, a chief, and the lieutenant officer-in-charge (OIC)) set up camp here and operated as a forward staging area for the remainder of that day and the beginning of the next until it redeployed to the victor sector.

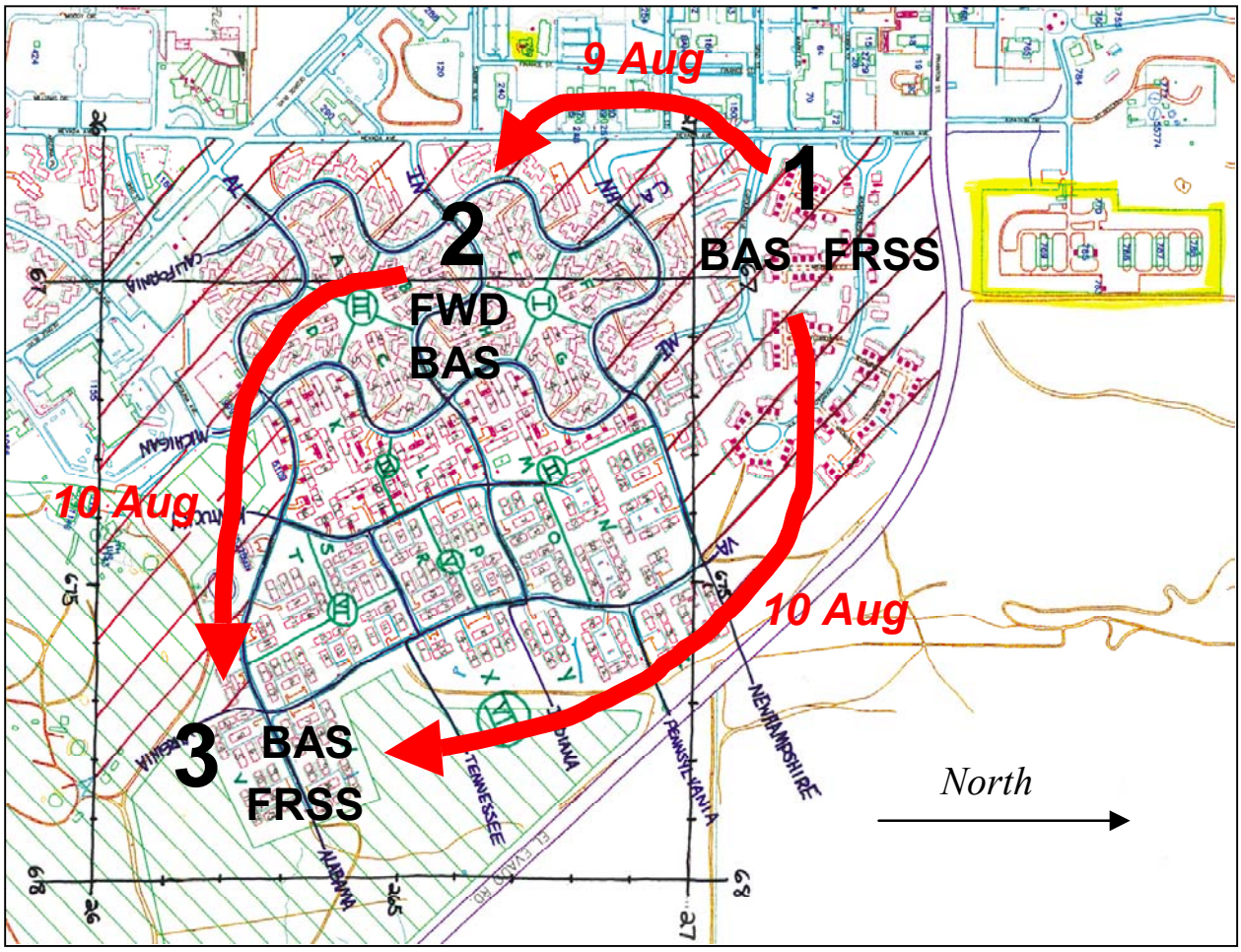


Figure 20 BAS / FRSS Movement During UCAX, 9-12 August 2002

On the morning of 10 August, the FRSS and rear BAS received a warning order to prepare to move. At 1005, the FRSS commenced packing up its gear. By 1110, the FRSS was ready to displace. The actual movement did not occur until 1430. The logistics convoy itself consisted of nine vehicles (in order of movement):

- A 7-ton with generators (FRSS)
- A HMMWV with trailer (FRSS)
- A HMMWV with trailer (FRSS)
- A HMMWV ambulance (BAS)

- A HMMWV (BAS)
- A 7-ton with trailer (BAS)
- A HMMWV with gun mount (Log security)
- Two privately operated vehicles

At 1454, the convoy arrived at the victor sector of the playbox. This is where 3/7 was establishing its command post. The forward BAS was already in position and had previously identified several two-story buildings to house the consolidated BAS and FRSS. Table 14 highlights what happened next. It shows overall FRSS set up time—approximately 45 minutes from when the convoy arrived to the point when the FRSS was capable of receiving patients.

Table 14. FRSS Set Up Times

Time	Description
1454	Convoy arrives at Victor Sector
1456	FRSS portion of log train pulls into parking area
1459	FRSS personnel examine rooms where FRSS is to set up
1501	First box comes off first trailer
1504	HMMWV is unloaded
1521	Trailer unloaded
1523	7-ton with generators moves to back of buildings
1524	Forklift lifts ECU off 7-ton
1525	Floors in FRSS being swept clean
1530	Second HMMWV and trailer is unloaded
1535	Forklift lifts second ECU off 7-ton
1538	First generator is taken off 7-ton
1540	FRSS has initial operating capability
1544	Both generators in place
1545	Forklift leaves area
1549	Engineer begins setting up generators for ECU

Additional Logistics Considerations

Based on discussions with experiment participants and after-action review (AAR) feedback, there were significant misgivings about the logistics burden of attaching a FRSS to an infantry battalion. Criticism centered on the following points:

The FRSS was viewed as making the battalion too heavy. An infantry battalion doesn't have ECUs, generators, and forklifts on its T/E. Each of these items was used by the FRSS during the UCAX. To get this equipment, the battalion would have to request it from higher headquarters and accept a larger log tail than it is used to having. Figure 21 shows the size of the FRSS.

The FRSS was viewed as a resupply challenge. Battalion personnel expressed concern over the procedures for finding and requesting specialized medical assets, such as those the FRSS would need for extended operations. The concern was not so much the difficulty of getting the gear (as the FRSS has prepackaged AMAL cans that can be stored with the medical logistics company of the FSSG) but the resulting loss of focus for the infantry battalion S-4s whose primary concerns were finding and delivering ammo, fuel, food, and water not advanced medical supplies.

Figure 21 FRSS Deployed During UCAX, 9-12 August 2002

The FRSS was viewed as limiting the battalion's mobility. Once the FRSS began to accept patients, it became stationary and could not move until all patients were evacuated to a higher echelon of care. Figure 22 is a picture of the interior of the FRSS showing the types of equipment and instruments that would need special handling during any pack-up and movement

This was not an issue during the UCAX because of the long lead times between the movement of the log train and the long delays between receiving casualties. Participants speculated, however, that if the battalion had to move while the FRSS was working on a patient, the battalion would have to weigh the risks of splitting up its logistics elements or accepting greater distance between the battalion main and its CSS assets. This may be a particular problem in an urban environment where there may not be a safe rear area from which the log train can operate.

Figure 22 FRSS Interior

In figure 23, we highlight those periods of time when the FRSS was stationary (in red) and contrast this with those periods when the FRSS could have redeployed (in green). The figure is based on estimates made by FRSS personnel of the time it would take to stabilize an injured patient and ready him for evacuation. The green portion of the chart reflects times when no patient was under FRSS care, and we assume reflects those times when redeployment of the FRSS could have been made. This means that the FRSS was immobile about 30 percent of the UCAX, which may or may not be a significant operational limitation.

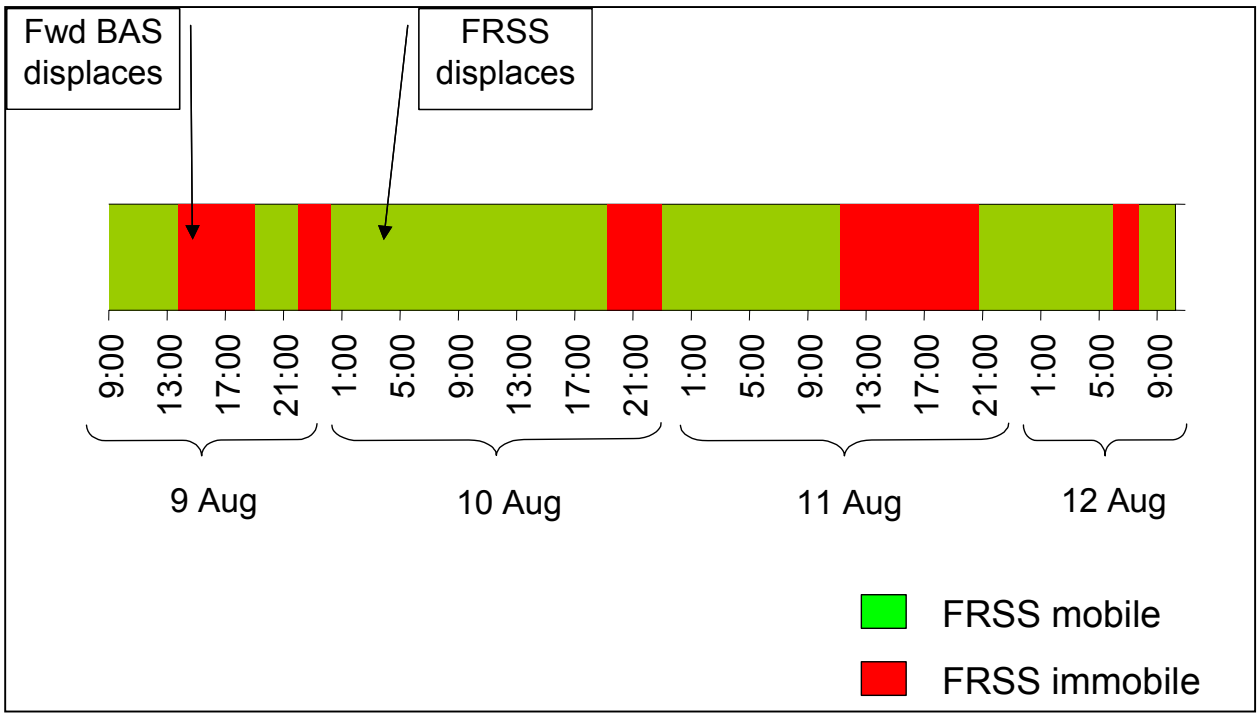


Figure 23 FRSS Mobility Versus Immobility During UCAX, 9-12 August 2002

Conclusions and Recommendations: FRSS

The goal of this experiment was to determine the degree of tactical integration that could be achieved between the FRSS and an infantry battalion. Based on our data analysis and reconstruction, we believe that the FRSS did indeed enhance an infantry battalion's organic medical capabilities and that it would have, in all likelihood, help save some small number of Marines' lives. This was accomplished by providing a trauma surgical capability to an infantry battalion. This allowed the BAS to forward its most serious cases to the FRSS for immediate trauma surgery. While this only affected a small fraction of friendly casualties—22 of the 55 most serious cases that the BAS received, it likely would have resulted in some lives being saved that otherwise would have been lost.

That said, no matter how far forward we place advanced medical capabilities, such as the FRSS, there were still significant delays in getting patients to those medical capabilities. During UCAX, for instance, only five of the 22 patients forwarded to the FRSS were logged in within an hour of their initial wounding (an additional two were logged in within 65 minutes). This suggests that, if we are serious about getting a trauma patient to a surgical team within an hour of wounding, we must either find more innovative ways to push advanced medical capabilities forward or find faster ways to evacuate casualties.

This leads to one of the limiting factors of the FRSS—to properly operate; it needs certain transportation assets, which will increase a battalion's logistics tail and security requirements. The question that has to be addressed is whether the inherent risks of doing so (various force protection and logistics considerations) are worth the obvious benefits of a more robust forward medical capability.

The UCAX represented the first time the FRSS actually operated in support of Marine ground forces. The results tell us a lot about the various ways the FRSS might be employed in the future. One key lesson is that the CSSE will have to package the FRSS with certain transportation and mobility assets. Another lesson is that future experiments might be necessary to develop a more robust employment concept for the FRSS. This leads to our key recommendation.

We recommend that the FSSGs develop a concept of employment focused on the various ways the FRSS could be used in support of division, regiment, and battalion assets. We believe this could best be accomplished under the auspices of a limited technical assessment or medical experiment (MEDEX) but would require active participation from division, regiment, and FSSG planners. The objective of such an experiment would be to find out how the FRSS might operate in conjunction with other MEF assets. Some of the questions that such an experiment might focus on, include:

- When should a MAGTF commander request FRSS augmentation? In what settings will a FRSS be of use?
- What is the appropriate size and configuration of the FRSS? What is really needed as part of the FRSS support package? Under what environmental conditions is an ECU essential? Can supplies and hardware be tailored to lessen the FRSS's current footprint?
- Who should control the FRSS? At what organizational layer should the FRSS be plugged into?

Chapter 3 – Assessment of Experimental Initiatives

Note: All of these assessments relate to the hypotheses stated in enclosure (2). These hypotheses are not restated in this portion of the report.

Dragon Eye Tactical UAV

Positive Utility of the UAV:

- Satisfactory training of the UAV teams was accomplished in only one week.
- The battalion successfully planned and executed multiple UAV flights in support of operations.
- The UAV imagery revealed the presence of both individuals and vehicles in the area targeted for surveillance.

Negative Utility of the UAV:

- The UAV could be launched from built-up areas but was never recovered in build-up areas due to the high probability of damage.
- Consistent with the results of Kernal Blitz (X), identifying the unit and specific Marines who should be tasked with owning, maintaining, and employing the UAV proved an unsolvable problem short of adding personnel to the infantry battalion T/O.
  - Per the current MCWL concept of employment for the Dragon Eye UAV, Marines from the Scout Sniper Platoon were tasked to train with and employ the UAV during the experiment.
  - UAV operations prevented these scouts from being employed as they normally would since launch and recovery of the UAV would have revealed their positions.
- The bulk and weight of a complete Dragon Eye system cannot be borne by foot mobile infantry for any extensive period.
  - This indicates the need for additional motor transport support for units equipped with this system.
- The quality of the UAV imagery was insufficient for intelligence Marines in the COC to discern many of the enemy positions that were actually being imaged.
  - MCWL technical representatives frequently pointed out positions not discerned by experiment force Marines.
- Full exploitation of the imagery will require extensive training for Marines currently assigned to infantry units or the assignment of imagery specialists to the infantry battalion T/O.
- In addition to the challenge of imagery interpretation, there are insufficient Marines assigned to the Battalion S-2 who could be dedicated to the single task of viewing the monitor and reporting enemy locations (or lack of enemy) for the full duration of the flights.
- Per the proposed concept of employment, the experiment force flew Dragon Eye missions in both direct support of a maneuver company where the team was co-located with the company, and in general support of the battalion with the ground station monitor located in the COC.
  - The direct support missions proved to be an excessive burden to a commander already fully consumed with command and control of his unit.
- The experiment force extrapolated from its MOUT experiences that the Dragon Eye could not support offensive mounted operations since the maneuver force rate of movement would exceed the range of the UAV in a short period of time.

- Similarly, Dragon Eye has less range of observation in open desert terrain where unaided observers can conduct effective surveillance far in excess of the system's range.

Net Assessment of Dragon Eye.
Without addition personnel and motor transport, benefits of the additive imagery are outweighed by the cost of transportation, UAV operators, and dedicated imagery observers. The concept of employment of a tactical UAV organic to an infantry battalion requires extensive modification.

Unattended Ground Sensors (UGS)

Positive Utility of the UGS

- The experimental ground sensors, linked to the battalion COC, did on several occasions detect and discern between foot traffic and vehicles.

Negative Utility of the UGS

- Sensor input did not allow the battalion to determine if detections were enemy, civilian, or friendly forces.
- Emplacement of the sensors was not subject to force-on-force tactical play and no data was collected on this employment task.
- The experiment force subjectively concluded that the sensors could not have been emplaced in the urban terrain without compromising the reconnaissance teams.
- Sensor reports received by the battalion COC provided no exploitable intelligence information due to the lack of personnel.
- As with the Dragon Eye imagery input, the current T/O for infantry units is insufficient in numbers and special MOSs to allow them to fully exploit this sensors output.

Net Assessment of UGSs
System emplacement challenges, and inability of the sensors to distinguish friend / foe / neutral indicates that a direct feed of this, or similar UGSs, would likely not benefit an infantry battalion.

Enhanced Reconnaissance Experiment

The Enhanced Reconnaissance Experiment was designed to rely primarily on user feedback as data to support assessment of the suite of experimental equipment employed by the experiment force.

Special Operations Mission Planning Environment - Maritime (SOMPE-M)
A Marine reconnaissance platoon employed this system during the STOM portion of MD 02. An operations support center was set up to provide intelligence and staff planning support for the deployed force

- Shipboard communications failures prevented use of SOMPE-M as a reach-back means to link the reconnaissance platoon to the operations support center.
- Despite the limited functionality achieved, the experiment forces extensively used SOMPE-M as a stand alone system that served as an electronic library along with a set of useful mission planning tools, formats, checklists, and templates tailored for reconnaissance.

- Considering the low cost (currently fielded system with USN SEALS), minimal training impact, and negligible logistics implications, there are no aspects of negative utility discerned during this experiment.
- Experimentation with the reach-back function may yield further positive utility of the system.

Miniature Infrared Camera

The MIRC enabled the reconnaissance teams to conduct nighttime surveillance of urban areas significantly better than with current night vision devices since the presence of lights tend to mitigate the usefulness of standard light amplification devices.
The experiment forces reported that the MIRC is sufficiently developed for immediate fielding.

Iridium Phone

- The IRIDIUM phone was not reliable enough to provide communications required by committed reconnaissance teams.

Combat Identification Experiment

The combat ID system was developed to reduce blue-on-blue fratricide. Although analysis reveals a measurable positive correlation between use of the system and fratricide reduction, the results are inconclusive.

- The system seemed to improve the ability of friendly forces to inflict casualties on enemy forces, but the cause of this remains unknown.
- The experiment was constrained by the number of combat ID sets available for the experiment.
  - Only two squads could be equipped.
  - The small number of friendly forces involved likely reduced the potential for fratricide and may have skewed the results.
- Additionally, the system available for experimentation works only with the M-16.
  - Since individual and crew served automatic weapons, and other supporting arms weapons systems provide the majority of the firepower during lethal engagements, any combat ID system considered must provide combat identification functions for all of weapons.
- Conclusive experimentation regarding any solution for combat identification must be in the context of the entire combined arms battlefield.
- System modifications to any similar system being developed must include a variable pulse code emitter—to prevent the obvious enemy counter action—and a pulse strength that can be varied to account for the engagement ranges.

Precision Target Location Experiment

- The benefits of a laser-based target locating system during MOUT are difficult to assess.
- Marines assigned to conduct indirect fire support were not significantly hindered during MOUT by the added equipment associated with Universal Combined Arms Targeting System (UCATS).
- The additional time to set-up and break UCATS when occupying OPs caused no discernable problems.
- The problem of abundant reflective surfaces and the extreme close range of targets inherent to MOUT significantly limit the value of UCATS or any similar laser based system.
- As part of the baseline, the experiment force used high definition, large-scale maps, that when geo-referenced were as accurate, lighter, and easier to use than the UCATS.
  - If similar maps can be produced to support MOUT this would be a preferred means to enhance the accuracy of target locations.
- No attempt was made to assess the net impact of digital calls for fire since this is already an accepted benefit.

Preliminary – First In Command and Control System (Pre-FICCS).

As part of the STOM experiment in support of MC 02, MCWL conducted inter service systems interoperability tests and attempted to demonstrate the ability of Preliminary - First in Command and Control System to serve as a C2 facility for a forward MAGTF CE (Figure 24).

Figure 24 Photo of Pre-FICCS

No associated hypothesis was developed for this experiment.

- The PRE-FICCS was full mission capable during 100% of the play.
- The original PRE-FICCS objective was largely negated by the inability to achieve the technical and tactical integration required to conduct the envisioned joint interoperability testing.
- Employed in support of the STOM phase landing force and during the UCAX phase at SCLA the communications capabilities yielded mixed results in terms of functionality and beneficial utility.

The following results are provided that capture key performance issues:

- On-the-move TACSAT performed poorly due to disparity between C2PC software and VIASAT protocol.
- Support for TCS/MGS Fusion provided "facility" support only, but could have posted combined blue-force PLI to SIPRNET with appropriate permissions.
- Distribution of Dragon Eye (DE) Video:
  - Took in streaming DE video and send the video over an unclassified VTC bridge for all authorized users.
- Ultra-thin client architecture workstations provided operators the ability to access SIPR and NIPR Nets rapidly.
- Wireless CP extension was effective in providing a link for administrative service to the battalion, but lack of encryption allowed OPFOR to copy IP addresses.
- GSM cell phone system provided local administrative phone service, but was not secure.
- Although the limited employment of the system precludes a comprehensive assessment, the system demonstrated promise as an expeditionary C2 node.

Improved Intra Platoon Radios

During UCAX, we assessed advantages and disadvantages of a proposed company level T/E for the AN/PRC-148 hand-held multi role radio. We also made an initial evaluation of replacing the currently fielded ICOM Intra Squad Radio (ISR) with the Personal Role Radio (PRR) in use by the British military. Subsequent experimentation—see MCWL *Squad Advanced Marksman* Experiment AAR—supported the expanded T/E for the PRC-148 and validated the PRR as the ISR replacement. Both of these actions are currently being implemented in the Operating Forces.

Enclosure (4) contains a detailed report and photographs of both the AN/PRC-148 and the PRR (Figures 33-35).

No associated hypothesis was developed for experimentation.

- The PRR provides a reliable and robust means of communications internal to infantry squads that is superior to the currently fielded ISR.
- The AN/PRC 148 IPR radio performed well during all MD 02 events.
- During MD 02, the experiment force emphasized and confirmed the critical value of tactical communications that span all elements down to the fire team level during operations in urban terrain due to the tendency for forces to become isolated forces down to the team level.
- The experiment yielded no information that would cause a modification of the fielding plan or unique employment TTPs for the PRC 148 IPR.
  - The Fielding Plan for the AN/PRC-148 *has been modified* for the Operating Forces.

Forward Resuscitative Surgical Suite

MD-02 (UCAX) provided a venue for experiments and demonstrations of the Forward Resuscitative Surgical Suite. This focused on an examination of the concept of employment for this system in support of an infantry battalion conducting MOUT.

No associated hypothesis was developed for experimentation with the FRSS.

- We found that the FRSS enhanced an infantry battalion's organic medical capabilities and that it would have, in all likelihood, help save some lives.
- The co-location of FRSS with a committed infantry battalion did facilitate the rapid surgical care of Marines shortly after being wounded.
  - However, since UCAX did not include any higher echelon of medical care, we cannot conclude that integrating FRSS at the battalion level provides more responsive care than could be achieved by simply increasing the allocation of ground and air CASEVAC means and transporting wounded Marines to other rear area or sea based facilities.
- What was clear from the experiment was that the integration of FRSS with an engaged battalion poses significant unsolved challenges in terms of protecting this soft target from enemy action and supporting it logistically.
- Regarding logistics, again the absence of a MAGTF CSSE that would likely be the parent unit to FRSS, examination of the logistics burden became too difficult to make definitive conclusions.

Chapter 4 – UCAX Report

UCAX Experiment Overview

This Urban Combined Arms Experiment (UCAX) experiment conducted by the Project Metropolis (ProMet) Section of the Marine Corps Warfighting Laboratory (MCWL) had two phases. The first phase was the fifteen-day pre-experiment training conducted from 12-30 June 2002 in a portion of the closed housing at Southern California Logistics Airport (SCLA), formerly: George Air Force Base. The second phase was the execution of experiment events from 7-11 August 2002 as part of *Millennium Dragon 02*. Each of these phases was designed to respond to discrete objectives in support of the overall experiment hypothesis that spanned the notional *three-block war* (see below). We were to evaluate the value of this type of UCAX to establish a training template—activities and resources—for a valid method to prepare a reinforced battalion combined arms team to conduct operations across the spectrum of MOUT.

Experiment Hypothesis. The basic hypothesis for the experiment was:

> *That properly trained MAGTFs conducting military operations on urbanized terrain can transition seamlessly and effectively between peacekeeping operations and urban combat without suffering unnecessary friendly casualties and minimizing noncombatant casualties and collateral damage .*

Definition of the Three-Block War. This ProMet experiment aimed to test, validate and refine existing and emerging doctrine, technologies and TTPs within the framework of the notional *Three Block War* described by the 31st Commandant and illustrated in figure 1.

> *"In one moment in time in the same urban area, our Marines are feeding and clothing displaced refugees—providing humanitarian assistance. In the next moment, they are holding two warring tribes apart—conducting peacekeeping operations. In yet another part of the city, they are fighting a highly lethal battle against a determined foe. All on the same day, all within three city blocks. This is what we call the three block war."*
>
> **General Charles C. Krulak, USMC**
> **31st Commandant of the Marine Corps**

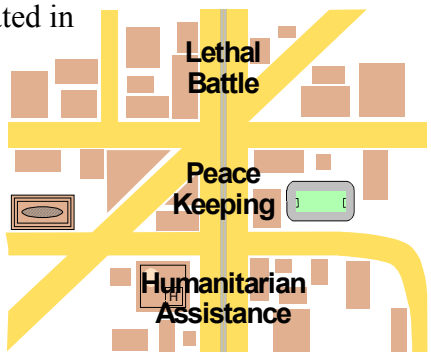


Figure 25 Three Block-War

Participant Force List

Ground Combat Element (GCE)

- 3d Battalion 7th Marines LtCol Belcher.
  - Artillery Liaison Section, I Battery, 3d Battalion, 11th Marines.
  - 1st Platoon, Company B, 1st LAR Battalion.
  - 2nd Platoon, Company D, 3rd AA Battalion.
  - 3rd Platoon, Company C, 1st Tank. Battalion.
  - 3rd Platoon (+), Company C, 1st Combat. Engineer. Battalion.
  - 2nd Platoon, Company A, 1st Reconnaissance Battalion.
  - Detachment, Military Police Company, 1st Marine Division.

Combat Service Support Element (CSSE)

- CSSE - Detachment, 1st Force Service Support Group (OPCON to 3/7).
  - Detachment, Transportation Support Battalion 1st FSSG.
  - Detachment, 7th Engineer Support Battalion.
  - Detachment, Supply Battalion.
  - Detachment, Maintenance Battalion.

Aviation Combat Element (ACE)

- HMM-268 (-). (DS to 3/7). LtCol Driscoll.
  - Five (5) CH-46E
- Detachment, HMLA 267.
  - Four (4) AH-1W
  - Two (2) UH-1N

Pre-Experiment Training

Training Objectives

1. Evaluate the most effective *content* of individual and collective training packages to prepare individuals, teams, and units for combined arms offensive and defensive MOUT.
2. Evaluate the most effective instructional *methods* to prepare individuals, teams, and units for combined arms offensive and defensive MOUT.
3. Establish the initial training requirements —time and resources—needed for a platoon, company, and battalion combined arms team to develop *proficiency* in MOUT.
4. Establish the sustainment training requirements—time, frequency and resources—for a platoon, company, and battalion combined arms team to maintain its proficiency to effectively conduct combined arms MOUT.
5. Determine the type and number of facilities required to properly conduct individual and collective MOUT training.

Training Execution. The ProMet team, augmented by certified MOUT instructors from I and II Marine Expeditionary Forces (MEFs), trained the BLUFOR using a tailored version of the Basic Urban Skills Training (BUST) syllabus. Training was conducted from 12 –30 June. This training, developed from five years of MCWL experimentation and participant feedback was essential in order to:

- Provide the TTPs intended for evaluation.
- Ensure the experiment forces have a consistent baseline of urban warfighting capability.
- Further evaluate and develop the BUST package.

The training culminated in a practical application/final exercise.

Notes:

1. See summary of 3/7's evaluation of the training later in this enclosure.
2. See the tailored BUST schedule later in this enclosure.

Turnover of Trained Personnel. Between completion of training at the end of June and returning to SCLA for UCAX in August, 3/7 replaced or joined many new personnel. This included two (2) company commanders and eight (8) platoon commanders. These new and non-BUST-trained Marines had an effect on the operational effectiveness of their elements and the overall integrity of the experiment.

MAGTF Warfighting Experiment

Note: These experiment objectives support the all of the elements of the combined arms MAGTF. They are broken out into separate elements in this AAR for easier identification.

Warfighting Objectives – MAGTF Command Element (CE)

1. Determine what command and control TTPs need to be further developed to enable mission accomplishment of units operating across the range of *Block II* peacekeeping through *Block III* lethal battle in MOUT.
2. Examine the adequacy of existing doctrine and TTPs for selecting, occupying, and operating out of urban patrol bases.

Warfighting Objectives – Ground Combat Element (GCE).

1. Examine the degree to which the urban combined arms combat formations developed for platoons, companies, and battalion enable seamless, effective transition from *Block II* peacekeeping operations to Block III lethal battle operations for a reinforced battalion.
2. Establish and evaluate procedures for deploying a reaction force.
3. Assess the adequacy of the escalation of force TTPs.
4. Evaluate the satellite patrol concept across the range of MOUT from *Block II* peacekeeping through *Block III* lethal battle.
5. Assess the adequacy of the TTPs for
   a. Vehicle and personnel searches and check point operations.
   b. Hasty building searches.
   c. Casualty evacuation.
   d. Tactical resupply operations.
6. Evaluate employment procedures and techniques used for reconnaissance and scout sniper teams in urban ground reconnaissance (UGR).

Warfighting Objectives – Combat Service Support Element (CSSE).

1. Assess the adequacy of TTPs for medical support and casualty evacuation (CASEVAC).
2. Assess the adequacy of TTPs for tactical resupply with the Small Urban Vehicle.

Warfighting Objectives – Aviation Combat Element (ACE).

1. Evaluate employment procedures and techniques for Rotary Wing (RW) CAS as they specifically relate to:
   a. Response time.
   b. Target identification
   c. Position marking.
   d. Existing tactics.
   e. Aircrew survivability.
   f. Use of the 6-line brief.
   g. Positive control.
   h. Suppression of enemy defenses.
2. Evaluate employment procedures and techniques for Assault Support as they specifically relate to
   a. Target identification
   b. Position marking.

c. Existing tactics.
3. Evaluate the Universal Spotter concept.
4. Evaluate the value of the non-T/E radios.

Experiment Organization. To optimize our opportunities to collect useful information and to maintain congruence with experiment objectives, we used three key groups: Exercise Control (EXCON), Observer Controllers (O/Cs) and Noncombatant role players (contract civilians).

- *Exercise Control (EXCON),* comprised of MCWL/ProMet staff members:
  - Established the initial flow of each event.
  - Maintained ground truth to the maximum extent possible and interjected appropriate events from the MSEL to set the conditions to align with experiment objectives.
  - Controlled general OPFOR activities.
- *Observer Controllers (O/Cs)*:
  - Monitored free-play, made on scene adjudications where necessary and collected data.
  - Debriefed participants at the end of every event.
- *Noncombatant Role Players* were introduced into each scenario to:
  - Challenge the ability of the participants to discriminate enemy from noncombatants.

Data Collection. We collected force-on-force information through direct observation by O/Cs, download of MILES data, and end-of-event questionnaires filled out at the individual, fire team, squad, and platoon levels. Casualty information was developed from downloaded MILES data, and on-site "calls" by O/Cs. The O/Cs also collected information generated by interaction with noncombatant role players.

Source of Observer Controllers (O/Cs) ProMet has historically invited subject matter experts (SMEs) as O/Cs. They have been a significant resource in assisting in developing and evaluating our concepts and assisting in drafting our *findings*. O/Cs were briefed on experiment goals, weapons effects adjudication, data collection procedures, data collection forms, and given an orientation to the BUST TTPs. These personnel were assigned duties consistent with their rank and MOS. We needed a large number of O/Cs to cover 24-hour continuous operations. O/Cs were sourced from:

- MCWL
- The Basic School
- Command and Control Systems School
- Marine Forces Atlantic HQ
- II MEF Special Operation Training Group (SOTG)
- Marine Corps Base Camp Lejeune
- 2d Marine Division
- I MEF
- 1st Marine Division Schools
- MP Company, 1st Marine Division
- Marine Aviation and Tactics Squadron (MAWTS)
- School of Infantry (SOI) West
- US Army
- US Air Force
- White Sands Missile Range
- Center for Naval Analysis
- United Kingdom
- Canada
- Australia
- Israel
- Sweden
- Belgium
- France
- Denmark.

O/C Organization. To meet the challenges presented by the continuous nature of the experiment over the 96 hours, O/Cs were formed into teams as follows:

- EXCON
- Battalion Command Group
- Company, Platoon and Squad
- Mechanized/Armor (mech/armor)
- Combat Service Support (CSS)
- Medical.
- Aviation
- OPFOR/role players

The O/C Team Leader managed his group to meet the experiment schedule. This included a daily key personnel briefing, the tactical debriefs and end of event data collection effort.

O/C Responsibilities.

- Track the unit through mission work-up; attend mission briefs and rehearsals.
- Move with the unit; observe, record activities, and adjudicate engagements as required.
- Maintain an activity log to record their element's actions.
- Participate in end-of-event reconstruction.
- Guide detailed debriefs.
- Ensure participants fill out event questionnaires and turn in casualty forms.
- Provided feedback based on their observations and knowledge of experiments objectives.
- Collect, collate and turn in completed data package upon completion of each watch.

Outline of Experiment Events.

- Experimentation began on 8 August and ended on 12 August 2002.
- Scenario was a mythical country where two competing paramilitary type elements using a combination of asymmetric and terrorist tactics, intermixed with noncombatants who opposed one another.
- Experiment events were force-on-force structured free-play format.
- Experiment scenarios were provided to the task force commander as warning orders to enable basic mission planning as early as practical.
  - For a 96-hour period, including rehearsal and operations.
- EXCON inserted some scripted events drawn from the master scenario event list (MSEL) to shape appropriate tactical activities
- After action review (AAR) conference was conducted on 13 August.

Experiment Execution.

Rehearsal Day.

- 8 August.
  - A full dress rehearsal for all forces and supporting personnel.
  - Operations included a mechanized / armor attack with two companies to seize a landing zone to enable the third company to land and continue the attack to expel the OPFOR from the AO.
  - Debrief of rehearsal.
  - Subsequent to debrief
    - OPFOR and role players established the city (*playbox*).
  - RSTA assets inserted into the *playbox* that evening.

This is the only day that participants used Special Effects Small Arms Marking System (SESAMS)—formerly: *simunitions*—to generate actual visible body hits. They also used MILES, blanks and subjective on-site "calls" by O/Cs.

Experiment Days.
Force-on-force events on 9 and 10 August used a combination of blanks, MILES 2000, and subjective calls by O/Cs. The decision to not use SESAMS during the main experiment was predicated on the need to eliminate the facemask to enable better recognition and communication among participants during the peacekeeping scenarios.

- 9 August.
  - BLUFOR attacked with two mech/armor company teams on line to seize a landing zone for the third company to land and continue the attack to expel OPFOR from the AO.

- 10 August.
  - At approximately 0930, the scenario shifted from Block III (lethal battle) operations to peacekeeping (Block II) operations.
  - Companies moved from their night positions and established individual firm bases.
  - Battalion headquarters and logistics train established a separate compound not too far from the battalion quick reaction force position.
  - BLUFOR occupied these positions until ENDEX at approximately 0800 on the 12th.

Results – Pre-Experiment Training

This section includes knowledge about pre-experiment training that we have gathered organized and synthesized from questionnaires, interviews, debriefs, direct observation, and after action reports from the various individuals, elements, and units involved.

Basis of the Pre-Experiment Training Objectives. This experiment moved from the reinforced company level to a reinforced battalion (mini-MEU) combined arms team. The goal was to continue development of the *Block III* lethal battle and *Block II* peacekeeping operations TTPs and supporting training requirements. The objective is to develop a single inclusive BUST package for use in training all MAGTF individuals, teams, and units. Here is a summary of findings and observations related to the training conducted from 12-30 June 2002 at SCLA. They are specifically matched to the Training Objectives stated earlier in this report.

Training Objective #1. Evaluate the most effective *content* of individual and collective training packages to effectively prepare individuals, teams, and units for combined arms offensive and defensive MOUT.

Overall Value of BUST.

1. The 3/7 AAR for UCAX provides the following assessment:
   a. *Leaders without BUST (+) experienced significantly more difficulties operating in the complex urban environment than their peers.*
   b. *These included challenges in orienting within the urban terrain, inability to gain and maintain situational awareness, slower and less effective tactical decision-making, difficulty in maintaining communication, and difficulty in assessing the friendly and enemy situation.*
   c. *All of these factors served to exacerbate the gaps in the junior leadership noted above, decrease tempo, and curtail aggressive searching for and attacking the enemy."*

Additions to Block III TTPs. Participants indicated that the lethal battle TTPs taught in BUST are adequate. ProMet will continue to evaluate and monitor these. However, as noted below, we note a need for some additional development—linked to experimentation—in areas outlined below.

1. Additional TTPs needed for:
   a. Air Combat Element operations; specifically,
      (1) Close Air Support (CAS), and
      (2) Assault support.
   b. Reconnaissance, Surveillance and Target Acquisition (RSTA) Operations.
   c. Casualty handling and evacuation.
   d. Fire support planning and execution.
2. Participant suggestions for expanding the BUST package:
   a. Include howitzer sections.
   b. Incorporate a separate mortar employment course for mortar units.
   c. Include CSS and other attachments in *all* BUST programs.
   d. Add a two (2) to three (3) day supporting arms live-fire exercise at Yuma/Yodaville.
   e. Add tank/mech infantry practical application time – to include more night operations.
   f. Add organic weapons live fire package, to include grenades, explosives.
   g. Include in-depth instruction on all three functions of electronic warfare in civilian infrastructure.

Additions to Block II TTPs.

1. Develop and refine training for:
   a. Media handling.
   b. Improvised explosive devices (IEDs)
   c. Booby traps.
   d. Battalion/company level firm base operations.
   e. Quick Reaction Force (QRF) employment.
   f. Resupply and convoy operations.
   g. Employing armor and mechanized assets in peacekeeping operations.
2. Add an additional day of squad and platoon peacekeeping practical application to allow for unit SOP development.

Adjustments to Small Unit Leadership Training.

1. Schedule the classes so that leaders do not miss other instruction.
   a. **Note:** The full BUST package includes an embedded separate instruction segment for small unit leaders. Due to time constraints, some classes during the tailored BUST ran concurrent with other BUST classes. That is, they were not given to everybody.
2. Develop a platoon commander's tactical decision game (TDG).
3. Develop instruction and practical application on initiative based tactics for small unit leaders to better develop their skills.
4. Develop an urban context to existing doctrinal terminology.
   a. **Note:** Throughout ProMet's experiments, it has been noted that there is a problem with understanding what terms should be used in describing the desired end state for urban operations.
   b. For example, doctrinal terms like "secure" or "clear" a building/buildings is not enough information. Probably need to add a phrase such as "by secure, I mean…."
5. Further develop and refine techniques and procedures for urban IPB.

Adjustments to Battalion Staff Planning in MOUT. ProMet included classes and a wargame oriented on battalion staff planning in the urban environment. Of all the experimental urban training packages, this one is in the greatest level of flux. This was the second time the team had attempted this seminar/ instruction package. Comments relative to this package include:

1. Use the staff training technique used at Mountain Warfare Training Center (MWTC); i.e.:
   a. Develop the order.
   b. Brief the order.
   c. Conduct a SME guided terrain walk.
2. Add discussions on information operations.

Training Objective #2. Evaluate the most effective instructional *methods* to prepare individuals, teams, and units for combined arms offensive and defensive MOUT.

In most cases, students want more practical application and fewer lectures during the BUST package. No more than two consecutive hours of lecture. Here is a summary of comments:

1. Use more preparatory videotapes to set the stage and motivate participants before training begins.
2. For better return on investment, plan break time into the BUST schedule for rest and recoup, plus time for maintenance.

3. Formalize the program and create a Combined Arms Urban Warfare Training Center similar in concept to the MWTC.
4. Consider increasing the fire team level practical application and then move on to squad and higher practical application level.
   a. *Note*: The person making this comment noted that the urban area divides squads and platoons into fire team sized elements, therefore more attention should be paid to preparing the fire team leader and his element.
5. Include an urban navigation course at the fire team level.
6. Conduct more tarpaper house drills.
   a. Include non-combatants and ROE.
7. Put more emphasis on supporting arms; i.e., mortars, artillery, rotary wing CAS.
8. Need more practical application on satellite patrol techniques.
9. Need more night practical application on offense/defense at the platoon and company level.
10. Consider following the martial arms training outline concept—explain, demonstrate, then imitate, then practice (EDIP).
11. Consider increasing unit leaders' roles in the train-the-trainer and let them play their roles in training/practical application.
12. Consider urban environment strength training.
13. Add urban martial arts practical application.
14. Provide a *smart pack* (e.g., pocket checklists, pertinent mini-references, etc.) for patrol/firm base ops in urban area, with a TEWT.

Training Objective #3. Establish the initial training requirements—time and resources—needed for a platoon, company, and battalion combined arms team to develop *proficiency* in MOUT.

Based on our observations we think it takes five (5) weeks of training to develop proficiency. We respond to the objective in the following three-tiered structure:

1. It takes approximately three (3) weeks of individual and small unit (squad through company) collective training to develop adequate *familiarization* with the Block II peacekeeping and Block III lethal battle urban TTPs.
2. It will take an additional one (1) week of intensive training to develop unit *proficiency* at the company combined arms team level.
3. Once the initial proficiency level is achieved at the reinforced company level, an additional one (1) week is needed to develop a fundamental proficiency level at the reinforced battalion level for Block III lethal battle operations.

> *Note*: When the requirement for peacekeeping operations is added, additional training time is needed before MAGTFs will function as cohesive teams.

Participant AAR Comments.

1. Units require more practical application training to develop needed proficiency in conducting combined arms operations in the urban environment.
2. Modifications to the BUST will be required to more thoroughly train units on those skills that were clearly more difficult to master (tank/infantry integration, satellite patrolling, etc.).
3. Marines seem to grasp Block III lethal battle operations easier than Block II peacekeeping operations. Therefore, it takes less training time for units to acquire a moderate level of

proficiency in high intensity ops than it will to attain an equal level for Block II peacekeeping operations.

Training Objective #4. Establish the sustainment training requirements—time, frequency and resources—for a platoon, company, and battalion combined arms team to maintain its proficiency to effectively conduct combined arms MOUT.

Given operational tempo issues, ProMet did not attempt to measure the effect on proficiency from the 35-day break between BUST and the beginning of experiment operations. Although 3/7 conducted some MOUT related sustainment training at 29 Palms during the break, this training was not only oriented toward maintaining skill level, but also at training newly joined personnel who had not attended BUST at SCLA. See the remark in the findings to Objective #1 relative to the effect of personnel turnover.

Training Objective #5. Determine the type and number of facilities required to properly conduct individual and collective MOUT training.

Although a comprehensive response to this objective cannot be empirically determined by this experiment, we were able to gain some insight as shown in the following combination of ProMet opinion and participant feedback specifically related to using the SCLA facilities. From this, we can deduce many of the things that are important to support meaningful and effective training.

1. SCLA is the best urban training site available to U.S. forces. Its size, layout and complexity give us the ability to conduct combined arms team training. There are adequate building designs and space to train for almost every needed skill set in the BUST package. There are few restrictions in employing mechanized vehicles. Its size enables the training team to run concurrent lanes in such numbers that allows an effective balance between the number of required instructors, time available, and class size. During BUST, ProMet trained approximately 900 Marines and Sailors of the MAGTF in sixteen training days using four separate BUST sites supported by thirty (30) primary instructors and 90+ assistant instructors from the various units.
2. Though small, SCLA presents a real challenge to differentiate friendly from enemy locations.
   a. *This was often a showstopper for CAS during the experiment*.
3. Because SCLA is not a government operated training site, MCWL had to procure hygiene and sanitation items (Porto-Potties, and potable water). And, to enhance training realism, acquired or produced items such as signs, furniture, household items, market items, lighting, role player costumes, vehicles/buses, etc.
4. Here are the current limitations to SCLA and how we dealt with them to support the training.
   a. No lighting.
      (1) To give us a scenario set in a semi-functioning city, MCWL used generators to light certain areas of the city. We used a combination of stand-alone light units and existing building wiring connected to generators for power. Engineers checked the wiring and then set up the generators. This presented the BLUFOR with different night lighting challenges, as well as enabling role players to conduct more normal nighttime activities.
   b. Absence of indigenous population/noncombatants.
      (1) MCWL hired civilian personnel to augment the Marines acting as both role players and OPFOR.

(2) Hiring civilians has its own set of problems, but it is one way to get the mix of ages, gender, shapes, etc. needed to more realistically replicate possible operational deployment scenarios.

(3) Because the civilian role players gave a realistic mix of noncombatant role we learned two important lessons. First, Marines are very hesitant to conduct searches of females and second, Marines are not too sure what to do with older personnel. Both of which are often found hiding in urban areas when forces move in.

c. Absence of language and ethnic differences.

(1) This is hard to replicate, but in some cases, we used Spanish speakers (or other languages) to create situations where role players speak a different languages than the Marines.

d. Size of Training Area.

(1) Although SCLA is the largest MOUT training site available for integrated combined arms training, it is still too small to conduct reinforced battalion sized MAGTF operations.

(2) There is inadequate space to assemble formations to enter the playbox prior to enemy engagement.

(3) Cannot replicate other urban areas surrounding a unit's TAOR though which they would have to move to get in and out of any objective area. This includes convoy ops, tactical maneuver to surprise the enemy, etc.

(4) This makes many support or movement to contact operations seem simpler than they might be if the battalion was operating deep within a city.

(5) This limited space causes the BLUFOR to focus inward and eliminates any real adjacent unit boundary issues.

e. Insufficient certified helicopter landing zones (HLZs). This is a safety issue for training

(1) Within the standard playbox, there are insufficient—only five (5)—certified HLZs and no certified rooftops for landing, hover drop-off, or FAST rope insertions.

(2) During free-play force-on-force events, it is a very simple task for the OPFOR to foul or defend the five existing HLZs.

5. In scenarios where the battalion was operating multiple company firm bases during peacekeeping operations, ProMet used the additional SW housing area in an attempt to provide a more realistic TOAR size. But vehicle off-road and breakage restrictions limited the learning environment.

Future UCAX Concept. UCAX could be improved to be an excellent method to prepare units for urban combat. Vision of improved UCAX concept is to model it after the existing 29 Palms combined arms exercise (CAX) without the live fire. For example, conduct a MOUT graduation exercise for a deploying battalion that had completed its work-up training (BUST) and developed a level of proficiency. This would entail having a permanent staff to O/C the event and some form of challenging urban FEX that enabled the commander to measure his unit's performance.

The MD-02 UCAX is not the conceptualized UCAX described above. It included parts of the needed program, but also included a good bit of developmental discovery learning. This was necessary because there are still a lot of urban TTPs that need development. Here is a summary of participant, O/C and ProMet feedback relative to resources required to conduct meaningful UCAX-like events.

Training Area(s).
If urban training becomes a priority, expanded and possibly additional urban training sites will be needed to meet the demands. We recommend:

1. Acquire and control a suitable DoD urban training area.
   a. SCLA is an exercise area that is marginally large enough and complex enough to properly challenge the unit.
   b. It is the only good urban training area in CONUS that is currently available.
      (1) However, SCLA is not a DoD-owned/operated training facility.
   c. The Marine Corps just recently took over control of a similar sized facility in Guam that is adjacent to Andersen Air Force Base. Composed largely of a closed housing area, barracks and light industrial area, the *Andersen South Training Area (ASTA)* is the largest urban training site owned by DoD.

The concepts and objectives for many of these experiments originated with the USMC Ground Board and/or the Infantry Operations Analysis Group (IOAG).

Training Cadre.
ProMet is the existing Marine Corps MOUT training cadre because we have had to develop and conduct training for participants in MCWL experiments. This is an ad hoc approach that relies heavily on augmentation from outside sources. We recommend a properly organized and equipped, dedicated core staff of SMEs and O/Cs to supervise and mentor the force.

Marine Corps Training Requirement.

1. First and foremost, the Marine Corps should:
   a. Establish a training requirement and support it with a training system that specifies and controls individual and collective training for all MOSs and MAGTF functions.
   b. Establish a USMC requirement (with necessary METLs) for units to conduct urban training.

Marine Corps MOUT Training Program of Instruction.
There is no USMC-wide training syllabus for MOUT other than the POI that supports the individual MOUT sites at different bases. The yet-to-be-approved BUST program that underpinned UCAX will eventually address this deficiency. Here is our recommended approach:

1. Establish funding line(s) and TEEP space for a institutional approach to MOUT training.
   a. TECOM is presently working with the MCWL ProMet team to develop the needed individual training standards (ITS), mission essential task list (METLs), training manuals, etc. to establish training standards/ requirements across the specialties and organizations.
   b. This is a slow effort that is not well funded.
      (1) Funding support for ProMet TTP development and experiments comes out of the MCWL budget. When the TTP development is completed and the training program transitions to TECOM, funding support will have to come from other sources. Budgeting action is needed to cover future operations once the requirement is established.
   c. Until such a program is established, mandated, prioritized and funded, MOUT training—especially collective training—will be hit and miss.

Results – Warfighting Experiment – CE Objectives

This section includes knowledge about warfighting by the MAGTF Command Element (CE) that we have gathered organized and synthesized from questionnaires, interviews, debriefs, direct observation, and after action reports from the various individuals, elements, and units involved.

Overview. This was the second reinforced battalion sized combined arms team urban experiment that ProMet has conducted at SCLA. It was the third event in the peacekeeping TTP development progression where we moved from company level operations to the battalion. The following selected findings are provided. Also, summary comments from 3/7's UCAX AAR are included later in this enclosure. It is derived from their two experiences, the battalion FEX during BUST and UCAX and is an excellent and honest review of how the battalion met the challenges and identified issues.

Effect of Personnel Turnover on the Experiment. The experiment was significantly affected by the fact that two (2) company commanders and nine (9) platoon commanders joined the battalion between BUST and the beginning of the UCAX experiment. Also, the battalion received its deployment fill personnel. To make up for the loss of training, 3/7 conducted some BUST-type training before returning to SCLA. This provided some sustainment training for those who attended BUST and introductory training for the new joins. It was encouraging to hear a new company commander using BUST terminology during an early rehearsal, which was only possible if he had been studying or receiving unit training.

- The absence of BUST was most apparent during company and below planning. These officers were learning as they went with guidance from those that had attended BUST.
- The experiment design did not incorporate any metric(s) to assess the effect of this factor on experiment results.

CE Warfighting Objective #1. Determine what command and control TTPs need to be further developed to enable mission accomplishment of units operating across the range of *Block II* peacekeeping through *Block III* lethal battle in MOUT.

Battalion Command Post Operations.

- Battalion Forward ("Jump") CP was mounted in an AAV-C7. This worked well.
- CO used HMMWV as additional mobile CP.
  - Needed to establish a security element with an NCOIC to supervise.
- During UCAX, established the main and did not displace until main attack was completed and seized a site capable of supporting the battalion main, BAS and the log train.
  - Included a Forward Resuscitative Surgical Suite **(**FRSS) in the battalion main.
- Battalion staff was severely strained by continuous operations and the requirement to support separate company firm base positions during the security operations phase of the experiment.
  - Severe staff strain particularly focused on F/Os, FACs, and intelligence personnel.
- The battalion expressed some frustration in trying to apply current doctrinal terms and symbols to operations in the urban battle space.
  - For example: "Clear" and "Secure"

Fire Support Coordination Measures.
Our results confirm once again that traditional fire support coordination measures that work well in open terrain are ill suited for the complex terrain of the urban battle space. The major challenges in this regard are:

- It is largely a direct fires fight; indirect fire weapons play a smaller role.
- Mortars may be the best and most responsive weapon system for missions.
- ROE restrictions and accuracy (range probable error and effective casualty radius) will preclude many missions by fixed wing and artillery.
- Responsiveness will require streamlined procedures.
- Inability of fire support teams (FiSTs) to gain line of sight to targets.
  - Controllers will not observe most missions.
- "Danger close" nature of most fire missions.
- Restrictions that come with ROE.
- Dead space created by buildings masking targets from artillery.
- Restrictions to CAS.
  - The battalion had success with some creative procedures.
    - Discussed in detail in the ACE results later in this report.
- Fleeting nature of targets.
- Marking friend and foe critical is in close terrain, particularly difficult for CAS

Force Requirements.

- If possible, it may be advisable to rotate forces after an intense fight rather than having the unit transition to peacekeeping operations.
- Battalions will need to task organize FiST differently to cover the decentralized small unit nature of the fight.
- Battalions will require additional personnel augmentation when assigned independent urban operations.
  - These may include civil military affairs, PAO, translators, counter intelligence, etc.

Employment of Military Police.
During the attack phase, 3/7 used their MP detachment in a number of ways, including as guides for the Army forces that joined the initial assault while in progress and to assist in linkup operations. During the peacekeeping phase, they were used to handle EPWs and assist in conducting vehicle checkpoints.

CE Warfighting Objective #2. Examine the adequacy of existing doctrine and TTPs for selecting, occupying, and operating out of urban patrol bases.
The 3/7 BUST end-of-course FEX was the first time that ProMet had an opportunity to conduct a multi-company firm base battalion level peacekeeping operation. Therefore, the TTPs for firm base operations were not fully developed. Additional lessons were discovered that will be included in future events.

- The standard playbox was too small to fully train and experiment with the force during UCAX.
- Post event feedback comments confirmed that the battalion did not have the necessary personnel to properly man three company firm bases and the battalion CP.
  - This was particularly true for extended 24-hour operations.

- Firm base operations personnel shortages were particularly noticeable for engineer, EOD, intelligence analysts / briefers / debriefers, fire coordinators, interpreters, and civil affairs.
- Difficult to run the battalion staffs while manning the perimeter.
- Need for rifles as many of the H&S personnel tasked to man the perimeter security positions are armed with pistols.
  - Establishing a separate battalion QRF position exacerbated this situation.

The shift from a *warfighting* CP to a *peacekeeping* CP brought some additional requirements for the battalion. For example, the battalion needed a secure area for meetings with media, non-government officials, local leadership, and other non-Marine personnel. This recurring requirement further strained the battalion leadership and security assets. The duty for most of these meetings fell to the battalion XO.

Participant feedback comments recommended that ProMet develop *smart packs* and checklists for firm base operations. Design the checklists on the tactical exercise without troops (TEWT) conducted for company officers led by Major Sullivan, ProMet OIC that was based on his experience in similar circumstances in Kosovo. TEWT was very effective, and participants recommended we formalize it into class and include all the unit leaders.

Results – Warfighting Experiment – GCE Objectives

GCE Warfighting Objective #1. Examine the degree to which the urban combined arms combat formations developed for platoons, companies, and battalion enable seamless, effective transition from *Block II* peacekeeping operations to *Block III* lethal battle operations for a reinforced battalion.

Making the Shift Between Lethal Battle and Peacekeeping. Individuals and units continue to have difficulty in shifting from higher intensity to lower intensity operations. The escalation from peacekeeping to battle tended to be easier. The senior leaders and SMEs generally agreed that the quick fix to difficult transition from combat to peacekeeping is to replace units as soon as practicable as shift is made. Although we encountered some problems with this approach, we saw that a unit other than the one that experienced heavy fighting and casualties was less on edge and better suited to "win hearts and minds." Nevertheless, there were a few instances of inappropriate behavior by Marines.

- If it is not possible to replace the initial attacking unit once the action shifts from battle to peacekeeping, the chaplain suggested bringing in contact teams to counsel the survivors to lessen any residual anger and improve the *hearts and minds* aspect.
- The intent here is to ensure the Marines and Sailors understand the change in situation and reduce stress-induced inappropriate actions.
  - It was further noted that memorial services could assist in dealing with grief.

There seemed to be less difficulty in shifting from peacekeeping to combat. Although we saw some hesitation by Marines to escalate their combat level after they have become *comfortable* during peacekeeping situations. They tended to look for direction or approval from a senior instead of acting on their own—even when the action was clearly within the ROE. This is consistent with observations from previous experiments.

GCE Warfighting Objective #2. Evaluate the effectiveness of TTPs used to employ the reaction force.

Terrain restrictions in SCLA made deployment of reaction forces somewhat predictable. Also, the battalion reaction force remained in the same location during UCAX. Because of this, the OPFOR planned to ambush the standing battalion reaction force. However, the battalion reaction was not deployed during the experiment. Therefore, we did not evaluate the battalion level TTPs. However, the company-level reaction forces were employed on a number of occasions with good results. Here is the knowledge gained from these employments.

Establishing the Force.

Once the infantry companies established their firm bases, each of them organized a small reaction force.

- Typically these reaction forces were a mix of CAAT and infantry.

24-Hour Battle Rhythm.

Because of the 24-hour a day (for four days) nature of the experiment, manning of a reaction force that was alert and reasonably rested/battle ready was very challenging for each company.

- Competing manpower requirements were:
  - Reasonable sleep plan.
  - Manning the company defensive perimeter.
  - Maintaining patrols in the area of responsibility.

Best Use of the Reaction Force.
Reaction forces often do not arrive in time to affect the fight, because of the spontaneous and fleeting nature of combat in the urban area. However:

- On a number of occasions, company reaction forces were effectively maneuvered to intercept or cut off a fleeting enemy following an engagement with a patrol.

Cross Boundary Coordination in a Fluid Situation.
Company areas of responsibility were very close in the experiment and the terrain did not lend itself to easily recognized boundaries. This caused cross boundary coordination issues for reaction forces during engagements and pursuit of OPFOR.

- Once these issues were recognized, units quickly established SOPs for mission support planning, coordination with adjacent units, and linkup procedures.
  - This intra battalion procedure was not sufficiently developed during the planning.
- As the UCAX progressed, units got better at cross boundary coordination during fights and when deploying reaction forces.

Advantage of Reaction Force Mobility.
In some cases, the company reaction force was a mobile team that moved periodically to improve responsiveness. This not only improved responsiveness, but made them less predictable.

- The periodic movement provided nominal security and enabled the team to maintain a set distance from the patrol it was most likely to support.

GCE Warfighting Objective #3. Assess the adequacy of the escalation of force TTPs.
TTPs seemed to be adequate for the situations presented during the experiment. These TTPs are closely linked to the rules of engagements (ROE). We saw that Marines were understood the importance of knowing the general and specific ROE while being very clear on the fact that ROE never denied them the right of self-defense. There were no noted problems with inappropriate use of force. BLUFOR did not have all the non-lethal (NL) assets normally available to a deploying unit, and noted that NL training was needed before a unit was given a peacekeeping mission. ProMet has not included the NL training in the BUST package because it is a mature (not currently used in experiments) program, but agrees with the unit's comments on that it is needed.

GCE Warfighting Objective #4. Evaluate the satellite patrol concept across the range of MOUT from Block II peacekeeping through Block III, lethal battle.
Comments from BLUFOR and particularly the OPFOR confirm that satellite patrolling is a viable concept. For example, OPFOR stated that they had problems dealing with the dispersed, unpredictable and seemingly random movement of the patrol sub-elements. Overall, it made OPFOR operations more risky and difficult. This greatly assisted in taking away some of the *defender's* advantage.

- Because satellite patrolling is a new concept to Marine forces, it takes more training time than other urban patrol training. However, ProMet experience has shown that once a unit grasps the concept, they perform it as well as any other patrolling technique.
- The standard Marine Corps infantry organization is an effective structure to use as the base unit for satellite patrolling.
- Satellite patrolling was effective during Block II and Block III situations in this experiment.

- Satellite patrolling with CAAT vehicles and other mechanized assets, though more difficult to execute, seems to be viable as well.
- Additional work is needed to develop better SOPs and battle drills.

GCE Warfighting Objective #5. Assess the adequacy of the TTPs for checkpoint operations (vehicle and personnel searches) and hasty building searches.

*Checkpoint Operations and Personnel / Vehicle Searches***.**

- In general participants remarked that the basic techniques were adequate.
- One of the O/C Israeli company commanders who came straight from operations in Ramala, offered a personnel search technique that seemed better than ours.
  - We are currently evaluating it for inclusion in BUST.

Hasty Building Searches.

- The TTPs were readily mastered in training and were seen to be adequate to support the experiment.
- As noted in previous experiments, building search techniques are very similar to cordon and search operations.
- During UCAX, all building searches (peacekeeping and lethal battle) became more like building *clearing* (Block III) operations.
  - This may have been related to role player actions and the lack of household effects and furniture inside the buildings.
  - Or, it could have been a result of using the same forces that attacked the city to remain in place to conduct peacekeeping operations.

GCE Warfighting Objective #6. Evaluate employment procedures and techniques used for reconnaissance and scout sniper teams in urban ground reconnaissance (UGR).

Reconnaissance Surveillance and Target Acquisition (RSTA**)** forces included a division reconnaissance platoon and a battalion scout sniper platoon. Based on previous RSTA lessons learned, the two assets were "pooled" in concept for planning and operations.

Existing MOUT Training for RSTA Marines.

Marine Corps reconnaissance forces and/or snipers do not receive any basic level instruction on urban reconnaissance and surveillance (R&S) unless attached to a deploying MEU. I this case they get training from the Special Operations Training Group (SOTG). However, the SOTG pre-deployment training focuses on covert missions. Therefore, these Recon Marines and snipers are left to their own devices to develop an approach to R&S in support of GCE in the urban environment. Also, if a Recon Marine or sniper has never been to the SOTG urban R&S course or the urban Sniper course, he has no knowledge of his role in this environment. Feedback from experiment participants recommended pre-employment MOUT training in the following subjects:

- Urban Hide Considerations / Construction.
  - Screen and backdrop cloth.
  - Loopholes in walls and doors providing observation on objectives.
- *Urban Hide Kits.*
  - Hand drills to create loopholes.
  - Hand glass cutters to create holes for firing ports for snipers.
  - Portable items to construct booby traps around their observation post and for employing passive security measures.

- *Urban R&S Mission Planning Considerations*, specifically:
  - Urban communications, communicating with maneuver units.
  - Insertion / Extraction methods;
    - Clandestine / overt, in support of GCE maneuver elements,
    - Not covert methods discussed in SOTG Urban R&S course.
- *Urban CAS 6 line brief*.
- *Room and Building Clearing*.
- *Angle Fire Training*. Snipers do not currently receive sufficient training on angle firing.
  - Expose them to shooting under different conditions when targets could be at angles presented by placing snipers in overwatch positions in the urban environment.
  - The only opportunity Marines get to fire angles is at the Urban Sniper Course when they fire from a two-story platform.
  - They also shoot at Hawthorne range when snipers do rotations at MWTC, Bridgeport, CA.
    - If snipers do not attend one of these packages, they have no data or experience in firing at angles.

Sniper Rifle Deficiencies in MOUT.
RSTA Marines participating in the experiment stated that snipers might not be optimally equipped for support of maneuver elements during the assault in MOUT.

- The M40A1 and A3 rifles are highly capable and accurate bolt-action rifles, however, they limit the Sniper to a five round capacity before having to transition to rapid bolt manipulation. This may degrade the snipers ability to engage multiple *fleeting* targets of opportunity that may present themselves in the urban environment.
- The M40A1 / A3 has a loud noise signature and is likely to give away the sniper's firing position.
- The M40A3 equipped with the AN-PVS 10 scope weighs approximately 24 lbs, which can make it very difficult to move rapidly between firing positions in MOUT.
- Snipers may have a need for a heavy barreled, match-grade semi-automatic rifle outfitted with a variable powered optic, greater magazine capacity and a sound suppressor assisting in maintaining the stealth of his firing position.
  - Given this capability, the Marine sniper could engage multiple targets of opportunity and eliminate a greater number of key targets in support of the assault phase of urban combat operations.

Planning and Management of RSTA Assets.
The Sniper and Reconnaissance platoons set up a combined Surveillance and Reconnaissance Center (SARC) as a centralized location for planning missions and collecting reports. Teams were employed on multiple company objectives, typically pairing a Six-man reconnaissance team with one- or two-man sniper teams covering each objective. This allowed them to take up positions from different vantage points so they could cover the objective area from multiple angles.

SARC Operation.
The snipers maintained the sniper control net and the reconnaissance platoon maintained their recon TAC nets. The platoon HQ elements were collocated but there was still seemed to be resistance to working completely together. The SARC needs to be a combined effort and the HQ

elements have got to work together in maintaining situational awareness about all R&S assets employed in the battlespace and provide combined information updates to the company commanders prior to crossing the line of departure.

Command and Control.

- The teams were employed in direct support of individual company attacks.
- R&S teams reported to the SARC prior to the company crossing the line of departure.
- Teams attempted to pass situational updates directly to platoon or company commanders.
- We saw that platoon and company commanders did not have time to process the information reports passed by R&S during the assault after crossing the line of departure.
  - They simply did not have time to process the R&S information.
    - Therefore it was usually disregarded.

RSTA Insert Methods.

The teams were inserted through the *stay behind* technique. They would patrol with an infantry security patrol during the hours of darkness to the vicinity of the their tentative observation post. Teams then moved to, clear and occupy an observation post that gave them line of sight view of the objective area. The infantry squad was the QRF during the insertion. The plan was for the infantry to remain for one hour in the AO during insertion—or until advised by the team that the insertion was complete—this never happened. After the teams moved towards their OPs from the release point, the infantry squads would leave them and move back to friendly lines.

Timing of Inserts.

Due to the limited planning time for platoon and company attacks, the reconnaissance and sniper teams were inserted the night prior to the attack.

- Snipers remained in position and supported the assault of the objectives and conducted link-up with the maneuver units, once the objective had been secured.
- Reconnaissance teams provided an information summary to the company commander prior to the platoon or company crossing the LD
  - Then they would attempt to move back to friendly lines during the attack attempting to use the confusion and chaos on the battlefield as their deception.
- Reconnaissance teams believed this to be a better method than linking up with maneuver elements during the attack because they often discovered that the maneuver elements did not maintain situational awareness on team locations.
  - This is especially true of the tanks and AAVs.
  - Recon teams discovered that the tankers and AAV vehicle commanders had no situational awareness of reconnaissance team locations and were often firing at buildings occupied by reconnaissance teams.

Special Equipment. Reconnaissance teams used the Litton M2120 “Sophie” thermal imager to attempt to discover enemy force movement at night.

- Because there was minimal OPFOR night movement, evaluation of the device is incomplete.
- Recon teams had very a high confidence level in this piece of equipment.

*Team Size***.**

- Reconnaissance teams found the standard six-man team was too large for this environment.
- For short duration urban operations, a four-man team was probably the optimum size.
- Two-man sniper teams proved to be very successful because it enabled the R&S teams to cover multiple objectives from different vantage points.

Results – Warfighting Experiment – CSSE Objectives

CSSE Warfighting Objective #1. Assess the adequacy of TTPs for medical support and casualty evacuation CASEVAC).

This experiment confirmed our belief that there is a serious shortfall in our ability to treat and handle casualties in the urban battlespace. Furthermore, it is our opinion that unless addressed, it may become a major pacing item in the fight. UCAX casualty figures were consistent with those seen in previous experiments.

When Most of the Casualties Occur.

The majority of the casualties happen during the initial assaults/movement into the battlespace. Specifically:

- BLUFOR suffered approximately 16% casualties to units in contact during the rehearsal and the main attack experiments on 8 and 9 August.
- These casualties occurred in approximately three to four hours of intense fighting.
- BLUFOR incurred approximately 95 casualties out of an estimated 594 in the playbox at the time of each attack.

Casualty Management.

Our data indicates serious shortfalls in the ability to treat, transport, and track casualties.

- By the end of the attack, the battalion aid station was overwhelmed, out of bandages and many important medicines; and—because of the absence of helicopter landing zones and ground vehicles not committed to the fight—there was no practical way to CASEVAC the wounded.
  - This is a recurring finding.
- Some of the inability to CASEVAC was due to SCLA flight restrictions and peacetime safety rules.

Casualty Management Training for MOUT.

We were told that casualty handling has not been a well-practiced event during previous training.

- The main focus for the battalion medical staff has been the routine daily medical support.
- It had not been tested in a full up battle training field event.
- This appeared to result in the lack of battle oriented SOPs.

Shortage of Medical Supplies at the Battalion Level.

The 3/7 medical staff expressed that they experienced serious shortages in the existing allowance of medical supplies found in their Authorized Medical Allowance List (AMAL) field kits.

- Based on *their* evaluation, the kits are inadequate to meet the needs for the urban fight.
- The 3/7 Battalion Surgeon has submitted—through the proper medical system channels—a requirement to reevaluate the content of this AMAL kit.

CSSE Warfighting Objective #2. Evaluate the adequacy of TTPs for tactical resupply in MOUT Using the Small Urban Vehicle.

Combat Support Teams.

All of our experimentation shows that the Combat Support Teams (CSTs) formed to support forward units are effective in MOUT.

- An important enabler for the CSTs was the small, agile, low silhouette vehicle they use to move supplies forward and casualties to the rear.

  - We used John Deere Gators as a surrogate for this capability.
- A significant amount of participant feedback extolled the value of having a small vehicle that can move quickly through the urban environment.
- CSTs reported that despite the SUV's limited carrying capacity, the effectiveness of the CST depended on such a capability. (See next item for expanded information on the SUV).

Small Urban Vehicle (SUV). MCWL has been a proponent of fielding a SUV since the beginning of the Urban Warrior series of experiments in 1998. Since that time, MCWL has rented John Deere *Gators* as the surrogate for the SUV. US Special Operations Command (SOCOM) and the US Army have procured M-Gators—a militarized variant of the commercial-of-the-shelf (COTS) *Gator*—and reported favorably on their general employment in Afghanistan; but they have not reported on its utility in the urban area. Therefore, MCWL saw the need to experiment further with the SUV surrogate to specifically identify its value in the urban battlespace relative to ammunition and water resupply "inbound" to the urban fight and its effectiveness in casualty evacuation "outbound" from the forward urban battlespace.

Figure 26 SUV Surrogate/Gator in Rubble

BLUFOR infantry companies and CSTs repeatedly used gators with great success in UCAX for resupply and casualty evacuation. Each vehicle was equipped with MILES so we could collect survivability data. Here are our results. They are consistent with previous experimentation with the SUV:

- The addition of a small, mobile and agile vehicle is a force enabler.
  - Comments from the participants, particularly the Company Gunnery Sergeants, Medical Officers, and CSS personnel, were very favorable.
  - The ability of the SUV to maneuver right up to a building to off-load supplies or collect casualties was reported as particularly advantageous.
  - Medical personnel commented that

Figure 27 SUV Surrogate/Gator on Resupply

when time is critical in transporting and treating casualties within the *golden hour*, the SUV might make a *significant* difference.
  - SUVs had the best survivability of any vehicle in the battlespace as confirmed by MILES 2000 vehicle kits.
    - None of the eight Gators was *hit* by enemy fire during the UCAX.
  - The Gator's survivability seems to be a result of the vehicle's small profile and ability to:
    - "Tuck-in" tightly to buildings for cover, and
    - Maneuver effectively through tight spaces.
  - This high survivability rate is consistent with all previous experiments.
- The Gator fits inside and has been internally transported in both the CH-46 and AAV P7 during experiments.
  - This capability is appears to be mandatory in any future system.
- The civilian variant is not rugged enough for continuous use and had numerous maintenance problems.
  - Despite the maintenance problems, participants stated that they really liked having the flexibility of the small, agile vehicle so they would "live with" making frequent repairs.
    - Flat tires were a particularly large problem.
  - This is consistent with previous findings.
- **Note:** MCWL rented civilian variants—not the militarized M-Gator variant used by SOCOM and the US Army.
- Users recommended the following improvements:
  - Install a weapon mount for a M249 SAW for the A-Driver/Vehicle commander.
  - Extend the bed to improve casualty handling.
  - Include run flat tires or provide an ATV type tire repair kit.

This experiment confirmed that the SUV is a valid concept. We have submitted a Universal Need Statement (UNS)—based on our findings—that such a capability be evaluated within the Expeditionary Force Development System (EFDS; formerly the Combat Development Process).

Refueling and Rearming in the Urban Battlespace.
In this and other experiments we have seen a need to develop an ability to refuel and rearm mech/armor and other vehicle assets in an expeditionary manner that fits the requirements of the urban fight. During the first battalion level experiment with 3rd Bn 4th Marines, ProMet used smaller fuel bladders to *take the fuel to the vehicle* rather than have the vehicle pull out of the fight and go to the fuel. During UCAX the 3rd Bn 7th Marines opted to pull the assets out of the line and have them go back to the fuel. In the latter case, this technique seemed more time consuming and caused a lull in operations.

Logistical Support Center (LSC).
3/7 (S-4) suggested establishing a *Logistical Support Center (LSC)* that would function like a DASC for managing logistics on the urban battlespace. See 3/7 summary AAR comments later in this enclosure for an outline of LSC activities. This would seem to be a viable concept given the decentralized nature of the environment and the complexity of support operations. However, we did not experiment with this concept.

Results – Warfighting Experiment – ACE Objectives

This section includes knowledge about warfighting by the ACE that we have gathered organized and synthesized from questionnaires, interviews, debriefs, direct observation, and after action reports from the various individuals, elements, and units involved.

Overview. UCAX was the second ProMet experiment in which rotary wing (RW) aircraft were employed. RW CAS was flown primarily by AH-1W Cobras, with some UH-1N Huey CAS flights. A detachment of CH-46E, AH-1W, and UH-1N deployed to SCLA from Camp Pendleton and remained at throughout the experiment. This enabled us to evaluate the survivability of some RW ordnance delivery tactics as well as troop lift flight paths. Based on our limited flight data, we saw that properly flown RW aircraft can be effective and survive in the low-rise urban battlespace. Cobras and Hueys consistently provided effective support to heavily engaged ground units and survived.

Live Threat Simulators Used in UCAX. During all experiments involving the ACE, aircraft faced live simulations of both a radar controlled AAA gun system and a surface to air missile (SAM) threat posed by a Man Portable Air Defense System (MANPADS). Additionally, we used the Multi-Air Defensive Simulator System (MADSS) during the experiment to give a visual presentation of a surface-to-air missile launch at the helicopters. The MADSS is a simulator that uses a smoke pellet to replicate the launch and flight of a SAM launched from a MANPADS. Figure 24 is a picture of the MADSS. We were unable to effectively simulate—or measure—the threat to the aircraft from small arms, rocket propelled grenades (RPGs) or visually controlled machine guns.

Figure 28 MADDS

Multi-Air Defensive Simulator System (MADSS) Description. MADSS replicates every phase of a missile launch from activating cockpit alert indicators to creating a visual signature/smoke plume for a missile trajectory. This challenges aircrew to see the difficulties of locating and engaging one person in and amongst the urban clutter. And, because of its portability, it is easily positioned in spots that would be selected by real enemy gunners. The particulars of the system are:

- Mobility.
  - Lightweight (19 lbs), man portable on foot.
  - Can be operated by one person.
  - Is not tied to electric power/generator.
- Capability.
  - Replicates the launch plume and ensuing ascent with a smoke cartridge.
  - Fires smoke cartridges up to 400 feet altitude.
  - Smoke cartridge is a powder tablet that poses no danger to aircraft.
  - Incorporates an eye-safe laser tracking device that activates the AVR-2 Laser Detection Device on the aircraft.

  - Simulating "laser beam riding" systems.
- Low cost expendable "Smoky SAM" cartridge—at $3.00 each.
- System is igniterless so there is no danger of pre-launch ignition of the cartridge.
- Has video capability that records all engagements for debrief purposes.
- Figure 25 shows a MADSS engagement of a UH-1N during UCAX.

Figure 29 MADSS Engagement of UH-1N

Limitations to UCAX Aviation Experiments.

1. *No Fixed Wing Aircraft Participation. Rotary Wing Aircraft Only.* Airspace restrictions around SCLA—an operational airport—precluded use of any fixed wing aircraft.
2. *No Chaff/Flare Deployment*. Aircraft were not permitted to deploy chaff or flare during the experiment. Therefore we focused on exposure time of the aircraft to the system, rather than trying to determine whether the system was able to successfully engage the aircraft.
3. *Airspace Restrictions at SCLA***.** Due to airspace use restrictions and the need to deconflict with runway traffic, the threat systems had less difficulty finding aircraft because search area was reduced. Rather than using a normal 360-degree search, systems were able to focus their search to approximately 225 degrees because aircraft had to deconfict with the active runway at SCLA.
4. *Inability to Use Full Range of Marking Options for CAS*. Because the exercise was force-on-force, position and target marking was limited to use of colored smoke to mark friendly positions and "talk-ons" to enemy positions by FACs. For example, no mortar rounds or tracer rounds could be used to mark enemy positions. This made target acquisition more difficult for the aircrew throughout the experiment.
5. *Restrictions on Positioning of Threat System Simulators*.
   a. Radar Controlled Guns. Each day the SA-16 and ZSU threat simulators were positioned to support the OPFOR scheme of maneuver. However, to balance experiment goals with

restrictions of the training area, the threats remained in the same location throughout that day. This had both good and bad effects. For example:

(1) Once aircrew understood where the threat was located, they could adapt their tactics to deal with a specific site.

(2) On the other hand, this generated consistent data upon which comparisons could be made on the effectiveness of various tactics flown: 1) during different missions; and, 2) by different aircrew. Because each mission was viewed from the same location.

b. MADSS. The two (2) MADSS remained highly mobile and were employed in a number of different locations that suited the OPFOR scheme of maneuver as the day progressed.

Experiment Factors that Uniquely Challenged the ACE.

1. *Live Ground Forces*. Unlike many *aviation only* experiments, UCAX had significant ground forces on both sides. This enabled us to examine tactics and the link between current TTPs and the ability of aircrews to:
   a. Rapidly and effectively differentiate between friendly and enemy forces.
   b. Without preplanning, acquire and engage "immediate" targets specified by ground forces.
   c. Survive a realistic, mobile threat.
2. *Proximity of Opposing Forces to Each Other***.** Although the enemy wore different uniforms, they used small unit, hit-and-run tactics that kept almost always within the "Danger Close" range for fire support. They remained decentralized thereby making it nearly impossible to develop an enemy "trace" or a clearly defined FEBA or FLOT. Because of these factors, it proved nearly impossible to successfully conduct a helicopter borne assault.
3. *Battlespace Geometry*. The SCLA housing area consists of 300 buildings with over 1,000 individual units in a battlespace of approximately one square kilometer. This challenged aircrews that have worked in the traditional 30 building MOUT sites where aircrews can often see the entire urban area from one position.
   a. SCLA's one- and two-story buildings are similar to the urban environments in many third world countries such as Somalia.
   b. Navigation proved difficult because the buildings are situated close together and are built with only three different floor plans so all of the structures look the same.
   c. The area is a series of cul-de-sacs and winding streets that are not oriented in a typical north-south, east-west grid pattern. This complicated both ground and air navigation.

Challenges to Effective Urban CAS. Our experience in these experiments has shown that effective urban CAS is degraded in responsiveness and effectiveness for the GCE. We have also seen it to be less survivable for the aircraft. Certain factors that are not unique to our experiments frame these challenges. These are:

- Limited/inadequate number of Forward Air Controllers (FACs) available to small units (platoon, and squad).
- Time consuming, often unnecessary/cumbersome protocols required to control the aircraft once they arrive on station.
- Challenges caused by urban terrain that limit:
  - Fields of fire/ballistic trajectories for weapons.
  - Sight lines for target acquisition and identification.
  - Aircraft survivability.
- The traditional method of clearing fires at the Battalion FSCC level is effective in deconfliction and airspace coordination, but is not optimal to engage a fleeting enemy.

  - At the company and below, it is almost impossible.
- Fleeting targets that—while lethal to our forces—are only vulnerable to our fire support for minutes rather that tens of minutes.

Therefore, to effectively employ CAS, the time/space advantage of the enemy must be minimized. One method that has been used with success is to utilize the 6-Line CAS brief instead of the traditional 9-Line CAS brief when using RW CAS. Another means to reduce the time for CAS fires is to give companies the authority to clear their own fires. This has been successful in reducing the time of request to the time ordnance impacts the target, but it has limitations because companies cannot do the same level of deconfliction as the FSCC. Second, the battle becomes decentralized down to the platoon and squad levels because of the compartmentalized terrain that the urban environment presents.

ACE Warfighting Objective #1. Evaluate employment procedures and techniques for Rotary Wing (RW) CAS as they specifically relate to:

1. Response time.
2. Target identification
3. Position marking.
4. Existing tactics.
5. Control of CAS.
6. Survivability.

*CAS Response Time***.**

The experiment design called for OPFOR to use Chechen style hit-and-run tactics so that potential CAS targets only presented themselves for fleeting periods. In response, we used these two (2) experimental approaches to speed up the CAS process.

1. Company Fire Support Team (FiST) Members as Universal Spotters**.** Because we know from all of our experiments that urban combat is a decentralized fight, we tried to experiment with this as a way to give *platoons* the capability to control fires. Therefore we employed company FiST members as "universal spotters" capable of controlling all supporting fires. The goal is to give each platoon in the company the ability and communications gear to request and control supporting fires.
2. Six Line (6-Line) CAS Brief. Our second approach centered on the use of a 6-line CAS brief vice the standard 9-line CAS brief to speed the processing of air support. We based this on the statement in the MAWTS-1 ACE MOUT Manual that states: *"An abbreviated CAS brief may be more suitable for rotary wing aircraft."* The 6-line brief proved to be very effective and was lauded by both pilots and FO/FACs. The six-line brief is as follows:

A/C callsign_____This is_____ — Fire Mission Over 1) My Position Marked By_____ — Friendly Location _____ 2) Direction_____ — Enemy Location _____ 3) Distance_____ 4) Target Description_____ 5) Target Marked By_____ 6) Remarks_____

3. Use of the 6-line CAS Brief**.** During the chaotic, compressed engagements typical of our experiments, we saw that unit leaders *at all levels* had to know how to effectively request and control short-response-time, *danger close* CAS.
   a. RW CAS was responsive—three to four minutes from request to getting an aircraft on station—once the GCE and ACE worked out the complexities of urban CAS.
   b. Proficiency with 6-line brief:
      (1) The ACE was proficient and familiar with the 6-Line brief prior to UCAX.
      (2) None of the FACs in the battalion had ever worked with the 6-Line brief before UCAX.
      (3) Classes on the 6-line brief prior to UCAX proved to be effective as Marines reported that they found the form simple and similar to the Call-For-Fire (CFF) format.
   b. Classes on the 6-Line were given to platoon commanders, FiST teams, and F/Os in order to have the capability to control CAS down to the platoon level.
4. Terms of Reference for the 6-line Brief:
   a. Referred to as "click and point" CAS because it does not require a map or a protractor.
   b. Brief merely requires the terminal controller to mark both his position and the target.
   c. CAS requested by the 6-line is understood to be immediate, unless otherwise directed by the terminal controller.

Position Marking.

1. Colored smoke was effective when used by friendly forces to mark their positions.
   a. Smoke was most effective when friendlies responded to the aircraft's call for the mark.
   b. When friendly forces deployed smoke *before* it was called for, the smoke often dissipated or spread over OPFOR positions before aircraft arrived.
   c. Because there will be several colors of smoke on the battlefield, inform the aircrews that the mark has been deployed, but leave it to the pilots to confirm the color of the mark.
      (1) This will help to prevent them from mistaking the mark.
2. During limited nighttime sorties, several chemically luminescent lights (chemlights), both visible and IR were used.
   a. Chemlights were an ineffective mark as aircrews were unable to visually locate them.
   b. Chemlights were placed on top of a roof marking the friendly location.
3. The VIPIR IR strobe lights were effective for marking friendly positions at night.
   a. This is an overt/covert individual position-marking device that is currently in use in the Operating Forces.
   b. The lights have steady/continuous and flashing modes.
   c. Aircrews preferred the continuous mode.
4. BLUFOR was unable to mark the enemy positions with tracer fire, 40mm smoke or illumination rounds, or IR pointers.

Target Identification.

Because of the close quarter, noncontiguous nature of the urban battlespace, verifying the location of friendly forces is a challenge. It was no different in this experiment because our experiments always presented *danger close* CAS missions against an OPFOR that was usually within 100 meters of the requesting unit. And, sometimes only one building, or one floor of a building separated friendly and enemy forces. Here is what we saw:

1. During "troops in the open" CAS missions, aircrews identified OPFOR by their black uniforms.

a. The aircrew almost always had to be at close range (c. 500 meters) for this visual ID.
b. Aircrew could not always begin shooting on the "cleared hot" call because they had to make the positive ID.

2. When OPFOR were out in the open—but not in a close battle with friendlies—aircrew successfully engaged those targets (with the above noted restriction).
3. When OPFOR was inside buildings, positive ID was not possible without a target mark or a FAC with the ability to clearly and concisely talk the pilot's "eyes-on" the target.

Effectiveness of Current Tactics.

1. Our videotapes showed us that properly flown existing tactics limited the potential for successful engagements by MANPADS and radar controlled guns.
2. Terrain masking / low altitude flight clearly reduced the number of successful engagements by OPFOR MANPADs and SAWs.
   a. The tactics took advantage of obstructions to restrict radar and visual acquisition and fields-of-fire of surface-to-air weapons (SAWs).
      (1) See Tables 15 *SAW Results* and 16 *MANPAD Results* below.
   b. *However*, although limiting sight lines and engagement opportunities on properly flown aircraft, the urban terrain provides all anti air weapons multiple hard-to-find sites in which to hid and from which to engage our aircraft.
3. Aircrew that used terrain masking / minimum altitude flight had significant difficulty in acquiring targets due to the vertical relief of low-rise buildings.
4. The pop and dive profile appeared to be the most effective way to visually find/identify and engage ground level targets.
   a. The dive gave aircrews look down angle that mitigated some obstructions that were otherwise present in the flat / level delivery option.
   b. It increased the ability of the CAS aircrew to acquire and engage enemy positions.
5. The radar controlled AAA was not affected as much as the MANPADS by such obstructions as trees and even electrical wires.

Table 15 – SAW (Gun) Information

Type A/C					Shot		Guidance Mode		Obstructed View		Exposure Time By A/C Type In Seconds			Profile					Range
Event	**CH-46**	**CH-53E**	**UH-1N**	**Ah-1W**	**Yes**	**No**	**Radar**	**Optical**	**Yes**	**No**	**Assault**	**UH-1N**	**AH-1W**	**T/O**	**Holding**	**Ingress**	**Pop**	**Egress**	**Meters**
1				X	X		X			X			15		X				1700
2				X	X		X		X				3					X	2200
3	X				X			X	X		11					X			910
4	X					X		X	X		11					X			570
5	X					X		X	X		2							X	360
6	X					X		X	X		3					X			770
7	X				X			X		X	7							X	300
8	X				X			X		X	10							X	700
9				X	X		X			X			43		X				1200
10				X	X		X			X			40			X			1200
11				X	X		X						38			X			1100
12	X				X			X		X	9					X			630
13				X	X		X			X			23		X				2000
14	X				X			X		X	31					X			600
15	X				X			X		X	13							X	500
16				X	X		X			X			21		X				2300
17	X				X			X		X	17							X	700
18				X	X		X			X			18		X				2600
19	X					X		X	X		3					X			680
20	X				X			X		X	12							X	1000
21				X	X		X			X			22		X				1600
22				X	X		X			X			27		X				2000
23				X	X		X			X			23		X				1900
24				X	X		X			X			14					X	1500
25				X	X		X			X			22		X				2000
26				X	X		X			X			20					X	2100
27			X			X	X		X			4			X				2200
28			X			X	X		X			4						X	2600
29			X			X	X		X			2						X	2500
30			X		X		X			X		8						X	1700
31				X	X		X			X			15					X	2000
32	X				X		X			X	12					X			1400
33	X				X		X		X		4					X			1500

Table 15 – SAW (Gun) Information

Type A/C					Shot		Guidance Mode		Obstructed View		Exposure Time By A/C Type In Seconds			Profile					Range
Event	**CH-46**	**CH-53E**	**UH-1N**	**Ah-1W**	**Yes**	**No**	**Radar**	**Optical**	**Yes**	**No**	**Assault**	**UH-1N**	**AH-1W**	**T/O**	**Holding**	**Ingress**	**Pop**	**Egress**	**Meters**
34	X				X			X		X	28							X	600
35	X				X		X			X	16							X	1680
36	X				X		X			X	17							X	1500
37	X				X			X		X	10							X	1100
38	X				X			X		X	11							X	900
39	X				X			X		X	13							X	910
40	X				X			X		X	10							X	1010
41	X				X			X		X	42							X	1350
42				X	X		X		X				4		X				2400
43				X	X		X			X			27		X				1850
44				X	X			X		X			14				X		600
45				X	X		X			X			12				X		2550
46				X	X			X		X			13			X			1300
47			X		X			X		X		13						X	470
48				X		X	X			X			4			X			1200
49			X		X			X		X		8				X			800
50			X		X			X		X		26						X	280
51			X		X			X		X		18				X			1000
52				X	X		X			X			7				X		1200
53			X		X			X		X		16						X	1140
54			X		X			X		X		8				X			740
55			X		X		X		X			3				X			2500
56				X	X		X			X			7			X			2600
57				X		X	X		X				5			X			2700
58				X	X		X		X				8			X			2700
59				X	X			X		X			11					X	630
60			X			X	X			X		2				X			1500
61			X		X		X			X		15							1500
62				X	X			X		X			17					X	700
63			X		X			X		X		15				X			1200
64			X		X		X			X		16				X			1400
65			X		X		X			X		11						X	1700
66			X		X		X			X		45			X				1200
67				X	X		X			X			14			X			1400

Table 15 – SAW (Gun) Information

Type A/C					Shot		Guidance Mode		Obstructed View		Exposure Time By A/C Type In Seconds			Profile					Range
Event	**CH-46**	**CH-53E**	**UH-1N**	**Ah-1W**	**Yes**	**No**	**Radar**	**Optical**	**Yes**	**No**	**Assault**	**UH-1N**	**AH-1W**	**T/O**	**Holding**	**Ingress**	**Pop**	**Egress**	**Meters**
68				X	X		X			X			13			X			1520
69				X	X		X			X			9					X	1470
70				X	X		X			X			6			X			2600
71	X					X		X		X	5					X			600
72				X	X			X		X			25			X			900
73				X	X		X			X			12			X			1780
74	X				X		X			X	22							X	1200
75				X		X	X			X			5			X			2500
76				X	X		X			X			4					X	1780
77				X		X	X		X				3					X	2480
78				X	X		X		X				6					X	1840
79				X		X	X			X			5					X	2040
80				X		X	X		X				1			X			2380
81			X		X		X			X	11				X				2600
82			X		X		X			X	10				X				2200
83			X		X		X			X	16				X				1500
84			X		X			X		X	12							X	1800
85				X	X			X		X			21					X	2000
86			X		X			X		X	11							X	2080
87				X	X			X		X			14					X	600
88			X		X			X		X		28				X			400
89			X		X			X		X		25				X			430
90			X			X		X		X		20				X			2690
91			X		X			X		X		30				X			360
92				X	X			X		X			15			X			400
93				X	X			X		X			9			X			800
94			X		X			X		X		11				X			680
95				X	X			X		X			9			X			510
96			X		X			X		X		10				X			900
97				X	X			X		X			10			X			800
98				X	X		X			X			7			X			400
99				X	X		X			X			11			X			2800
100				X	X		X			X			5					X	2250
101				X	X		X		X				11			X			1800

Table 15 – SAW (Gun) Information

Type A/C					Shot		Guidance Mode		Obstructed View		Exposure Time By A/C Type In Seconds			Profile					Range
Event	**CH-46**	**CH-53E**	**UH-1N**	**Ah-1W**	**Yes**	**No**	**Radar**	**Optical**	**Yes**	**No**	**Assault**	**UH-1N**	**AH-1W**	**T/O**	**Holding**	**Ingress**	**Pop**	**Egress**	**Meters**
102				X	X		X			X			5					X	2500
103				X	X		X			X		11						X	1400
104			X		X		X			X			9					X	1100
Average Exposure Time in Seconds											**13.1**	**14.5**	**13.8**	**Average Range**					**1415**

Table 16 SAW (MANPADS) Information

	Type A/C				**Shot**		**Guidance Mode**		**Obstructed Mode**		**Exposure Time By A/C Type**			**Profile**				
Event	**CH-46**	**CH-53E**	**UH-1N**	**AH-1W**	**Yes**	**No**	**Radar**	**Optical**	**Yes**	**No**	**Assault**	**UH-1N**	**AH-1W**	**Take Off**	**Holding**	**Ingress**	**Pop**	**Egress**
1				X		X			X				0					X
2	X					X			X		0							X
3	X				X					X	9					X		
4	X				X					X	18					X		
5	X				X				X		43					X		
6	X				X				X		16							X
7				X		X			X				7					X
8	X					X			X		5					X		
9				X		X			X				2			X		
10				X	X					X			7					X
11				X		X			X				3				X	
12				X	X					X			8				X	
13				X	X					X			14			X		
14				X		X			X				2					X
15				X		X			X				3					X
16	X					X			X		4							X
17	X				X				X		11							X
18	X				X					X	46					X		
19	X					X			X		2							X
20				X	X					X			36		X			

Table 16 SAW (MANPADS) Information

	Type A/C				Shot		Guidance Mode		Obstructed Mode		Exposure Time By A/C Type			Profile				
Event	CH-46	CH-53E	UH-1N	AH-1W	Yes	No	Radar	Optical	Yes	No	Assault	UH-1N	AH-1W	Take Off	Holding	Ingress	Pop	Egress
21	X					X				X	20							X
22				X		X				X			8		X			
23				X		X			X				3					X
24	X					X				X	36					X		
25	X				X					X	26					X		
26			X		X				X			8			X			
27	X				X					X	30					X		
28			X		X					X		13				X		
29	X				X				X		16					X		
30			X			X			X			4				X		
31	X					X				X	18					X		
32				X	X					X			33		X			
33				X	X					X			14		X			
34			X		X				X		13				X			
35				X	X				X				10				X	
36			X		X				X			10				X		
37	X				X				X		8						X	
38	X				X					X	8						X	
39	X					X			X		5					X		
40				X	X					X			42			X		
41				X	X					X			9					X
42				X	X					X			26			X		
43				X	X					X			11					X
44			X		X					X		13				X		
45				X	X				X				8					X
46				X	X					X			9					X
47				X	X					X			4			X		
48				X	X					X			9					X
49				X	X					X			7			X		
50				X	X					X			13					X
51				X	X					X			14					X
52				X	X					X			10					X
53				X	X					X			13					X
54				X	X				X				8			X		

Table 16 SAW (MANPADS) Information

	Type A/C				Shot		Guidance Mode		Obstructed Mode		Exposure Time By A/C Type			Profile				
Event	CH-46	CH-53E	UH-1N	AH-1W	Yes	No	Radar	Optical	Yes	No	Assault	UH-1N	AH-1W	Take Off	Holding	Ingress	Pop	Egress
55				X	X					X			7			X		
56			X		X					X		8				X		
57				X	X					X			8					X
58				X		X			X				5				X	
59				X	X				X				8					X
60				X	X					X			15			X		
61				X		X				X			10			X		
62			X		X					X		5				X		
63			X			X				X		7						X
64				X	X				X				3					X
65				X	X				X				8					X
66				X	X					X			8					X
Average Exposure Time in Seconds											**16.5**	**8.5**	**10.7**					

Explanation of Data Collection Terms Used in Tables 15 and 16.

1. *Event*—numbered in sequential order from the beginning to the end.
2. *Type of Aircraft*—each *A/C* had an individual event number.
3. *Shot*—from videotapes.
   a. SAW shot recorded when the operator had lock and "fire" appeared on the display.
   b. MANPADS shot recorded with lock-on "successful engagement" displayed.
4. *Radar/Optical*—Each SAW engagement was acquired by either radar or optical means.
   a. Radar results based on positive system lock
   b. Optical results based on operator using this mode to visually acquire the target.
5. *Obstructed View*—from videotape views from both systems.
6. *Exposure Time*— the time that A/C in range or in view of MANPADS or radar.
   a. A/C visible but heavily obscured by trees or buildings, exposure time not calculated.
7. *Profile—S*pecified the flight regime when A/C was exposed to each threat system.
   a. Takeoff—lift off until aircraft transitioned to forward flight.
   b. Holding—away from the target but still inside the effective range of the threat systems.
   c. Ingress—from holding position inbound to the landing zone/target area until the point when assault aircraft landed or CAS aircraft began their transition to the pop.
   d. Pop—point where A/C begins climb visually locate the friendly/enemy positions; pop is complete when the aircraft pulled off the target after having "fired" simulated ordnance.
   e. Egress—when A/C pulled off CAS target or the point when they transitioned to forward flight and turned away from the LZ until they were established back in holding or were out of the max range of the threat system.

8. *Range.* The range was only calculated for the SAW because the MANPAD system did not have range-finding capability. During each run, the range was calculated at the point where the SAW was able to get radar lock on the target. For those instances when lock-on was not achieved, the range was calculated at the point where the aircraft was closest to the threat system.

Aircrew Survivability.

1. Aircraft in our experiments could not employ on-board defensive systems (chaff, flares), so their primary defense against threat systems was terrain masking.
2. Pop up, shallow diving fire in close proximity to the intended target proved to be highly survivable.
   a. Exposure times of 3-12 seconds significantly reduced the aircraft's vulnerability to MANPADS and radar-controlled guns
3. Aircrews consistently identified *and* engaged the target—and showed increased survivability—when they used pop-up maneuvers and shallow diving fire in close proximity to the intended target.
4. Videotapes showed that aircrews using the above tactics consistently experienced fewer valid "shots" against them and had much lower exposure times.
5. There were significant periods of time throughout the experiment that aircrews operated without being exposed to the threats for any period of time. This was the result of effective terrain masking flight and being out of the range of the threat systems.
   a. The periods of non-exposure are not reflected in the above tables.
6. The terrain had a degrading effect on the ability of the MANPADS seeker to lock on to aircraft.
   a. With *any* obstruction between the MANPADS and the aircraft, the system had difficulty in achieving lock on the target.
   b. Surprisingly, when operating ("hot") high-capacity power lines were between the seeker and the aircraft, the system could not achieve lock.
7. The sun also degraded both systems.
   a. The MANPADS could not *see* the aircraft coming out of the sun—and when the aircraft attacked out of the sun—the seeker could not achieve lock even if the operator pointed at them.
   b. The SAW used optical cueing; so when coming out of the sun, the system could not see to engage the aircraft.
8. The SAW radar was effective in maintaining lock through trees.
   a. In order to break lock, aircraft had to use the terrain or hard obstacles such as buildings.
9. The SAW used a second operator for visual cueing.
   a. When an aircraft was located, the operator was cued into the area at which time the radar would be turned on to achieve lock.
   b. This worked for the system but caused significant delays in acquisition when aircraft were exposed.
   c. The requirement to search such a large area was a limiting factor in the urban environment. Because there was no front line, the SAW was required to search a much larger area, thereby limiting its' effectiveness.
10. Several times during the experiment, aircraft transmitted the threat indications to the GCE. In turn, action was taken to simulate destroying the SAW.

11. We kept the threats in play even after they were destroyed through simulated CAS strikes so we could continue to collect data.

Direct Positive Control of CAS. Positive control of CAS, as specified in MAGTF doctrine is often severely restricted because of limited by visibility and lack of radios with units in close contact. It can also be restricted by the lack of a trained forward air controller (FAC) positioned with the small unit in need of the CAS.

- Buildings and rubble reduce visibility MOUT.
  - Forward air controllers and forward observers are limited by reduced horizontal and vertical sight lines.
  - This seriously degrades the ability of a controller to have "eyes on" target while controlling CAS.
- Under the current table of organization (T/O) and table of equipment (T/E):
  - There are no radios capable of communicating with aircraft below the platoon level.
  - There are no trained FACs present below the platoon level.
  - Squad leaders currently have no ability to communicate with CAS aircraft.
- The T/O of an infantry battalion includes one (1) Air Liaison Officer (ALO) and two FACs.
  - Actual manning level for a battalion is the ALO and one FAC.

Indirect Positive Control of CAS. In an attempt to overcome limited sight lines and bridge the gap in communications and lack of FACs at the small unit level, the battalion began using positive *indirect* control of CAS. As a result, there were many instances where the squad leader had "eyes on" but the control of CAS had to be done at the platoon or company level. Here is how it occurred:

- The unit requesting the CAS would get eyes on target and then communicate via intra squad radio (ISR) to the platoon/company who talked to the aircraft.
- When the unit with "eyes on" target was certain the aircraft had the target and was pointed in the right direction, he would relay through platoon/company to give the aircraft the "cleared hot" call.
  - The aircraft would then engage the target.
- We saw this work when the small unit leader had the training and understanding necessary to control CAS.
  - Although not an optimal means to request/control CAS, this method enabled small units involved in a fight to have the support even though they did not have the necessary radios or a qualified FAC.

ACE Warfighting Objective #2. Evaluate employment procedures and techniques for Assault Support.

Airspace restrictions to the routes flown and types of approaches limited assault support helicopters. SCLA property use agreements and peacetime safety regulations also severely limited the number of acceptable helicopter landing zones. These same restrictions also eliminated the use of rooftop landing sites or rappelling. *Therefore, we were unable to generate any meaningful data from the tactical lifts described later in this section*.

ACE Warfighting Objective #3. Evaluate the Universal Spotter Concept.

Company Fire Support Team (FiST) as Universal Spotters.

This concept is based on separating the company Fire Support Team (FiST) into smaller teams and attaching them to each platoon. The key is to ensure that each team has a person capable of controlling surface fire support (artillery and naval gunfire) and air delivered air support. For example, the artillery and mortar F/Os could request and control CAS while the FAC could request and adjust artillery and mortar fire. The T/O for an infantry company FiST includes these assets:

- Weapons Platoon Commander.
- Artillery Forward Observer (F/O) and radio operator (R/O).
- 81mm Mortar F/O.
- FAC and two R/Os.
  - In two of the three companies.
- Communications Gear.
  - One (1) PRC-113 UHF.
  - Four (4) PRC-119 VHF.

By separating the FiST assets into "universal spotter" teams, each platoon was given the capability and communications gear to control all supporting fires within the company AOR.

Universal Spotter Results. This method was effective for these two main reasons.

- Having a dedicated "spotter" enabled the platoon commander to focus on fighting the platoon with the confidence that his spotter could request and control supporting fires when directed.
- The addition of another PRC-119 negated the need for the platoon commander to leave the company TAC net in order to control supporting arms.

This method depends on vigorous cross training so that each member of the FiST team is capable of controlling all methods of fire support.

- This training—while not currently done routinely—is made easier by the fact that all members of the FiST are already familiar with controlling fires.

ACE Warfighting Objective #4. Evaluate the Use of T/E and Non-T/E Radios.

Use of T/E Radios for Control of CAS.

Not surprisingly, in the companies equipped with only the one T/E radio, it was extremely difficult to request, communicate, and control CAS. For example, the platoon commander had to choose to control CAS over the VHF / Company TAC frequency—or—leave the company frequency and control CAS on another frequency. Depending on the tactical situation, both of these approaches may be effective when in extremis, but can have serious consequences relating to loss of situational awareness of/by units not directly involved in using the CAS.

- For purposes of the experiment, and to mitigate the loss of situational awareness, the T/E companies compensated for lack of radios by assigning its artillery F/Os (and radios) down to the platoon level.
  - This arrangement proved workable for the experiment.
  - However, it highlights the fact that squad leaders need access to a VHF/UHF radio for fire support in the small unit fight that is typical during MOUT.

AN/PRC-148 MBITR.
ProMet issued the hand-held AN/PRC-148 Multi Band Inter/Intra Team Radio (MBITR) to unit leaders in Kilo company—down to and including the squad leader. The PRC-148C enabled VHF/UHF covered communications thereby facilitating fire support control.

The other companies, India and Lima, used the T/E communications structure; i.e., one PRC-119. This is normally used for the platoon commander to communicate with higher.

Use of Non-T/E Radios for Control of CAS.
Kilo Company effectively used the PRC-148 at the platoon and squad level across the doctrinal nets for control of aviation. Because of this, they never had to choose between controlling fire support at the expense of SA for other small units within the company.

- Although the PRC-148 has a secure mode, all UCAX CAS control used non-secure mode.
- Covered communications were not successful between the ACE/GCE.
  - Tactical Air Direction nets are by doctrine single-channel plain text.

ACE Event Summaries

Suppression of Enemy Defenses (SEAD) We employed one team of two scout snipers to provide urban SEAD during the experiment. The team inserted the night prior to a company helicopterborne assault to provide surveillance of enemy activity around the LZ (Wren).

1. The sniper team set up in the NW corner of the attic in building A3. (See figure 30.)
2. Sniper team mission:
   a. Provide surveillance into the Bravo sector to deny enemy access to the rooftops and open areas that could be utilized to engage landing aircraft.
3. The team accomplished their mission of denying access to the Bravo sector.
4. However, the OPFOR fouled two of the landing zones forcing friendly forces into LZ Wren.
   a. OPFOR also took note of the determined the prevailing westerly winds and prepared an ambush in anticipation of an east-to-west approach.
   b. Surrounded the only non-fouled LZ with triple strand concertina wire and AT mines.
   c. OPFOR stayed concealed until aircraft landed. Both the sniper team and (2) AH-1Ws assess the zone "cold" or absent of a visible threat.
5. Ambush triggered as the first wave of (2) CH-46s landed.

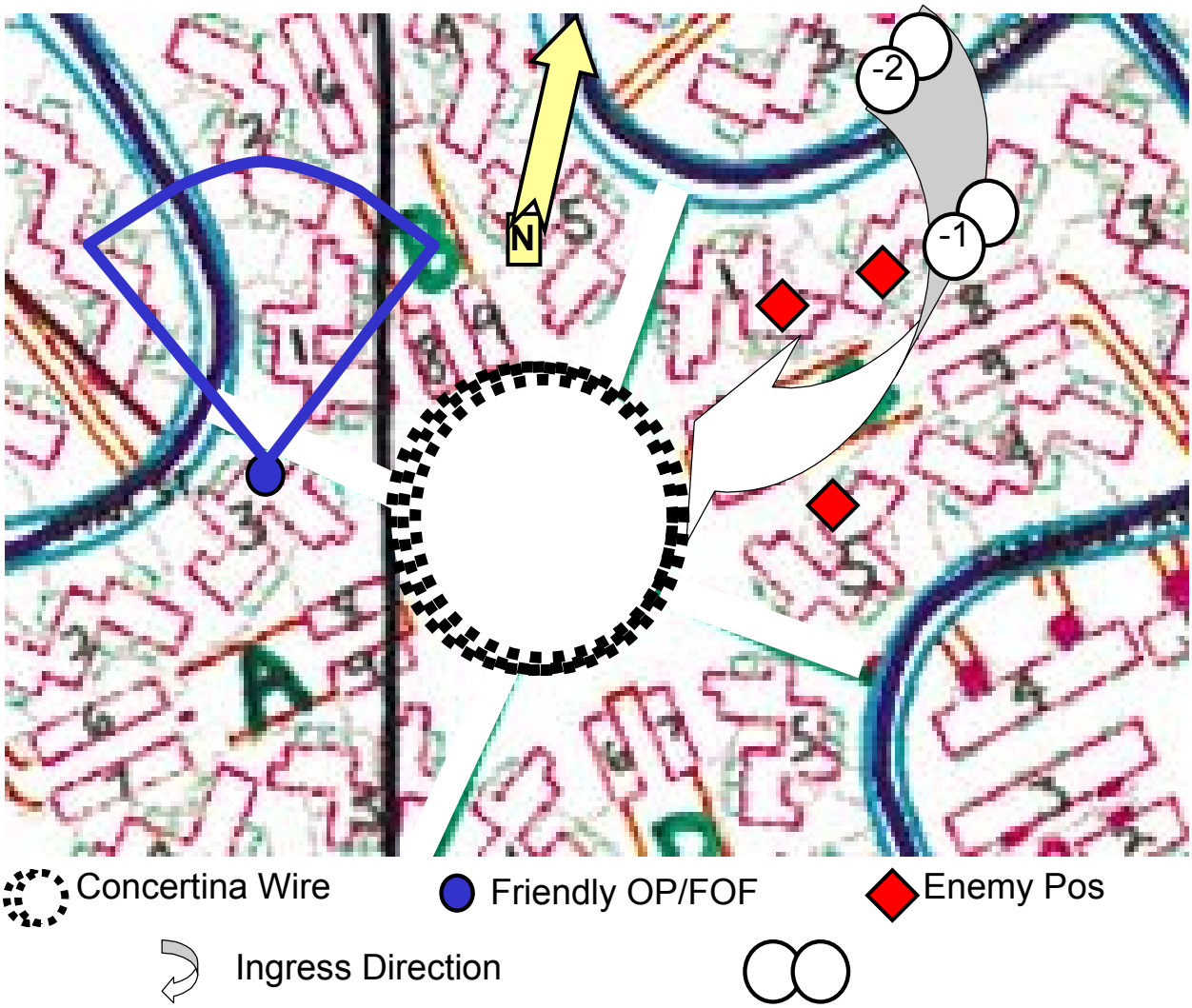


Figure 30 SEAD Insertions

a. Had devastating effects on the helicopter borne force as OPFOR fires swept the LZ.

Analysis of Urban SEAD Experiment.

1. The Sniper Team had limited visibility from its hide—a 10" vent in the roof.
   a. Highlights the need to saturate a specific area with multiple teams to ensure coverage.
2. Insertion for the purpose of denying rooftops can be accomplished relatively close to L-Hour. However, if the mission of urban reconnaissance is LZ surveillance to determine the feasibility of landing, that will require more observation time.
3. Criteria to determine an LZ "hot" or "cold" must be clearly defined.
   a. Not only do the normal conditions apply but also other factors such as obstacles surrounding the zone must be recognized to prevent devastating losses on the ground.
4. Detached escorts cannot simply fly over the zone and determine the zone to be "cold" simply because they did not see any obvious threats or obstacles.
   a. In fact, during this event, they reported the zone to be "cold" when it was not.
5. The "brown out" conditions made landings difficult, but did afford the aircraft and the Marines egressing the aircraft a degree of concealment in the zone, acting in the same manner as smoke grenades.
6. When feasible, escort platforms should be in position to immediately engage pop-up threats as assault support aircraft are approaching the zone.
7. The enemy scheme of maneuver was very effective. By remaining concealed they were able to retain the advantage as Marines egressed and initiate the ambush at a moment when units were attempting to gain cover and unit integrity.
8. Enemy RPGs (simulated) had a devastating effect on approaching slow, heavy and non-maneuverable aircraft, unable to defend themselves in the 12 o'clock position.
9. Helicopterborne forces should have an obstacle clearing capability in the initial waves to prevent follow-on waves from dealing with the same obstacle.
10. Aircraft being engaged from ground threats identify and report the threat location to the GCE commander so that the threat can be eliminated.
    a. Throughout the experiment, aircraft were engaged by ground threats, but did not relay this information to the GCE.
    b. Also the GCE did not attempt to pull this information.
    c. As a result aircraft were continually engaged by threats that were sometimes no more than 50 meters from friendly forces.

Company Helicopterborne Events. During the experiment, two companies were inserted via helicopter. The first lift was conducted on 08 August into LZ Wren—refer to Figure 31. The second lift was conducted on 09 August into LZ Hawk—refer to Figure 32.

08 Aug Company Insertion.

1. LZ Wren is roughly 80m by 80m with a flat gradient and loose sand surface.
2. LZ is surrounded by 30' power lines that lie about 20M off the edge of the LZ.
3. Temperatures exceeded 100 degrees F at L-Hour with light winds from the W-NW.
4. A force of 120 Marines from India Company was to be inserted into the LZ.
5. A section (two aircraft) of AH-1Ws provided escort and detached to determine the status of the zone 2 minutes prior to insertion.
6. A sniper team was positioned in building A3 to provide SEAD into the Bravo sector.
7.

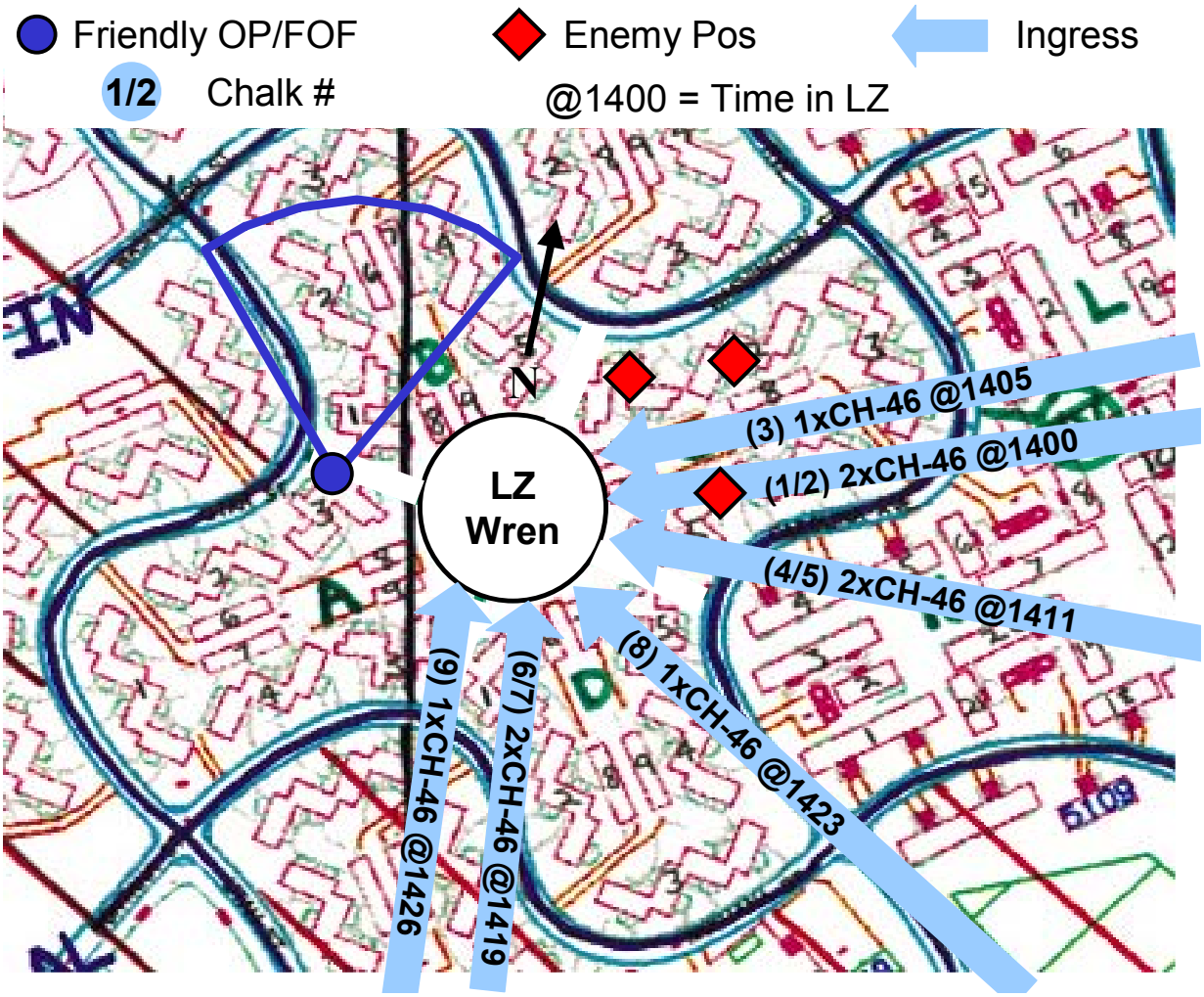


Figure 31 LZ Wren Helicopterborne Assault

8. AH-1Ws determined the zone to be "winter" and the first section of CH-46s landed at L-Hour (1400).
9. LZ was fouled with buried AT Mines and it was surrounded with triple concertina wire.
   a. This remained undetected until the first wave was on the deck.
10. LZ was extremely dusty making landing difficult due to reduced visibility in blowing dust.
11. The aircraft were power limited due to their weight, ambient air temperature and the high-density altitude.
12. Upon exiting the aircraft, the Marines immediately came under fire from a platoon sized enemy ambush.
13. The concertina made getting out of the zone difficult for the initial waves.
14. Initial waves of the insert were engaged by a simulated MANPADS and small arms on short final as they flew through the "Lima and Charlie" sectors.
15. AH-1Ws moved to engage the MANPADS and small arms threat in the Bravo sector, but deconfliction with friendly forces on the ground prohibited engagement.
16. After the third wave, follow-on waves shifted to a south-to-north approach to avoid the threat of the LZ.

17. Total insert time was 26 minutes. Each aircraft had to cycle back to the airfield to pick up a second wave, which accounted for much of this time.
18. There were (5) CH-46s used for the lift forcing each aircraft to insert two waves.

09 August Company Insertion.

1. Temperatures exceeded 100 degrees F at L-Hour with light winds from the West.

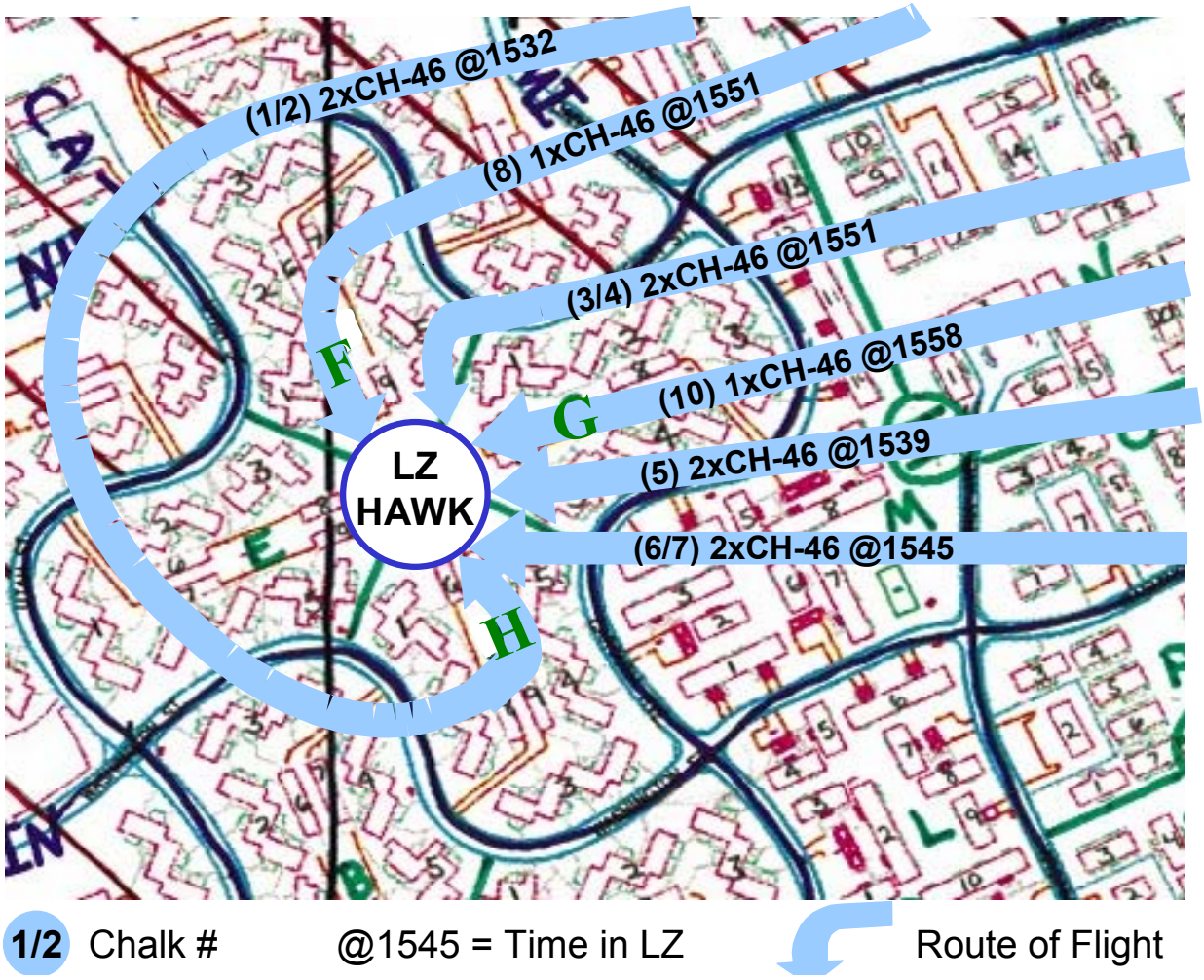


Figure 32 Company Insertions on 9 August

2. A force of 120 Marines from India Company was to be inserted into the LZ.
3. Scheme of maneuver was for two companies to push from the northern end of the training area and clear south through LZ Wren. Then India Company would insert into Wren.
4. As Marines of 3/7 pushed south, they incurred a sizable enemy force in and around LZ Wren.
5. The battalion commander then made the decision to insert India Company into LZ Hawk.
   a. Advantage was friendly forces controlled LZ Hawk.
   b. Disadvantage was that the helicopterborne force would have to move about 200 meters to link up with forces already on the ground.

6. The advantage of a low-threat insertion greatly outweighed the longer movement to link up on the ground, so Marines moved to increase security around the zone. Engineers worked to clear any obstacles in the zone prior to L-Hour.
7. AH-1Ws escorts provided over watch of the insertion. During the insertion, the initial waves received electronic indications of AAA fire control radar system in the area.
8. AH-1Ws scanned the area until they located the threat—a simulated ZSU-23-4.
9. AH-1Ws engaged the threat with precision guided munitions (PGMs); i.e., they met all attack geometry parameters, generated proper cockpit electronic indications and radio calls to get simulated kill on the ZSU gun.
10. Zone was extremely dusty making landing difficult because of reduced visibility.
11. Aircraft were power limited due to weight, ambient air temperature and high-density altitude.
12. Total insert time was also 26 minutes.
13. Each aircraft had to cycle back to the airfield to pick up a second wave.
    a. There were (5) CH-46s used for the lift forcing each aircraft to insert two waves.

Results of MADSS Employment During UCAX. The MADSS proved to be an effective threat simulator that significantly added to the experiment realism. One (1) MADSS and operator were attached to the OPFOR and employed in their scheme of maneuver. Here are its results:

1. 180 Stinger MADSS cartridges were launched at CH-46E, AH-1W, and UH-1N aircraft.
    a. There were zero (0) malfunctions or misfires.
2. All aircrews that flew against the MADSS reported the system was highly effective and made them choose proper tactics for mission completion in a MANPADS environment.
    a. They stated that it could fill a current gap in training against MANPADS systems.
3. Aircrews were able to visually locate a MANPADS launch—the missile smoke trail—from several kilometers away.
4. MADSS launches were visible at night because, in addition to the flash at initial launch, the cartridge has an easily seen orange glow associated with its ascent.
5. UH-1N aircrews routinely picked up indications of MADSS-generated laser energy on the AVR-2 laser detection device when operating within range of the system.
6. Cartridges used in the MADSS are identical to those used on the Omega-36 Weapons Effects Simulator that is used to simulate weapons effects on targets and vehicles.
7. The MADSS/Omega-36 is fully compatible with the Marine Corps MILES-2000.
8. MADSS is hero safe enabling it to be stored, loaded and employed aboard and from ships.

ACE/GCE Planning. Due to unplanned Ops Tempo factors, ACE representatives could not fully participate in the integrated planning with the GCE for UCAX. To some degree, this reduced the potency of the MAGTF synergy in execution, and ultimately, the decision-making process with the GCE. For example, planning for the company insert on the 8th (done by the GCE without ACE involvement) did not establish effective criteria for determining whether an LZ is hot or cold. Beyond that, aircrews were not fully aware of the GCE tactical situation or scheme of maneuver.

All simulated CAS (SIMCAS) planning was conducted over the telephone or via radio after aircraft were already airborne and checking in for mission briefs. This was an especially limiting factor during reconnaissance insert missions when the absence of knowledge about GCE priority intelligence requirements did not generate focused information pertinent to GCE maneuver.

AC 130 Gunship Employment. During UCAX, one USAF A/C-130 gunship was employed for one day and one night mission. The aircraft circled the area at 7000-10000 feet. Although this optimized firing parameters for the AC-130, it was vulnerable to MANPADS. One USAF ground controller with radio beacon accompanied the GCE FAC during the missions to assist in explaining the capabilities of the gunship. The key GCE leadership was briefed on the capabilities of the AC-130 and were familiarized with the following:

- Planning factors for use of each of the weapon system on the gunship
- 25mm, 40mm, and 105mm are employed independently with their own targeting systems enabling them to engage different targets simultaneously.
- Standard night marking for AC-130 employment is to have every soldier on the ground use infrared (IR) glint tape so that gunship crew can separate friend from foe.
  - Note: This should work well when supporting small Special Forces units, but—given the fact that IR glint tape is not normally issued to standard Marine infantrymen—it would probably not work during large-scale conventional operations.
    - Other IR marking devices such as the Fire Fly or VIPIR would mark positions rather than individuals.

AC-130 Gunship Results.

- The aircraft was extremely effective in locating the friendly position with the use of the man-packed radio beacon.
- When location of friendlies could be firmly established by the radio beacon, the optics enabled the aircrew to locate enemy forces and in many instances determine the exact number of enemy soldiers in the target area.
- The threat level dictates the employment of the A/C-130s.
  - Even though it operates almost exclusively at night, it remains vulnerable to MANPADS and radar threats.

RW Aviation Summary Recommendations.

1. Conduct further experiments to determine the most effective methods for marking positions in the urban environment during day and night operations.
2. Ensure that each platoon has a marking kit consisting of:
   a. Fluorescent air panel to mark friendly positions in daylight.
   b. IR marking device (e.g., firefly or VIPIR light) to mark friendly positions at night.
3. Introduce or continue use of the 6-Line Brief to develop an understanding of its potential to enable aircrews to provide immediate fire support for the GCE.
4. Train personnel at platoon and squad level to understand how to control rotary wing CAS using a 6-Line briefing format.
5. Create an urban CAST trainer for FACs and F/Os to become proficiency in the unique aspects of urban CAS; e.g., restricted sight lines and indirect control measures.
   a. Emphasize the use of the 6-line CAS brief in MOUT.
6. Create an urban CAST trainer for use by non-FAC or F/Os—primarily small unit leaders and FiST members—to increase their ability to become *universal spotters* and control CAS when necessary.
7. Continue to review the role of the FSCC in urban environments to determine if procedures should be instituted to clear fires at the company level.

8. Continue to examine the utility of breaking down the FiST team into smaller platoon level teams to provide each platoon with the capability and communications to request and control fires down to the platoon level.
9. Develop a standard map reference system for the ACE and GCE that can assist in identifying targets/zone locations visually.
   a. The level of detail for aircrew need not be as detailed as that of the GCE.
10. Conduct further examination of the MADSS to determine its suitability to be used widely in all MAGTF training.
11. Procure enough PRC-148 MBITRs to equip the battalion FACs.
   a. This would free up (4) ROs per battalion for other tasking.

Summary Comments from 3/7 BUST AAR

Commander's Overview.

1. The training progressed from instruction and practical application of individual skills to the conduct of a 72-hour Battalion force-on-force final exercise. The Exercise Force (EXFOR) was under operational control of the Commanding Officer, 3/7, and are listed in enclosure (1). Primary Instructors from MCWL Project Metropolis and Assistant Instructors from the EXFOR units instructed the Marines and Sailors of 3/7. Simunitions were employed to increase combat realism and assess the effectiveness of the tactics and training.

2. BUST (+) provided 3/7(Rein) an outstanding opportunity to learn, exercise, and experiment with new tactics, techniques, procedures, and technologies for urban warfare. The training significantly enhanced the EXFOR's ability to conduct operations and support in low-, mid- and high-intensity urban (Block 1-3) operations.

Summary of After Action Items.

EXFOR Command Structure.

Discussion. The Battalion was consequently tasked to serve simultaneously as the Command Element (CE) for both the Ground Combat Element (GCE) and the MAGTF as a whole. This put an undue burden on the Battalion Staff in the execution of routine training and maintenance operations. In addition, it required the Battalion Staff to extend beyond their normal areas of expertise. The Battalion was responsible for the coordination, employment and support of over 1000 I MEF personnel.

Recommendation. Based on the model of the Combined Arms Exercise (CAX), a distinct MAGTF CE (as opposed to an embedded CE) is required to properly employ and support the EXFOR in an urban training environment.

Classroom Instruction vs. Practical Application.

Discussion. Several training days included prolonged periods of instruction in a formal classroom environment. The EXFOR routinely had up to four hours of instruction in the SCLA Theater. After approximately two hours of instruction, the Marines attention began to wane and their retention diminished. The cramped seating and hot, humid temperatures within the theater further aggravated the loss of student attention. On Training Days 7 and 8, however, the Marines participated in a series of round robin classes/demonstrations conducted in the training area. The movement between the training sites as well as the outdoor setting invigorated the Marines and

increased their interest and attention span. This less formal environment and smaller class size also prompted more questions and interaction from the students.

Recommendations.
- Restrict classroom instruction to periods of no more than two consecutive hours.
- Encourage teaching smaller-sized, on-site classes/demonstrations.
- To the extent possible, teach classes properly lighted, climate-controlled facilities.

Preparatory Instruction.
Discussion. No introductory/preparatory BUST tapes shown until Training Day 1.
Recommendation. Provide videotapes battalions prior to commencing training.

Media Training.
Discussion. Forces participating in urban operations will be subject to close scrutiny by the national and international media. Internal and external media will routinely operate with Marine forces, thus "the "Strategic Corporal" must understand and be prepared to handle the media. In addition, the Marines must understand that their actions will be covered by both friendly and hostile media and can affect national objectives and policy. Limited media play was incorporated into the Block II portion of the Final Exercise (FINEX).

Recommendations.
- Include a period of instruction on the media and handling media coverage of urban operations.
- Incorporate public affairs operations into BUST that include integrating public affairs, combat camera, and civilian media into routine operations and responding to friendly and hostile media interviews.

Repetitive Training.
Discussion. At BUST Site 4, the Marines conducted two consecutive iterations of the attack on the Tar Paper House. This provided the units an opportunity to immediately correct and reinforce proper room clearing tactics, techniques and procedures. It also allowed the individual Marines a chance to re-think their tactics, visualize the assault, and increase movement and weapons handling muscle memory. Executing two back-to-back iterations of the attack prolonged the conduct of the training, but was highly beneficial to increasing unit coordination and individual understanding and consequently retention of room clearing techniques. Other BUST Sites executed the Tar Paper House assault only once or, alternatively, conducted two separate iterations of the attack.

Recommendation. Whenever possible, conduct training in two consecutive iterations. The first time to assess performance and the second to correct errors, reinforce lessons-learned, and increase muscle memory.

Physical Demands of Urban Training.
Discussion. MOUT is physically demanding. This includes prolonged movement over hard, uneven, debris-strewn surfaces, sprints between buildings and rooms, breaching of obstacles, and climbing through super-surface and sub-surface spaces. While doing this, Marines wear protective equipment; e.g., flak jackets, helmets, face masks (training only), and knee and elbow

pads. The man made environment retains heat, thus significantly increasing the temperature in and around buildings and rubble.

Recommendations.
- Develop a MOUT-specific strength-training program and provide it to battalions as a baseline from which to build individual and unit physical abilities prior to commencing training.
- Incorporate a period of acclimatization into the BUST schedule for units coming from less severe climates.

Scheduling of Rest, Recuperation, and Maintenance.
Discussion. After approximately ten days of extended and exhaustive training, the EXFOR began displaying signs of fatigue and diminished attention. The energy and enthusiasm of the Instructor Staff also began to wane. Consequently, on Training Day 10, the EXFOR and Instructor Staff were afforded one day of liberty to allow them to rest and attend to their personal needs. The Marines returned from this liberty period refreshed and reinvigorated to continue training. The liberty period also allowed the commands to establish and exercise their liberty policy and procedures. Similarly, the EXFOR required additional time in the BUST (+) schedule to maintain equipment, weapons and vehicles. Maintenance periods were crucial for the efficient functioning of the tanks, assault amphibian vehicles, light armored vehicles and heavy engineering equipment.

Recommendation.
- Include a one to two day period within BUST for the rest and recuperation of exercise and support personnel.
- Include at least two one-day maintenance periods into the training schedule to ensure that vehicles, weapons and equipment are properly serviced and maintained.

Incorporation of the Marine Corps Martial Arts Training Program (MCMATP).
Discussion. Urban operations require Marines to fight in confined spaces. This includes close quarter firing techniques as well as hand-to-hand fighting techniques. Due to the limited area to conduct fire and maneuver within and buildings and rooms, Marines must be prepared to grapple with hostile personnel. In addition, Marines must be proficient in compliance techniques in the handling of belligerent non-combatants (i.e. in quelling civil disturbances or conducting check-points). BUST (+) did not instruct or address martial arts training or its application in urban operations.

Recommendation.
- Include martial arts practical application in BUST.
  - For Example. Design/develop an instructional segment that takes a team of Marines through a second story building entry, through a room clearing drill and into a close-combat/grappling fight.

Need for a Logistical Support Center.
Discussion. The chaotic, congested, and confusing nature of the urban environment make the application of precision logistics extremely problematic; e.g., logistical transport assets are lost, misdirected, or delayed in route to the forward combat forces. Similarly, such assets often return

to the logistics or combat service support trains with empty loads. It appears the creation/establishment of a Logistical Support Center (LSC), with functionality similar to that of the Direct Air Support Center (DASC) could efficiently control the routing and loading of logistical lift assets. Here is how it would function:

- Each logistical lift asset would check-in with the LSC upon entering the area of operations, and report its load, destination, and proposed route.
- Based on a priority of support list, the LSC would determine the best use of this lift and its load.
- By monitoring the capacity of the streets, civilian and military traffic patterns and man-made or natural obstacles, the LSC would also determine the preferred (i.e. safest, most expedient) route for that asset.
- Once the logistical supplies were delivered, the LSC would determine if remaining supplies should be distributed to other forces or whether the lift assets could accomplish an additional mission en route out of the area of operations (e.g., CASEVAC, troop or equipment movement).

Recommendation. Establish a Logistical Support Center to efficiently route and employ logistical lift assets as described above.

Battalion Staff Training.
Discussion. The BUST (+) Battalion Staff training was helpful in prompting the Staff to identify and discuss the myriad of factors influencing urban operations. It exercised the staff's ability to perform the deliberate planning process and provided an open forum for discussion and debate on urban operations.

Recommendation. Develop the Battalion Staff Training package to include:

- Battle Staff development (and briefing) of an operations order.
- Staff subsequently execute ("fight") the operations order during a SME-guided terrain walk over the terrain described in the scenario (i.e., training area or local city).

Information Operations Training.
Discussion. Forces operating in the urban environment must be understand and support the information operations being conducted by higher headquarters. To maintain legitimacy with the local populace, the operating forces must ensure that their actions reflect what is promulgated through information operations.

Recommendation. Incorporate/address (in battalion training) information operations and their affects on the operating forces and indigenous population.

Operational Terminology Unique to MOUT.

- Discussion: The existing doctrinal operational terminology (MCRP 5-12A and MCRP 5-12C) does not include descriptive terminology emerging for MOUT and taught in BUST (e.g., penetration, thrust, swarm, go firm, satellite patrolling). Also, the existing terminology can be unclear, inapplicable or misleading when applied in an urban context (e.g., clear in zone, secure, fix) against a highly mobile, asymmetrical military, paramilitary, or terrorist force.

- Recommendation:
  - MCCDC (MCWL, MSTP and Doctrine Division) continue to develop and define focused terminology that is useful/meaningful in execution of the *Three Block War*.
  - Explain, incorporate and publish these terms as soon as possible in USMC doctrine.

BUST Training Schedule

Battalion BUST Training Schedule				
Time	**Activity**	**Site**	**Instructor**	**Equip**
WED 12 JUN — INTRODUCTION TO THE URBAN ENVIRONMENT				
Time	Activity	Site	Instructor	Equip
0800-0815	ProMet Brief	Theater	Maj Sullivan	Notebook
0800-0830	Chief Instructor Brief	Theater	Sgt Viklund	Notebook
0830-1000	Urban PME: Chechnya	Theater	Maj Power	Notebook
1000-1200	Intro to Urban Environment / Threat	Theater	Bn S-2	Notebook
1200-1300	Chow			MRE
1300-1315	Safety Brief	Theater	ProMet/Bn	RSO
1315-1400	Urban Movement	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
1400-1700	Urban Movement Practical Application	BUST 1, 2, 3, or 4		TacGear w/ PRR and PRC-148
1700-TBD	Gear Issue	Theater	Bn-If Needed	
TBD	Key Leader Brief	ProMet Office	Capt Storer	
THU 13 JUNE — ASSAULTING AND FORCIBLE ENTRY				
0815-0930	Assaulting	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
0930-0945	BREAK	BUST 1, 2, 3, or 4		
0945-1100	Forcible Entry	BUST 1, 2, 3, or 4	ProMet	ProMet Gear
1100-1200	CHOW	BUST 1, 2, 3, or 4		MRE
1200-1700	Forcible Entry Practical Application	BUST 1, 2, 3, or 4	ProMet	ProMet Gear
1200-1700	Assaulting Practical Application	BUST 1, 2, 3, or 4	ProMet	ProMet Gear
1230-1300	Commander's Estimate of Battlespace	Theater	Maj Sullivan	
TBD	Key Leader Brief	ProMet Office	Capt Storer	
FRI 14 JUN — CLEARING				
0800-0815	Safety Brief	Theater	RSO	
0815-0930	Observation and Reporting	Theater	GySgt Roundtree	Notebook
0930-0945	Urban Navigation	Theater	GySgt Barry	Black Hawk Down
0945-1015	Rubble Fighting Techniques	Theater	Sgt Viklund	Notebook
1015-1215	Introduction to Clearing	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
1215-1315	CHOW			MRE
1315-1530	Tape House Practical Application	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
1530-1730	Single Story Building Practical Application	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
1730-1930	Multiple Story Building Practical Application	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
TBD	Key Leader Brief	ProMet Office	Capt Storer	
SAT 15 JUN — COUNTER SNIPER / PATROLLING				

Battalion BUST Training Schedule				
Time	**Activity**	**Site**	**Instructor**	**Equip**
0800-0815	Safety Brief	Theater	RSO	
0815-0945	Introduction to Patrolling	Theater	Sgt Viklund	Notebook
1000-1030	Urban Sniper Employment	Theater	Bn	Full Metal Jacket/Pvt Ryan
1030-1045	BREAK			
1045-1130	Introduction to Counter Sniper Ops	Theater	Bn	Leadership Only
1130-1230	CHOW			
1230-1930	Patrolling Practical Application	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
	Sewer Patrols	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
	Tarpaper House	BUST 1, 2, 3, or 4	ProMet	Sim Rounds
TBD	Key Leader Brief	ProMet Office	Capt Storer	
	Issue Squad patrol Order			
SUN 16 JUN — SQUAD ATTACKS / DAY AND NIGHT PATROLLING				
0800-1000	Religious Services		Bn Chaplain	
1000-1015	Safety Brief	BUST 1, 2, 3, or 4	A-RSO	
1015-1200	Patrol Prep/Rehearsal & CHOW	BUST 1, 2, 3, or 4	Bn	Tactical Gear
1200-1500	Day Urban Patrols	BUST 1, 2, 3, or 4	Bn	Sim Rounds
1500-1545	Intro to Night Considerations	Theater	GySgt Clark	Notebook
1545-1645	Key Leader Brief	ProMet Office	Maj Sullivan	
1645-2100	Patrol Prep / Rehearsals	BUST 1, 2, 3, or 4	Squad Leaders	
2100-0300	Night Urban Patrols	BUST 1, 2, 3, or 4	Bn	Tactical Gear
MON JUN 17 — ORGANIC INFANTRY WEAPON SYSTEMS AND OFFENSIVE/DEFENSIVE PLANNING				
0800-1030	Machine Guns in MOUT	Theater	Bn	Notebook
1030-1115	Weapon Systems in MOUT	Theater	Bn	Notebook
1115-1215	Mortars in MOUT	Theater	Bn	Notebook
1215-1315	CHOW			
1315-1415	Combined Arms Offense in MOUT	Theater	Capt Storer	Notebook
1415-1430	BREAK			
1430-1630	Combined Arms Defense in MOUT	Theater	Capt Walker	Notebook
1630-1730	CSS in MOUT	Theater	Capt Storer	Notebook
1730-1830	Key Leader Brief	ProMet Office	Capt Storer	Plt Attack Order
TUE 18 JUN — PLATOON COMBAT PATROLS				
0800-0815	Safety Brief	Theater	RSO	
0815-1200	Patrol Prep / Rehearsals	ProMet Area	Capt Bush	Tactical Gear
1200-2000	Day Urban Attacks	Op Area	Platoons	Sim Rounds
1200-1530	TEWT Tanks, AAV, LAV, CAAT	Theater	Capt Storer/Rap	

Battalion BUST Training Schedule				
Time	**Activity**	**Site**	**Instructor**	**Equip**
1530-Comp	Veh Maintenance	AA	Bn	
TBD	Key Leader Brief	ProMet Office	Capt Storer	
TBD	TACP Shoot	Quackenbush TA		
WED 19 JUN — MECH AND ARMOR ASSETS				
0800-1200	Intro to M1A1 Main Battle Tank	AA	Bn	Tactical Gear
	Intro to LAV-25	AA	Bn	Tactical Gear
	Intro to AAV-P7	AA	Bn	Tactical Gear
1200-1300	CHOW			
1300-1315	Safety Brief	BUST 1, 2, 3, or 4	RSO	
1315-1600	Mech/Armor PracApp	BUST 1, 2, 3, or 4	ProMet	Tactical Gear
1630-1730	Engineers in MOUT	Theater	Capt Bush	Notebook
TBD	Key Leader Brief	ProMet Office	Capt Storer	Plt Patrol Orders
TBD	TACP Shoot	Quackenbush TA		
THU 20 JUN — PLATOON MOVEMENT TO CONTACT				
0800-0815	Safety Brief	Theater	RSO	Tactical Gear
0815-0845	Medevac Procedures	Theater	Capt Rap	Notebook
0845-0930	Platoon Orders	BUST 1, 2, 3, or 4	ProMet	Plt Cdrs
0930-1300	Prep / Rehearsals / CHOW	BUST 1, 2, 3, or 4	Platoons	Tactical Gear
1300-1900	Platoon Movement to Contact	BUST 1, 2, 3, or 4	Platoons	Sim Rounds
TBD	Key leader Brief	ProMet Office	Capt Storer	Plt Attack Order
TBD	TACP Shoot	Quackenbush TA		
FRI 21 JUN — PLATOON COMBINED ARMS ATTACK				
0800-0815	Safety Brief	BUST 1, 2, 3, or 4	RSO	Tactical Gear
0800-1100	Bn Staff Training / Wargame	ProMet office	Maj Sullivan	Bn Staff
0815-1100	Plt Orders / Rehearsals / CHOW	BUST 1, 2, 3, or 4	Platoons	
1100-1900	Plt Combined Arms Attack	BUST 1, 2, 3, or 4		
TBD	Key Leader Brief	ProMet Office	Capt Storer	Company Order
SAT 22 JUN — COMPANY MOVEMENT TO CONTACT				
0800-0815	Safety Brief	BUST 1, 2, 3, or 4	A-RSO	Tactical Gear
0800-100	Bn Staff Training / Wargame	ProMet Office	Maj Sullivan	
0815-1100	Company Orders / Rehearsals	BUST 1, 2, 3, or 4	Co Commanders	Tactical Gear
1100-1630	Company Movement to Contact	BUST 1, 2, 3, or 4	Co Commanders	Sim Rounds
1630-1900	Company Orders / Rehearsals	BUST 1, 2, 3, or 4	Co Commanders	
1900-2300	Company Combined Arms Attack	BUST 1, 2, 3, or 4	Co Commanders	Sim Rounds
TBD	Key leader Brief	ProMet Office	Capt Storer	Company Day Attack Order

Battalion BUST Training Schedule				
Time	**Activity**	**Site**	**Instructor**	**Equip**
SUN 23 JUN — COMPANY COMBINED ARMS ATTACK				
0800-1000	Religious Services		Bn Chaplain	
0800-1100	Bn Staff Training / Wargame	ProMet Office	Maj Sullivan	
1000-1015	Safety Brief	BUST 1, 2, 3, or 4	A-RSO	
1015-1200	Company Rehearsals	BUST 1, 2, 3, or 4	Co Commanders	Tactical Gear
1200-1800	Company Combined Arms Urban Attack	BUST 1, 2, 3, or 4	Co Commanders	Sim Rounds
TBD	Key Leader Brief	ProMet Office	Capt Storer	
MON 24 JUN — PEACEKEEPING / PEACE ENFORCEMENT BUST				
1000-1100	Kosovo PME	Theater	Maj Sullivan	Tactical Gear
1100-1145	ROE	Theater	Maj Power	
1145-1245	CHOW			
1245-1330	Force Continuum	Theater	Capt Rapisarda	
1330-1445	Communication Skills	Theater	Capt Storer	
1445-1600	Personnel Searches	Theater	Capt Bush	
1600-1730	Personnel Searches Practical Application	BUST 1, 2, 3, or 4	ProMet	
1730-1930	Night Squad Patrols	BUST 1, 2, 3, or 4	ProMet	India Company
TBD	Key leader Brief	ProMet Office	Capt Storer	
TUE 25 JUN — SEARCHES				
1000-1100	Vehicle Searches	Theater	Capt Rapisarda	Notebook
1100-1200	House Searches	Theater	Sgt Viklund	
1200-1300	CHOW			
1300-1430	Checkpoint Ops	Theater	ProMet	
1430-1445	Safety Brief	Theater	RSO	
1445-1730	Search/Checkpoint Practical Application	BUST 1, 2, 3, or 4	ProMet	
1730-1900	Night Squad Patrols	BUST 1, 2, 3, or 4	ProMet	Kilo Company
TBD	Key Leader Brief	ProMet office	Capt Storer	
WED 26 JUN — PLATOON SATELLITE PATROLLING				
1000-1015	Safety Brief	Theater	RSO	
1015-1130	Satellite Patrolling Techniques	Theater	Sgt Viklund	
1130-1230	CHOW			
1230-1430	Individual/Team Practical Application	BUST 1, 2, 3, or 4	ProMet	
1300-1500	Co Patrol Base Ops TEWT	Theater	Maj Sullivan	Key Leaders
1430-1730	Plt Patrol Practical Application	BUST 1, 2, 3, or 4	ProMet	Sim Rounds
1500-1630	Air Support in MOUT	Theater	Capt Butler	Notebook
1730-1930	Night Squad Patrols	BUST 1, 2, 3, or 4	ProMet	Lima Company
TBD	Key Leader Brief	ProMet Office	Capt Storer	
THU 27 JUN — PLATOON COMBINED ARMS SATELLITE PATROLLING				

Battalion BUST Training Schedule				
Time	**Activity**	**Site**	**Instructor**	**Equip**
0800-0815	Safety Brief	BUST 1, 2, 3, or 4	A-RSO	Tactical Gear
0815-1300	Patrol Rehearsals / CHOW	BUST 1, 2, 3, or 4	Capt Bush	Sim Rounds
1300-1600	Conduct Day Combined Arms Patrols	BUST 1, 2, 3, or 4	ProMet	
1600-1700	CHOW / Frag Order			
1700-TBD	Night Combined Arms Patrols	BUST 1, 2, 3, or 4	ProMet	
TBD	Key Leader Brief	ProMet Office	Capt Storer	
FRI 28 — JUN BN FEX				
1145-1200	Safety Brief	Theater	RSO	Tactical Gear
1200-2400	Conduct Attack		Bn CO	Sim Rounds
SAT 29 JUN — BN FEX				
0800-0815	Safety Brief	Theater	RSO	Tactical Gear
0815-2359	Security Operations		Bn CO	Sim Rounds
SUN 30 JUN — BN FEX / AAR				
0001-1000	Security Operations		Bn CO	Tactical Gear
1200-1500	BUST AAR	Theater	ProMet	

Summary Comments from 3/7 UCAX AAR

Commander's Overview.

MD-02 provided 3/7(Rein) with an unsurpassed opportunity to learn, exercise, and experiment with new tactics, techniques, procedures, and technologies for urban warfare. Thanks to the exercise infrastructure provided by MCWL and Project Metropolis (ProMet) and the unmatched training area at SCLA, the EXFOR was able to conduct Battalion-level operations in a highly realistic and intensely challenging urban environment. MD-02 significantly enhanced the EXFOR's ability to conduct operations and support in mid- and high-intensity urban environments. The EXFOR's increased combat effectiveness and reduced casualty rate were proof of the effectiveness of the BUST (+) package. Based on the superior individual and collective urban war-fighting skills developed during MD-02, I and the subordinate and supporting EXFOR element commanders enthusiastically support the establishment of a formal BUST (+) program of instruction.

Summary of After Action Items.

Compromise of Reconnaissance, Surveillance Targeting and Acquisition (RSTA) Teams To Engage High-Value Targets.

Discussion: The Battalion can employ up to six Scout Sniper Teams composed of a sniper and a scout/observer. When assigned a reconnaissance/surveillance mission, these teams are unable to employ their sniping capabilities without compromising their position and consequently their RSTA mission. We saw opportunities to engage high-value targets with direct fire weapons that warrant sacrificing the reconnaissance/ surveillance mission for effects on target. The Commander must clearly establish his criteria for compromising a RSTA position to engage a

target. The team must understand these criteria in case communications are lost and they are unable to get approval to engage the target prior to insertion.

Recommendation: The Commander must determine and prioritize the criteria under which he is willing to compromise a RSTA team to engage a high-value target.

The *Go Firm* Tactic.
Discussion: By "going firm" at phase lines for extended periods of time the Battalion unintentionally gave a reprieve to the enemy forces the it was attacking. Due to the linear nature of urban streets and man-made terrain features, the enemy was able to determine the phase lines the Battalion would utilize. Armed with this knowledge the enemy was able to estimate when the attacking unit would halt its forward movement and go firm. This somewhat predictable break in the momentum of the attack gave the enemy relief from the affects of fire and maneuver, thus allowing him to rest, refit, and reinforce his positions prior to the next wave of the attack.

- Consequently, while going firm is an excellent technique for maintaining command and control in the urban environment, it does sacrifice speed and momentum. The Commander must weigh this trade-off carefully to determine the timing and location of going firm.

Recommendations:

- Units "go firm" only briefly at phase lines so as to not break the momentum of the attack or relieve the enemy of pressure on the far side of the phase line.
- Ensure that "go firm" points are not aligned with liner terrain features such as streets or rows of buildings to ensure that the enemy does not detect friendly patterns of operation.

Forward Resuscitative Surgical Suite (FRSS)
Discussion: The FRSS provided superb trauma care further forward that normally available. Embedded in the Battalion battlespace, the FRSS significantly enhanced the ability to triage and stabilize urgent and priority casualties. The FRSS is an effective means to triage and stabilize seriously injured casualties forward in the battlespace. The FRSS routinely operates on casualties for one to two hours. This time constraint drives a minimum notice to displace lead-time requirement of two hours. This timeline adds a significant burden to an infantry battalion's logistics trains by further reducing their mobility and survivability.

Recommendation: Do not employ the FRSS below the Regimental level due its restricted mobility.

Civil Military Affairs
Discussion: The Battalion is not properly manned, equipped, or trained to conduct civil-military affairs above the very basic level. Further, if forced into this role without assets or special training, the Battalion could possibly compromise its perceived impartiality among the population.

Recommendations:

- Conduct civil-military affairs planning and coordination a higher level than the battalion.
- If an infantry battalion is conducting separate operations without the availability (or the reach-back ability) of a properly organized command element to provide civil-military guidance, a civil-military affairs team should be attached or placed in Direct Support.

Civil Disturbance Training
Discussion: The (BUST package did not address the subject of handling civil disturbances. In particular, tactics, techniques, and procedures (TTPs) for employment of non-lethal weapons and crowd control formations. As a result, when the Battalion was confronted with both friendly and hostile demonstrations along the perimeter of its battle position (firm base), the unit was slow and unorganized in its response. This put both the civilians and military personnel at risk.

Recommendation. Amend the BUST program of instruction (POI) to include classroom and practical application in crowd control.

Secure Briefing Area During Stability Ops
Discussion: During stability operations, local civilian community leaders and the media frequently visited the Battalion CP. It is very challenging to host these personnel without interfering with operations.

Recommendation: Establish a separate and secure briefing facility within the Battalion CP area in order to meet with civilian and media personnel. Locate it so that transiting to or from the area does not interfere with operations or compromise tactical security.

Collocation of The Quick Reaction Force (QRF)
Discussion: The Battalion area stabilization plan called for reinforced rifle companies to be out-posted throughout the Battalion's area of operations. The QRF and Battalion CP were also out-posted in close proximity to one another, but not collocated. This configuration required both the QRF and Battalion CP to employ their own personnel and resources to maintain local security. When tasked to deploy in response to emergency situations, the QRF was required to leave personnel at its battle position to maintain security. This requirement reduced the size and capabilities of the QRF and made the remain-behind security force more vulnerable to local attacks. The QRF became another maneuver element with its own sector. While this proved effective in this specific scenario, it pulled resources away from a dedicated Battalion Reserve. By consolidating the battle positions of the QRF and a comparable force (Rifle Company (Rein) or Battalion CP) the Battalion could have achieved better economy in the employment of its manpower, firepower, security and resources.

Recommendations:
- During the planning process, the commander must specifically indicate whether he desires to withhold a reserve or accept risk by committing the preponderance of his forces.
- If a reserve or QRF is tasked, collocate it with a comparable element in order to husband the battalion's combat power and provide security for both units.

Increased Requirement For Explosive Ordnance Disposal (EOD) Detachments
Discussion: Units operating in urban areas can plan to encounter more unexploded mines and explosives than in normal combat operations. This problem is compounded because the densely packed urban terrain precludes infantry and combat engineer from destroying such munitions in place due to the risk of collateral damage.
- There is a requirement to diffuse or transport such munitions to a safe location for disposal.

- Such missions require additional training for combat engineers, specifically trained explosive ordnance disposal (EOD) detachments, special bomb disposal units, or some other agency capable of de-mining.

Recommendation(s):

- Units operating in urban environment should have EOD detachments embedded in their force structure or on-call.
- We think that Block II (peacekeeping) MOUT will require a greater number of EOD detachments than normally deployed for other contingency operations.

Registration of Civilians and Detainees

Discussion: During Block II operations, the Battalion encountered numerous civilians who initially acted as noncombatants but were later revealed to be hostile militia or paramilitary force members. Had these individuals been registered (i.e., photographed and documented) when they were first encountered, we would have been better able to:

- Track actions, patterns and alliances.
- Share information with civilian law enforcement agencies
- Assist in identification of displaced, missing, injured or dead civilians.

Recommendations:

- Battalion register (photograph and document) all civilian, government, military, and paramilitary persons stopped, detained, or captured.
- Equip patrols with digital camera equipment to photograph and transmit images of potentially hostile civilian personnel.

Fratricide Investigations During Training Events

Discussion: When a simulated fratricide incident was reported, the Battalion assigned an Investigating Officer to conduct a full JAG Manual investigation of the event. The result of this investigation was:

- It alerted the Marines that the command took fratricide incidents very seriously and would take swift action if they occurred.
- It forced Marines to realize their culpability in the incident and recognize the impact of their actions. By writing statements and being interviewed, the Marines were required to seriously reflect on their involvement in the incident. This resulted in reactions of disbelief, shock and fear that they may have injured or killed a fellow Marine.
- The investigations educated and exercised the Adjutant/Legal Officer in his duties in a combat scenario.

Recommendation:

- Investigate—to the fullest extent possible—all known or suspected incidences of fratricide occurring during training events. Such investigations should:
- Get interviews/statements from individuals and commanders involved in the incident.
- Identify the known or suspected causes of the incident and recommend methods to avoid or mitigate such tragic events.

UCAX Communications Issues

Background. The IC 4008M (ICOM) Intra Squad Radio (ISR) is a small, lightweight, and low cost radio that was fielded as a temporary solution to fill the communications gap between the squad leader and his fire team leaders. Although this ISR has filled the need to provide intra-squad communications, its has these problems:

- The ISR was designed to have an 18-month life cycle.
- It has no designated replacement so when it breaks the unit looses it permanently.
- It has reached the end of the initial life cycle so there is a need to replace the capability.
- It has been misused above the squad level as an non-secure intra platoon/intra company tactical radio.

An Integrated Solution. The eventual fielding of (21) AN/PRC-148 radios for use as an Intra-Platoon Radio (IPR) to every FMF/MARFORRES Rifle Company (Ref: SON for an interim Tactical Hand Held Radio (THHR) NO. CCC1.48; CHANGE 3). This will resolve the misuse of the non-secure ISR; however there will be a need to integrate the IPR with an ISR for intra squad communications.

The Joint Tactical Radio System (JTRS) ORD does not currently include the replacement of an ISR, but only the provision for a JTRS Handheld. The JTRS Handheld Multiband Inter/Intra Team Radio would not be a realistic or cost effective solution to be used at the fire team and below level. It is also a Controlled Cryptographic Item (CCI), which can be a very difficult accountability consideration at the infantry fire team level. The fact of the matter is that there is currently not a plan in effect to replace the current ISR that has reached its life cycle and is not tactically utilized by units in the Operating Forces.

UCAX Experiment with the AN/PRC-148. As described in the *ACE Warfighting Objectives Results* (earlier in the body of this report), Kilo Co 3/7 (rein) was equipped—down to the squad leader—with the AN/PRC-148C Multi Band Inter/Intra Team Radio (MBITR). It was also equipped—down to the fire team leader—with the United Kingdom Personal Role Radio (PRR) down to the fire team leader during the conduct of UCAX.

- The MBITR was used as a Type I secure platoon radio by the platoon commander, platoon sergeant, and squad leaders to communicate sensitive tactical information.
- The PRR was used as an integrated intra-squad radio that physically connected to the MBITR through the use of a standard military six-pin connector, enabling the squad leader to maintain simultaneous communications with the platoon and his fire team leaders.

ProMet has employed the AN/PRC-148 MBITR since early experiments in 2000 and reported its utility in numerous reports. It provides the missing covered link between the platoon commander and his squad leaders that is necessary for effective command and control in the urban battlespace.

ProMet took the concept a step further during our experiment in North Little Rock AR in Feb ’02 and coupled the MBITR and Personal Role Radio (PRR) by using a single headset with a toggle switch so the radio the operator switch radio transmissions between radios while using the same headset. This configuration (See Figure 31) showed great promise so it was further evaluated during UCAX.

The PRR is a COTS radio and has been fielded to the UK Royal Marines who report favorable results with its use in Northern Ireland. Figure 33 shows the PRR and its accoutrements.

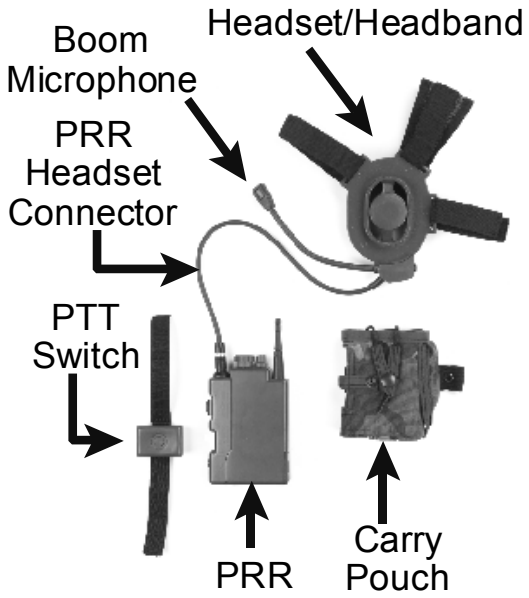


Figure 33 PRR and Accoutrements

Experimentation has clearly demonstrated the requirement for expanded small unit communication. The ICOM Intra Squad Radio (ISR) was fielded following the Urban Warrior experiments to provide needed communication between the squad leader and his fireteam leaders. This radio has significantly improved the ability of the small unit leader to:

- Command and control his elements.
- Maneuver in the complex and compartmented urban terrain.
- Maintain SA on the location and status of his elements.
- Identify and engage enemy elements.

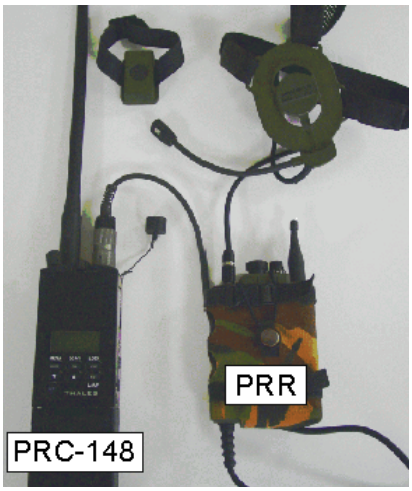
Because the ISR is an uncovered radio, many expressed concern about the enemy's ability to intercept and collect against it. Repeated evaluation by Radio Battalion assets during experimentation demonstrated that when properly used, there is a very low probability that any *usable* information can be garnered by monitoring the squad's tactical comms. However, as the PRR has a lower probability of intercept because of design and reduced range, ProMet evaluated the PRR as a possible replacement radio for the ISR. We believe that the final solution may reside somewhere between disposable COTS ICOM and the PRR.

One observation from UCAX that we see in all experiments is that company commanders, platoon commanders, and squad leaders use the ICOM/PRR as a tactical command net. They state that they find themselves relying on the ICOM/PRR because they seem to function better in the urban environment than the MBITR and AN/PRC-119 SINCGARS. This is because these radios use the UHF frequency band. The battalion and company tactical radio nets, which are programmed on the MBITR and AN/PRC-119, use the VHF frequency band—which has proven not optimal for urban communications. Furthermore, the small size of the ICOM and PRR their ready availability make them easy radio to use. This is both a training issue as well as a potential urban design frequency issue. The PRR should <u>not</u> be employed as a platoon radio. It is designed to be used as a squad radio only.

Another comment from the PRR users was that it did not seem to work as well as the ICOM. Most of the comments related to its reduced range rather than its design and function. Future analysis on the balance between range and probability of intercept is needed to determine the final radio design.

The PRR is designed to be employed in conjunction with a "higher radio." Each squad is assigned one channel on the PRR for internal squad communications between squad leader and fire team leaders within the same squad. The only person to communicate outside the squad

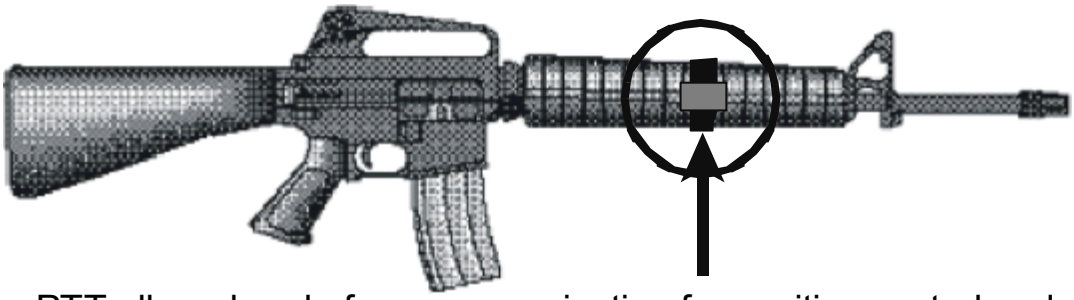
should be the squad leader, using the AN/PRC-148, to coordinate movement between squads. This should be done via the PRR *only* as a backup in the absence the AN/PRC-148. Each infantry battalion currently rates (69) AN/PRC-148s on their T/E, however, they currently only have a quantity of (18) on hand. Marine Corps Systems Command is aware of this deficiency and has taken this issue for action. Figure 34 shows the PRR and AN/PRC-148.



Another feature of the PRR is the fact that the headset connects into the top of the radio so that the boom microphone can be positioned as required. Also, users can position the wireless push-to-talk (PTT) switch on their weapon so that they transmit while maintaining weapon "hands-on." Figure 35 shows this configuration and describes how the rifleman can obtain this capability.

Figure 34 PRR and AN/PRC-148

Using the strap provided, you can attach the Push-to-Talk (PTT) switch to your weapon—or any other piece of your equipment. When pressed, the wireless PTT switch operates the PRR by means of a short range radio assembly.



PTT allows hands-free communication for positive control and better situation awareness with no loss of immediate firepower.

Figure 35 Wireless PRR Switch Attached to a Rifle

Post Experiment Feedback on the AN/PRC-148 and the PRR. Questionnaire responses from the Kilo Co Marines and their attachments that used the MBITR and or PRR are summarized below:

1. **Rate the training you received on the operational use of the MBITR.**
   a. Quality of training on the operational use of the MBITR was sufficient.
   b. Quantity of training was <u>not</u> sufficient.

(1) Kilo Co 3/7 was given two periods of instruction on the operational use of the MBITR, each consisting of 1.5 hours of instruction and 1.5 hours of practical application, during BUST and prior to UCAX.
(2) Some of the Marines that operated the MBITR during UCAX were not present for the MBITR training conducted during BUST. This issue was a contributing factor to the response of this question due to the complexity of operating and troubleshooting the MBITR.

2. **Rate the training you received on the operational use of the PRR.**
   a. Quality *and* quantity of training on the operational use of the PRR was sufficient.
   b. Kilo Co 3/7 was given two periods of instruction on the operational use of the PRR, each consisting of 1 hour of instruction and 1 hour of practical application.
      (1) Some of the Marines that operated the PRR during UCAX were not present for the MBITR training conducted during BUST.
      (2) This issue was not a contributing factor to the response of this question due to the simplicity of operating and troubleshooting the PRR.

3. **Overall, how difficult were the radios to use?**
   a. The Marines stated overall that the MBITR was easy to use and that the PRR was very easy to use.

4. **How difficult was it to change frequencies on the MBITR?**
   a. Most of the Marines felt that it was difficult to change frequencies on the MBITR due to the location of carriage.
      (1) Most of the Marines placed the MBITRs in their Camelbaks, keeping it out of the way from the rest of their gear, which kept the radio out of reach to change channels.

5. **How difficult was it to change frequencies on the PRR?**
   a. Most of the Marines felt that it was very easy to change frequencies on the PRR, which was also due to the location of carriage.
      (1) Marines carried the PRRs high on their shoulders and well within reach of the channel selector.
6. **How difficult was it to use the MBITR and the PRR at the same time?**
   a. Most of the Marines said that it was easy to operate the MBITR and the PRR at the same time.

7. **On average, how many times per hour did you transmit traffic on the MBITR PRR?**
   a. Average amount of MBITR transmitted traffic was from between 11 to 20 times per hour.

8. **On average, how many times per hour did you transmit traffic on the PRR?**
   a. Average amount of PRR transmitted traffic was from between 31 to 40 times per hour.

9. What type of message traffic did you transmit most frequently (position report, situation report, contact report, casualty report, request for fire, other)?
   a. Most frequently message traffic over both MBITR and PRR was the position report.

10. **On average, how long did the MBITR and the PRR batteries last?**
    a. Average duration of MBITR rechargeable lithium ion batteries was between 5 to 6 hours.
    b. Average duration of PRR AA batteries was between 24 to 48 hours.

11. **Did the MBITR and the PRR allow you to perform your mission more effectively?**
    a. Overall, the Marines said that the combination of MBITR and PRR:
        (1) enhanced situation awareness,
        (2) enabled communications with supporting arms attachments from the squad and fire team level, and
        (3) was fairly easy to operate.

12. **Did you experience any problems with the MBITR and the PRR during UCAX?**
    a. The main problems experienced by Marines faced with operating the MBITR were:
        (1) Timing loss in SINCGARS Frequency Hopping mode with some of the older MBITR versions.
        (2) Difficulty changing channels due to radio carriage.
        (3) Range limitations (due to frequency or antenna used).
        (4) Limited battery duration.
    b. The main problems the Marines addressed with the PRR were:
        (1) Limited range.
        (2) Headset was a bit snug while worn under the Kevlar helmet.

13. **Were the MBITR and the PRR rugged enough to support your mission?**
The Marines felt that both radios were rugged enough to support their mission.

14. **Did the MBITR or PRR headset or push to talk button cause you any problems in using your assigned weapon?**
    a. The Marines preferred the PRR wireless push to talk device to the MBITR "hockey puck style" push to talk device.

15. **How comfortable was the MBITR and PRR headset?**
    a. Marines stated that the MBITR Racal "solid plastic headband" was very uncomfortable while worn either under the Kevlar helmet or soft cover.
    b. Most of the Marines liked the PRR headset, but some of them felt that is was too snug while worn under the Kevlar helmet.

16. **What recommendations do you have to improve the MBITR and the PRR?**
    a. MBITR—increase the battery duration, provide a method to better view the selected frequency, shorten the length of the VHF tape antenna, and replace the Racal headset.
    b. PRR—increase the range and decrease the size of the earpiece portion of the headset.

17. **Do you feel that this capability should be provided to every infantry rifle platoon?**
    a. The overall recommendation of the Marines that operated the MBITR and PRR was that this level of capability should be provided.

Summary.

1. *Integrated ISR*
   a. Needed at the squad level to provide non secure communications down to the fire teams and secure communications between the squad leaders and up to the platoon commander.
   b. Squad leader will also need to be able to receive simultaneous transmissions through the use of a single headset.
      (1) Eliminates requirement for two separate headsets.
2. *Communications Security*.
   a. One of the most important capabilities that the Integrated Intra-Squad Radio must possess is some form of communications security.
   b. One of the main reasons that some Infantry Battalions do not operationally use the current ISR is its total lack of communications security.
      (1) They do not need a Type I Encryption solution down to the Fire Team level, but a solution that cannot be intercepted or direction found by a "Radio Shack" scanner.

An Integrated ISR UNS has signed by CG 1st MAR DIV CG as a result of 3/7's use of the PRR during UCAX. This UNS identifies the need for a replacement ISR that can be physically integrated with the AN/PRC-148C MBITR and provides for a Limited Probability of Intercept/Limited Probability of Detection (LPI/LPD) capability.

Figure 36 on the following page depicts the distribution of the AN/PRC-148C and the PRR to K Company, 3/7 during UCAX.

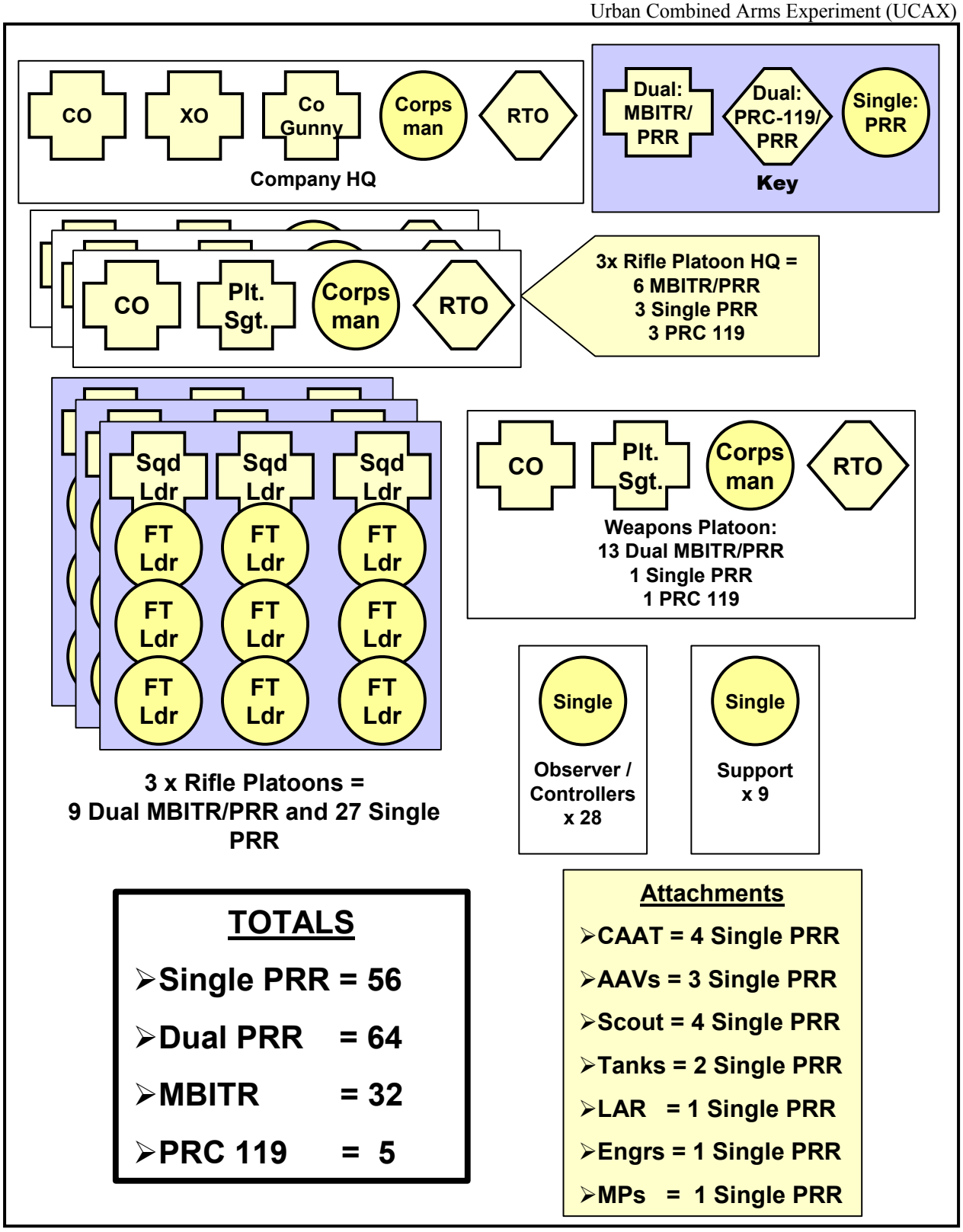


Figure 36 Distribution of Radio Assets During UCAX

Chapter 5 – Follow-on Actions Planned by MCWL

Reconnaissance, Surveillance, and Target Acquisition (RSTA)
Prior to fielding the Dragon Eye Unmanned Aerial Vehicle (UAV), MCWL will consider alternate concepts of employment that address the manpower and logistics concerns that arose during MD 02. This may require some form of future experimentation to validate these changes and ensure that we do not field a system to the operating forces without providing them with at least informal documentation reflecting a validated employment concept and Tactics, Techniques, and Procedures (TTPs)

MCWL will continue to work with Marine Corps Systems Command (MCSC) to develop unmanned ground sensors being developed under the Tactical Remote Sensor System (TRSS) Operational Requirements Document (ORD) by providing opportunities for live experimentation.

During Sea Viking 2004 (SV 04) MCWL will continue efforts in RSTA by seeking to develop command and control systems that integrate sensor inputs, information management processes, and sensor employment concepts within the context of STOM.

Combat ID
MCWL has already provided feedback to the vendor regarding possible enhancements to the system that is mounted on the M16 Service Rifle.

MCWL will conduct small-scale Limited Technical Assessments (LTAs) if follow-on systems become available. Currently, there are neither plans nor budget lines for any larger scale experiments in this area.

Enhanced Surgical Care
The current program calls for fielding of the Forward Resuscitative Surgical System (FRSS) to the Operating Forces during FY 03.

The analysis and assessment clearly indicates a need to work on the concept of employment and TTPs for this system. MCWL can provide personnel to participate in efforts, but has no plans to lead a separate effort.

Preliminary—First In Command and Control System (PRE-FICCS)
The initial/preliminary program, originally funded by the Office of Naval Research, is at the end of its planned and budgeted development effort. no source for funding a continued effort with this system currently exists. However, the PRE-FICCS is supporting I MEF in SWA and undergoing further operational evaluations and S&T testing.

Precision Targeting
The system employed during MD 02 was a subset of the Target Hand-off System (THS(X)) that is currently being developed. Even though we confirmed the limitations of laser devices in urban terrain, the end state universal observer system remains a desirable and viable enhancement for operating forces.

MCWL will continue to support development and fielding of this system and the current plan for SV-04 incorporates use of the THS as part of the STOM related fires initiatives.

Transition Recommendations Requiring Action by MCCDC.

Mapping Support for MOUT

The non-standard maps of the urban training area at SCLA used by the experiment forces proved to be an extremely useful tool for planning, navigation, and fire support.

These maps were on a scale of 1:3,000. They portrayed on outline view of the urban structures overlaid with a geo-referenced grid. Creation of these maps required no experimental systems, and relied only on the correct form of overhead imagery of the area.

MCWL recommends that this mapping convention be institutionalized for MOUT by including references to the form, format, and production steps into existing and emerging doctrinal publications dealing with MOUT.

Additionally, we recommend that the Expeditionary Force Development Center (Doctrine Division) forward a recommendation to the US Army Training and Doctrine Command (TRADOC) to include this material in the next revision of FM 34-130, Intelligence Preparation of the Battlefield. MCWL personnel will provide any assistance needed to prepare revisions or input.

Tactical Communications Universal Needs Statement (UNS)

MCWL notes that the Universal Need Statement (UNS) for the Intra Squad Radio (ISR)—focused on procurement of the Personal Role Radio (PRR)—was signed and input into the system by the CG, 1st Marine Division (MARDIV). We also note that the PRR is currently in the hands of forward elements of the 1st MARDIV in SWA.

Reconnaissance Force Equipment
MCWL recommends that MCCDC pursue fielding of the SOMPE-M, the 3-Day assault pack, and the MIRC thermal scope for Division Reconnaissance Battalions and Force Reconnaissance Companies.

Annex A – Combat ID Reconstruction

This is a chronology of events for the combat ID experiment. There were six events—three baseline events and three experimental events. Each event consisted of a force-on-force engagement. In iteration number 1, the BLUFOR, equipped with the experimental combat ID system, cleared a three-story building occupied by an unconventional enemy force and civilian noncombatants. In iteration number 2, the BLUFOR attacked an enemy force through urban terrain, culminating the attack with an assault on a one-story building. In iteration number 3, the BLUFOR, equipped with the experimental combat ID system, attempts to defend a U.S. diplomatic site from attack by an unconventional enemy force. The remaining iterations focused on the same scenarios without experimental gear (i.e., without the combat ID system). Tables A-1 through A-6 highlight the chronology of events for each iteration.

Table A-1. Chronology of Events, Experiment Event 1E

30 July 02	Location	Event 1 E: Attack On Three-Story Building
0901	1st deck, north end	OPFOR spread out in starting positions
0901	1st, 2nd, 3rd decks	Civilians spread out in starting positions
0903	1st deck, south end	1st squad starting position
0903	East of Bldg 588	2nd squad starting position
0907–0909	1st deck, south end	1st squad moves north clearing rooms. 1st squad encounters civilians inside rooms and conducts hasty search.
0909–0914	1st deck, mid-hall	1st squad takes fire, engages enemy. Both sides take casualties.
0911	East of Bldg 588	2nd squad departs assault position for objective
0914	1st deck, south entrance	2nd squad breaches building and takes position in rooms at south end
0914–0917	3rd deck	Civilians milling around inside and outside rooms
0915	1st deck, center ladderwell	1st squad reaches center ladder well under fire. Civilian hiding in ladder well flees bldg.
0916	West of Bldg 588	OPFOR moves into position outside center entranceway
0917	1st deck, center entrance	OPFOR launches grenade, enters bldg and engages BLUFOR in ladderwell
0918–0925	1st deck	BLUFOR pushes north and continues engagement. Casualties taken by both sides.
0918	2nd deck, center ladderwell	Civilians descend to 2nd deck to observe engagement.
0920	1st deck, center ladderwell	Civilian hiding in ladderwell flees bldg.
0921	Center ladderwell	BLUFOR team climbs to 2nd deck to secure while engagement continues on 1st deck
0925	2nd deck	BLUFOR encounters civilians milling around.
0926	1st deck	BLUFOR calls 1st deck secure.
0926	3rd deck	OPFOR resurrected and assume new starting position on 3rd deck
0927	2nd deck, mid-hall	BLUFOR begins clearing second deck, moving north and south

30 July 02	Location	Event 1 E: Attack On Three-Story Building
0928–0936	2nd deck	OPFOR engages BLUFOR. Both sides take casualties.
0930	3rd deck, center ladder well	BLUFOR team (2-man) climbs to 3rd deck to secure ladder well
0930	2nd deck	BLUFOR encounters civilians hiding in closet and fires on them
0930	3rd deck, south end	Civilians provide intelligence to OPFOR
0937	3rd deck, mid-hall	BLUFOR begins clearing third deck, moving north and south
0941	3rd deck	BLUFOR encounters civilians
0944	2nd deck	BLUFOR calls 2nd deck secure C12
0945–0950	3rd deck, mid-hall	BLUFOR takes fire from both ends of the hall. Engagement ensues.
0952–0955	3rd deck, south end	BLUFOR resumes clearing rooms, encounters and detains civilians. BLUFOR also captures one enemy POW.
1001	3rd deck	BLUFOR calls 3rd deck secure.
1003	3rd deck	BLUFOR calls for consolidation and casualty count.
1006		Endex

Table A-2. Chronology of events, experimental event 2E

30 July 02	Location	Event 2E: Attack On One-Story Building
2000	Section XII Bldg 5	OPFOR starting position with barricades around entrances (BLUFOR objective)
2000	Section XI and XII	Civilians milling around inside and outside buildings
2001	Section XI Bldg 6	1st squad steps off from BLUFOR starting position
2003	Section XI Bldg 14	1st squad arrives outside support position
2003	Section XI Bldg 6	2nd squad steps off and moves in trace behind 1st squad
2004	Section XI Bldg 14	Civilians approach and question 1st squad
2004	Section XI Bldg 14	1st squad enters and begins clearing building
2008	Section XII	Civilians on street, making noise
2009	Section XI Bldg 14	1st squad throws smoke to obscure objective
2009	Section XI Bldg 14	Civilians flee area
2009	Section XI Bldg 15	2nd squad maneuvers to objective, using building as cover
2010	Section XI Bldg 14	1st squad puts suppressing fire on objective
2010	Section XII Bldg 5	2nd squad engages OPFOR at objective
2012	Section XI Bldg 14	1st squad hears car honking outside
2013	Section XI Bldg 15	Headquarters element maneuvers to objective using building as cover
2014	Section XI Bldg 14	Civilians flee as firing continues
2016	Section XII Bldg 5	2nd squad enters objective
2018 - 2020	Section XII Bldg 5	Engagement continues with casualties on both sides

30 July 02	Location	Event 2E: Attack On One-Story Building
2024	Section XII Bldg 5	1st squad 2nd team enters objective
2024	Section XII	1st squad 1st team maneuvers to objective
2025	Section XII Bldg 5	Engagement renews
2027	Section XII Bldg 5	Call for consolidation
2027	Section XII Bldg 5	1st squad advances to southern section of objective and clears the area
2028 - 2034	Section XII Bldg 5	OPFOR counterattacks inside and outside the building. Both sides take casualties, including BLUFOR platoon leader.
2035	Section XII Bldg 5	BLUFOR re-secures objective and posts security
2038	Section XII Bldg 5	BLUFOR consolidates force
2038		Endex

Table A-3. Chronology of events, experimental event 3E

30 July 02	Location	Event 3E: Defend the Consulate
2230	Sector XII, Bldg 8	OPFOR sniper team in position around building
2230	Sector XII, between Bldgs 11 and 12	OPFOR ambush team in position between buildings
2233	Sector XII, between Bldgs 5 and 6	Civilian vehicle arrives at checkpoint. 1st squad, 2nd team conducts search with driver's cooperation
2234	Sector XII	Civilians milling around inside and outside buildings
2235	Sector XII, Alaska Circle	1st squad, 2nd team finishes vehicle search. Vehicle proceeds around Alaska Circle towards consulate.
2236	Sector XII, Bldg 7	Civilian passenger exits vehicle and is frisked by BLUFOR.
2238	Sector XII, Bldg 13	2nd squad patrol steps off from consulate
2239	Sector XII, Road between Bldgs 5 and 6	New civilian vehicle arrives at checkpoint. 1st squad, 2nd team conducts search of vehicle with driver's cooperation. Civilians approach and attempt to interfere with search.
2240	Sector XII, Bldg 13	Consulate guard take fire
2243	Sector XII, Bldg 8	OPFOR snipers open fire on consulate from position in bldg. 8
2245	Sector XII, Outside Bldg 13	1st civilian vehicle arrives at consulate, attempts to enter, and is turned away
2246	Sector XII, Outside Bldg 13	BLUFOR response team leaves consulate for sniper position
2248	Sector XII, Bldg 8	BLUFOR response team enters building to search for sniper
2249 - 2301	Sector, XII, Bldg 8	BLUFOR response team engages OPFOR snipers, with casualties taken by both sides

30 July 02	Location	Event 3E: Defend the Consulate
2250	Sector XII	2nd squad patrol conducts personnel search
2253	Sector XII, between Bldgs 11 and 12	2nd squad patrol ambushed by OPFOR and returns fire with casualties taken by both sides
2251	Sector XII, Road between Bldgs 5 and 6	2nd vehicle search concludes and vehicle moves toward consulate
2255	Sector XII, Road between Bldgs 5 and 6	3rd vehicle arrives at checkpoint. 1st squad, 2nd team conducts search of vehicle. Civilians approach and attempt to interfere with search.
2255	Sector XII, Bldg 13	Civilians attempt to enter consulate saying they want to obtain visas
2259	Sector XII, Road between Bldgs 5 and 6	3rd vehicle search concludes and vehicle moves toward consulate
2300	Sector XII, Bldg 13	Civilians attempt to enter consulate and are searched
2300	Sector XII, Outside Bldg 13	OPFOR team attempts to breach consulate from rear (North) and fails
2302	Sector XII, Road between Bldgs 5 and 6	1st squad, 2nd team observes suspicious person walking around. They stop him and force him to use another route.
2302	Sector XII, Bldg 8	BLUFOR response team secures sniper
2305	Sector XII, Outside Bldg 13	OPFOR team attempts to breach consulate from East and fails
2305	Sector XII, Outside Bldg 13	3rd vehicle arrives at consulate, attempts to enter, and is turned away
2310	Sector XII, Bldg 13	BLUFOR response team returns to consulate
2313	Sector XII, Outside Bldg 13	OPFOR team opens fire at front of consulate, takes one KIA
2314		Endex

Table A-4. Chronology of events, baseline event 1B

31 July 02	Location	Event 1B: Attack on Three-Story Building
0856	2nd deck, north and south ends	OPFOR team starting position
0856	3rd deck, mid-hall	OPFOR team starting position
0856	1st, 2nd, 3rd decks	Civilians spread out in starting positions
0859	3rd deck, south end	1st squad starting position
0901	East of Bldg 588	2nd squad starting position
0902-0907	3rd deck	1st squad moves north clearing rooms, encounters civilians and conducts hasty search
0904	3rd deck, mid-hall	1st squad encounters civilian being used as human shield. OPFOR drags hostage down center ladderwell

31 July 02	Location	Event 1B: Attack on Three-Story Building
0905	3rd deck	1st squad takes fire, engages enemy and calls for support-up
0906	3rd deck, south entrance	2nd squad breaches building and moves north to consolidate with 1st squad
0906	2nd deck, center ladder well	OPFOR drags civilian hostage to 1st deck
0907	3rd deck lounge	BLUFOR provides security for detained civilians
0908	3rd deck, ladder well	OPFOR climbs ladder well from lower deck and engages BLUFOR. Both sides take casualties
0911	3rd deck	BLUFOR calls 3rd deck secure
0912 - 0914	3rd deck, north ladder well	OPFOR team climbs to 3rd deck with civilian hostage and re-engages BLUFOR.
0915	South ladder well	2nd squad moves to 2nd deck and moves north clearing rooms.
0915	Center ladder well	1st squad provides security in center ladder well
0916	2nd deck, south end	2nd squad clearing rooms, encounters civilians
0916	2nd deck, mid-hall	OPFOR uses civilian as shield and engages BLUFOR
0916-0924	2nd deck	BLUFOR moves north and continues engagement. Casualties taken by both sides
0920	Center ladder well	BLUFOR security climbs down to 2nd deck to support engagement
0925	2nd deck, north end	BLUFOR calls for support up; support moves to north end of hallway to take lead
0925	Center ladder well	BLUFOR detains and flexi-cuffs two civilians
0926	2nd deck, north end	BLUFOR clears north end of deck
0927	2nd deck	BLUFOR calls 2nd deck secure
0927-0929	2nd deck, north ladder well	OPFOR engages BLUFOR outside north ladder well. BLUFOR takes heavy casualties
0929	1st deck, north end	BLUFOR enters deck
0932 - 0942	1st deck	OPFOR occupies center ladder well and south end of deck and is using civilians as hostages. BLUFOR engages OPFOR. Both sides take casualties. Civilian casualties.
0932	1st deck	Civilians flee bldg
0936	2nd deck	OPFOR uses civilian hostage and moves from room to room
0937	1st deck	BLUFOR pushes south under fire
0942	South ladder well	OPFOR flees 1st deck and climbs to 2nd deck
0947	Outside 1st deck, south end	BLUFOR team comes around end of bldg and climbs to 2nd deck. BLUFOR engages remaining OPFOR.
0947-0949	2nd deck	BLUFOR engages remaining OPFOR

31 July 02	Location	Event 1B: Attack on Three-Story Building
0949	1st deck	BLUFOR calls building secure
0950	1st deck	BLUFOR calls for consolidation and casualty count
0952		Endex

Table A-5. Chronology of Events, Baseline Event 2B

31 July 02	Location	Event 2B: Attack on One-Story Building
2000	Sector XI, Bldg 19	OPFOR assumes starting position (BLUFOR objective)
2000	Sector XII, Bldg 13	2nd squad steps off from starting position and proceeds around perimeter of sector towards assault position
2000	Sector XI and XII	Civilians milling around inside and outside buildings
2001	Sector XII, Bldg 13	1st squad steps off from starting position and proceeds towards support by fire position via the center of the sector
2002	Sector XI, Bldg 19	Civilian vehicle departs OPFOR building and circles the block
2005	Sector XI, Bldg 19	OPFOR arranges for civilians to act as early warning system
2005	Sector XII	1st squad on the move through center of sector
2006	Sector XII	2nd squad on the move around perimeter of sector
2009-2011	Sector XI, Bldg 13	1st squad reaches support by fire position and conducts hasty search of bldg. 1st squad encounters civilians and clears bldg.
2010	Sector XI, Bldg 6	2nd squad arrives at assault position and secures bldg
2011	Sector XI, Bldg 19	OPFOR spots BLUFOR and begins maneuvering through bldgs.
2012	Sector XI, Bldg 12	1st squad team attempts to access bldg for additional support by fire position, but door is locked. Team returns to Bldg 13
2013	Sector XI, Bldg 13	1st squad engages objective, lays down supporting fire, throws grenades, killing two civilians in the open
2013	Sector XI, Outside Bldg 12	1st squad fire team advances to secondary support position
2013	Sector XI, Bldg 19	OPFOR returns fire
2014	Sector XI, Bldg 13	Platoon leader and corpsman reach SBF position and call "Bumblebee Tuna" prior to entry
2014	Sector XI, Behind Bldg 13	Vehicle drives behind bldg
2014	Sector XI, Bldg 19	2nd squad enters objective and begins clearing
2015	Sector XI	Civilians running away from gunfire

31 July 02	Location	Event 2B: Attack on One-Story Building
2015	Sector XI, Outside Bldg 7	Civilian abandons vehicle and takes cover
2016	Sector XI, Bldg 19	2nd squad illuminates chem lights to signal 1st squad can enter objective
2019	Sector XI, Outside Bldg 12	1st squad moving towards objective, is engaged by OPFOR, and takes fire
2026	Sector XI, Bldg 19	1st squad enters objective
2028-2032	Sector XI, Bldg 19	BLUFOR clears objective, casualties taken by both sides
2033	Sector XI, Bldg 19	BLUFOR declares objective secure, but knows there are still OPFOR outside the building
2034	Sector XI, Bldg 19	BLUFOR fire team exits building via the rear to secure outside
2036	Sector XI, Bldg 19	BLUFOR establishes security around objective
2037	Sector XI, Outside Bldg 19	Outside of objective secure
2038	Sector XI, Bldg 19	Consolidation
2039		Endex

Table A-6. Chronology of Events, Baseline Event 3B

31 July 02	Location	Event 3B: Defend the consulate
2157	Sector XI, Between bldgs 17 and 18	OPFOR ambush team in position between buildings
2158	Sector XI, Between bldgs 6 and 7	Civilian vehicle arrives at checkpoint. BLUFOR team conducts search.
2159	Sector XI, Bldg 19	Civilians milling around outside consulate
2200	Sector XI, Bldg 19	BLUFOR patrol steps off from consulate
2201	Sector XI, Behind Bldg 18	BLUFOR patrol ambushed, shots fired
2201	Sector XI, Bldg 19	Civilians flee gunfire
2202	Sector XI, Bldg 19	BLUFOR quick response force departs consulate and moves towards ambushed patrol
2203	Sector XI, Bldg 19	Civilians approach consulate guard for help finding missing child, but are turned away
2204	Sector XI, Bldg 19	QRF returns to consulate with casualties
2204	Sector XI, Bldg 19	Civilians harassing guards outside consulate
2206	Sector XI, Bldg 19	Suspicious person runs through crowd outside consulate
2207	Sector XI, Behind Bldg 19	Shots fired south of consulate (rear of building)
2208	Sector XI, Bldg 19	Vehicle attempts to enter consulate and is turned away
2208	Sector XI, Bldg 19	Civilians gather outside consulate

2209	Sector XI, Bldg 19	BLUFOR patrol departs consulate
2210	Sector XI, Bldg 19	BLUFOR instructs civilians to stay away from the consulate gates
2211	Sector XI, Across street from Bldg 19	Civilian crowd gets bigger and attempts to enter consulate
2212	Sector XI, Bldg 19	BLUFOR guard allows injured/sick civilian to enter consulate and be treated by medic, but turns away rest of civilian crowd
2214	Sector XI, Bldg 19	Civilian instigator attempts to enter consulate but is turned away
2215-2217	Sector XI, Bldg 19	Large civilian crowd gathers outside consulate with instigator and demands to see ambassador. Small riot ensues.
2218	Sector XI, Bldg 19	BLUFOR patrol returns to consulate
2219	Sector XI, Bldg 19	BLUFOR consulate guard fires shots over crowd and detains civilian instigator
2220	Sector XI, Bldg 19	Civilian crowd gathers again and attempts to enter consulate grounds.
2222	Sector XI, Bldg 19	OPFOR in crowd fire at consulate entrance
2224	Sector XI, Bldg 19	Civilian female collapses outside consulate and is brought inside grounds for medical attention
2225	Sector XI, Bldg 19	BLUFOR under fire from crowd, returns fire
2227		Endex

Annex B – Battalion RSTA Scenarios

The following information provides additional details on each of the experimental scenarios associated with the battalion RSTA experiment.

Experiment Event 1E – 2 August 2 2002

- During this event, 3rd Battalion, 7th Marines (3/7) was to initiate an attack to secure a portion of the Southern California Logistics Airport (SCLA).
- The enemy operating base was located in the vicinity of sector B4. Fire teams were initially positioned in P10, L6, and H5. A minefield was set up at the intersection of Michigan and Indiana.
- During 1E, the battalion was tasked with:
  - Locating and destroying the enemy operating base in Victorville.
  - On order transitioning to peacekeeping operations.
  - Recon teams positioned in sectors H4 and H2. STA team was in K4.
  - India Company crossed the line of departure at 1135.
- First two Dragon Eye flights flown by India Company.
  - Another five flown by the battalion. (For a more detailed discussion of Dragon Eye flights see Tab C to this enclosure.
- Unattended ground sensors administratively emplaced in two suites of four sensors.
  - Sensor string 1 emplaced west of sector E3, north of sector F5, south of sector G4, and north of sector B3.
  - Sensor string 2 emplaced north of sector L6, west of sector B1, south of sector A5, and east of sector D5.
- ENDEX at 1500

Experiment Event 2E – 3 August 2002

- This scenario called for 3/7 to transition to peacekeeping operations, but still faced a threat from Mojavian militia forces loyal to the government of Sonora.
- OPFOR was believed to be in one of the ethnic Stonerian neighborhoods. Marines were told to expect public unrest stemming from the threat of the militia forces, as well as a shortage of staple food products.
- Shrinking food supplies were consolidated in a storage site at K7.
- The enemy operating base was located at L7. Other key locations included the Hobsian Temple at H3, the Stonerian Temple at M6, the police station at H5 and the jailhouse at C5.
- At STARTEX, OPFOR planned to attack the police station and within half an hour follow-up with an ambush of BLUFOR forces in vicinity of patrol base.
- For this scenario 3/7 established an operating base at B5.
- The company was tasked with:
  - Conducting security patrols
  - Defense of the food storage site

  - Locating and neutralizing militia forces in Victorville.
- India Company plan was to send out regularly scheduled patrols.
- First patrol left BLUFOR base at 1016.
- Target list included the intersections of Michigan and New Hampshire, Kentucky and Indiana and Kentucky and Alabama
- Two routes planned:
  - Route A (foot):
    - Point of Departure (POD) – B5, Check Point 2 (CP2) – E1, CP4 – F3, CP6 – M11, CP8 – M2, Point of Return (POR) – B5.
  - Route B (vehicle):
    - POD – B5, CP1 – B3, CP3 – A1, CP5 – D3, CP7 – K12, CP9 – L5, POR – B5
- Recon teams located in L10 and K12;
- STA team located in G3
- Sensors administratively emplaced
  - Sensor string 1 (4 sensors) located between F5 and G1, north of G3, east of G4 and between G4 and G5
  - Sensor string 2 (4 sensors) located between C3 and C4, between D4 and D5, east of D3 and south of D2
    - ENDEX at 1500

<u>Baseline Event 1B—4 August 2002</u>

- During this event, 3/7 was to initiate an attack to secure SCLA.
- The main enemy operating base was located in the G4 sector of the playbox. Fire teams were initially positioned in sectors E1, C3, and O1
- A minefield was set up between P6 and P8
- Two OPFOR LAVs and two 7-ton trucks were positioned in the vicinity of sector G4. Another two OPFOR LAVs were positioned in the vicinity of Michigan and New Hampshire at STARTEX
- During 1E, the battalion was tasked with:
  - Locating and destroying the enemy operating base in Victorville.
  - On order transitioning to peacekeeping operations.
- During 1B neither the Dragon Eye UAV nor the unattended ground sensors were used in mission execution by 3/7.
- Recon teams were located in M4 and R5; scout/sniper team was located in B4.
- India Company crosses LOD at 1000
  - OPFOR based found and destroyed by 1245.
- ENDEX at approximately 1300

Baseline event 2B – 5 August 2002

- In this event 3/7 had transitioned to peacekeeping operations but still faced a threat from Mojavian militia forces loyal to the government of Sonora.
- OPFOR was believed to be in one of the ethnic Stonerian neighborhoods. Marines were told to expect public unrest stemming from the threat of the militia, as well as a shortage of staple food products.
- Shrinking food supplies were consolidated in a storage site at K14.
- The enemy operating base was at M8. Other key locations included: Hobsian Temple (H3), Stonerian Temple (M6), police station (H5), and jailhouse (C5).
- Recon teams located in K10 and C2. Scout/sniper team located in H4.
- 3/7 was tasked with:
  - Conducting security patrols
  - Defense of the food storage site
  - Locate and neutralize militia forces in Victorville.
- Company planned patrol routes by platoon. Patrols begin at approx. 1000.
- 1st Platoon:
  - Primary Route: POD – B5, CP9 – C3, CP7 – L7, CP5 – M3, CP8 – H3.
  - Alternate Route: POD – B5, CP1 – B2, CP3 – H6, CP5 – M3, CP7 – L7, CP9 – L3, POR – B5
  - Objective – Intersection of Michigan and Indiana.
- 2d Platoon:
  - Primary Route: POD – B5, CP1 – B3, CP5– D3, CP7 – K12, CP9 – L5, POR – B5.
  - Alternate Route: POD – B5, CP2 – E1, CP4 – R3, CP6 – M11, CP8 – M2, POR – B5.
- 3d Platoon:
  - Primary Route: POD – B5, CP3 – C4, CP1 – K7, CP9 – K14, CP3 – C4, POR – B5.
  - Alternate Route: POD – B5, CP3 – C4, CP2 – K10, CP9 – K14, CP1 – K7, POR – B5
- ENDEX

Annex C – Dragon Eye Survey Results

Part I – Operator Survey

Here are the survey results from the Marines who operated the Dragon Eye UAV during the Battalion RSTA (Bn RSTA) experiment.

There were 12 Dragon Eye operators, drawn from the battalion's scout/sniper platoon, used during this experiment. These Marines were drawn from the battalion's scout/sniper platoon and had received only two weeks of training on Dragon Eye before their arrival at SCLA. Dragon Eye operators were responsible for flying the Dragon Eye system and reporting any sightings of note to the battalion or company headquarters. This same group of Marines was also asked to identify and troubleshoot any technical problems associated with the UAV.

During experiment events, a large plasma television screen was set up in the COC, where the battalion staff could monitor, in real-time, video images of what the Dragon Eye was seeing on the ground. As a result monitoring and passing information was largely a staff function rather than an operator function. When the UAV was under the direct control of the company, Dragon Eye operators were responsible for relaying information to the company commander.
We asked the Dragon Eye operators to fill out a survey at the end of each experimental event (1E and 2E) and to rate how well the UAV operated during the experiment. We distributed 12 surveys over two days of experimentation—9 were returned. Not every Marine answered every question on the survey.

The first half of the survey asked Marines to rate Dragon Eye's performance on a scale of 1 (poor) to 5 (excellent). The Marines were asked to rate the following:

- Overall size
- Overall weight
- Functionality
- Ti me and effort required to assemble
- Time and effort required for launch and recovery
- Difficulty/complexity of operation
- Ruggedness of airframe
- Ruggedness of ground control station
- Stability/quality of video signal
- Sufficiency of training
- Overall system usefulness
- How well UAV suited to a combat situation

Figure Tab C1 summarizes survey results. Marines gave the UAV good marks for system functionality—weight, ruggedness of the ground control station and ease of use. The Marines, however, did not think that the UAV was that useful in an actual combat situation.

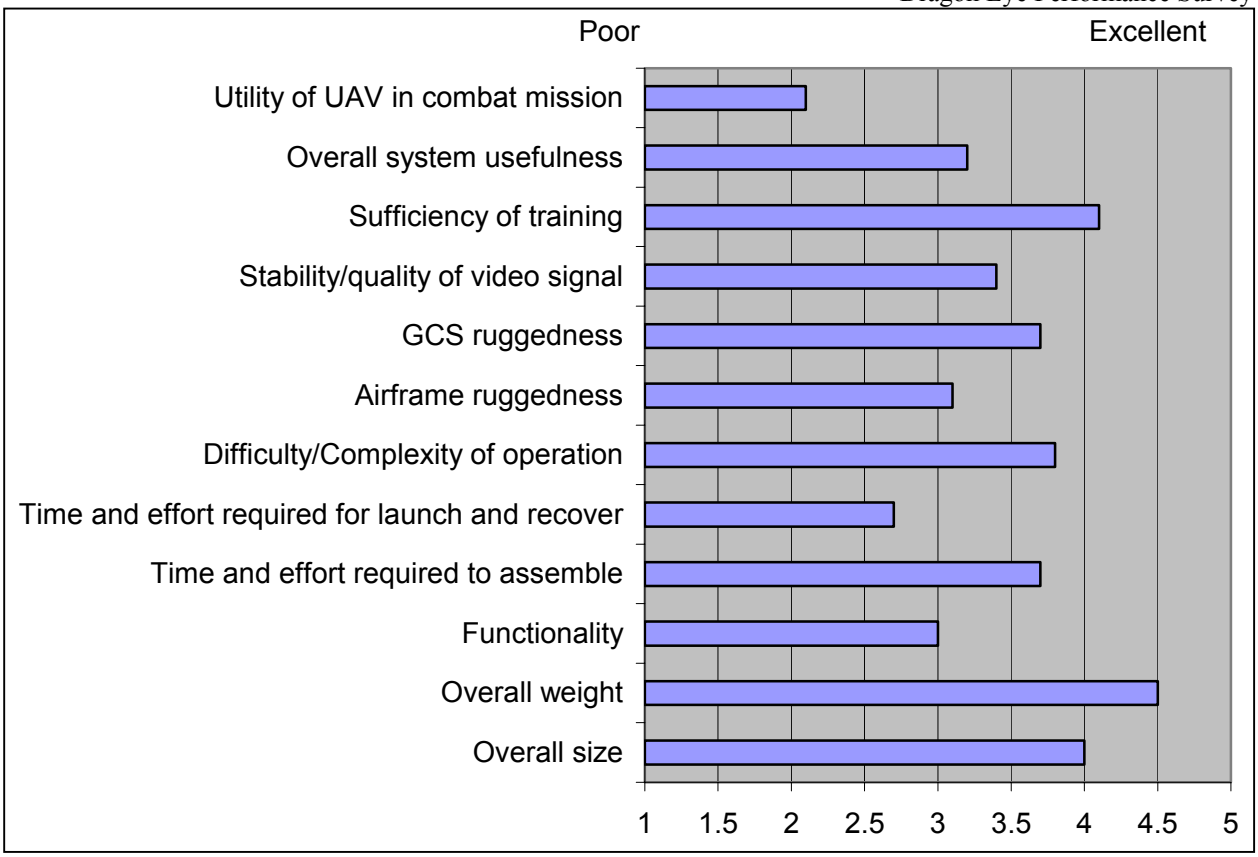


Figure C-1 Dragon Eye Survey Ratings

Operators made the following observations for the poor combat utility of the UAV:

- Too prone to technical problems that required too much knowledge and too many parts for most people to be able to fix, especially in the field.
- Bulky to pack.
- Communications problems and spare parts were plentiful during the experiment.
- Marines felt that during an actual combat operation they would be allotted far fewer spare parts and airframes.

In addition to rating the system's performance we asked Marines the following survey questions:

1. Describe the wind, and other weather conditions under which you used the Dragon Eye UAV today.
   a. The wind was calm from 0800 to 1400. Bird flew well until after 1400. Last flight shaky; take off with wind gusty and omni-directional. (08/02)
   b. From 0 to approximately 25 mph (8/02)
   c. It has been hot and dry with calm winds until flight 8 where the winds reached 30 mph (08/02).
   d. Calm during the morning. Very windy during the afternoon (08/02).
   e. The weather was good with minimal winds (08/03)

2. Approximately how long did you fly the Dragon Eye today?
   a. 6 hours (2)
   b. 5 hours
   c. 2 hours
   d. 8 flights
   e. 4.5 hours

3. How far did Dragon Eye fly today (i.e., its approximate range)?
   a. 600 meters (4)
   b. 500 meters
   c. 1 kilometer

4. How much training time did you receive?
   a. 1 week
   b. 2 weeks (3)
   c. A lot (2)

5. Was the training adequate? Why or why not?
   a. Yes, system is pretty easy to use.
   b. Yes, because now we can employ the Dragon Eye proficiently.
   c. Yes, we are able to fly with little screw up on our side.
   d. Yes, to be able to operate and fly the contraption we had good training, but to be able to repair the system outside of the troubleshooting, not so much.

6. Was the quality of the video sufficient for your mission?
   a. Yes (6)
   b. Was the ground station's display large enough to be useful?
   c. Yes (6)

7. How did you employ the UAV?
   a. Recon the enemy (6)
   b. Route recon
   c. Recon terrain

8. Give examples of the types of targets or features you identified or located using the Dragon Eye system.
   a. Trucks, troops, HUMMWV, LAV
   b. Personnel, LAVs, tanks, AAVs

c. Individuals, tanks, AAVs, Hummers
d. Vehicles, buildings and enemy personnel
e. Personnel, vehicles, equipment

9. Describe any problems encountered with the Dragon Eye.
   a. Holding down link antenna
   b. Apparently one machine fell apart during take-off
   c. Imagery glasses need sunshades
   d. Communications problems, technical problems on a regular basis
   e. Comm boxes are constantly being switched out because of loss of visual data and communications with the UAV
   f. When the system gets to be around 128 degrees it can't download info
   g. During the fifth mission the bird fell apart on launch

10. What are the system's good points?
   a. Once the bird got up it was easy to control
   b. Good visual aid for operations
   c. User friendly/easy to use
   d. Good eyes on objectives and targets
   e. It provides photographic intell on an area of interest
   f. It provides real time info to the companies about the enemy
   g. It can provide good surveillance of the enemy position, equipment and personnel

11. What are the system's bad points?
   a. Bulky to pack
   b. The antenna always has to be pointed at the bird
   c. Seems something had to be switched out every flight (i.e. battery, laptop, camera)
   d. Too prone to damage in real world situation.
   e. Technical problems require too many parts and too much knowledge for most people to be able to fix, especially in the field
   f. Unpredictable malfunctions between comm box and aircraft
   g. Comm boxes are failing and need to be replaced regularly.
   h. Aircraft autopilot took the UAV into the side of buildings and rocks on several occasions.
   i. We are constantly trading out aircraft for reasons we don't understand.
   j. It is unlikely we will have as many spare parts for the vehicle that we have during experimentation.
   k. The launching process.
   l. The camera can't zoom in and out.

Were you able to send Dragon Eye imagery to the COC? If so, how?

m. Yes, with about 1 million feet of cable and a bunch of other electronic tools attached.
n. Yes… because we had a lot more spare airplanes and comm boxes to replace than would actually be allotted to units who receive them.
o. Yes, using the ground station via link cables to television.
p. Yes, by telling the company commander via ICOM radio.
q. Yes, our visual was fine, but it was hard to get a definite ID on some targets.

12. How many images were sent? How many images got through?
    a. All of them
    b. None, we relayed each one by ICOM

Part II – Bn Staff and Company Commander

Here are highlights of the opinions and assessment of the battalion staff and the company commander who employed the Dragon Eye UAV and the SenTech UGS. It is based on surveys completed after each experimental vignette.

1. *Did RSTA asset emplacement delay your mission planning? How or why not?*
    a. No—we used Dragon Eye during mission execution, not during mission planning (S-2).
    b. No (CO).
    c. No, utilized during execution (S-2).
    d. The information provided by Dragon Eye was too fleeting in this environment and couldn't help me plan for the unexpected enemy engagement because it couldn't detect enemy moving inside houses (CO).
    e. Not significantly (S-3).

2. Did RSTA asset emplacement delay your mission execution? Why or why not?
    a. No. However, RSTA assets needed much more time to observe enemy movements, strength and disposition (CO).
    b. No—emplaced during an admin period (S-2).
    c. No, emplaced prior to execution.
    d. No, I still had good situational awareness and developments from STA and RECON assets on the ground in order to continue my mission (CO).
    e. Yes, sensor emplacement took time, Dragon Eye launch took time to get picture (S-3).

3. Did RSTA assets provide information that allowed you to detect OPFOR?
    a. Yes —aerial recon (CO).
    b. Yes —Dragon Eye helped determine the location of [static] log site and [static] light armor positions. UGS gave some cueing but due to three of eight sensors reporting it limited their capability (S-2).
    c. Yes—Dragon Eye provided good real-time video information. Recon and sniper teams provided good direct observation (S-3).

d. We were able to detect people and vehicles with UGS but were unable to determine if they were OPFOR or civilians. Dragon Eye could not distinguish between OPFOR and civilians (S-2).
e. More so in detecting vehicles than personnel. The real answer is no. The Dragon Eye can only capture a limited view of the battle space at any given moment. By the time the system was reprogrammed or re-routed the enemy had moved and may have escaped further detection. (CO).
f. No during the second event (S-3).

4. Did RSTA assets provide information that allowed you to identify OPFOR?
   a. No—unable to distinguish enemy due to distance and clarity of picture. Connectivity was sometimes weak. However, was able to view vehicles and recognize due to shapes and familiarity (CO).
   b. UGS was unable to identify OPFOR. It gives hits/indications on vehicles and personnel but cannot distinguish between civilians and OPFOR. The company employed Dragon Eye. Imagery from DE often was not clear enough or stable enough to distinguish between militia and civilians.
   c. Dragon Eye -- only at low altitudes (CO).
   d. No (S-3).

5. Did RSTA assets provide information that allowed you to track OPFOR?
   a. Did not have enough time to continuously track OPFOR movement (CO).
   b. Dragon Eye yes – provided us with visual capability. UGS – only three working sensors did not give us the coverage we were hoping for (S2).
   c. No for UGS, no for Dragon Eye. It was difficult to track and distinguish between OPFOR and civilians. The location of the sensors may not have supported what our intent was, lack of technical expertise may have tasked Marines beyond their capabilities. (S2).
   d. No —the system needs multiple cameras looking in multiple directions that all feed back to the terminal to provide a wider, almost all encompassing view of the battle space (CO).

6. Did you personally view the UAV video? If yes, was the video useful?
   a. Yes. 3/7 COC had a direct video feed. Video was <u>not</u> helpful. 3/7 COC did not have direct control over the system and was unable to pull useful data from the system. Dragon Eye needs to be employed at the BN level (S-2).
   b. Yes. At times, especially when UAV was overhead during significant events such as attacks or enemy movement out of engagement area (S-3).
   c. Yes. The video was able to give me a real-time picture of enemy disposition in a given sector; however, inexperience on my part made it difficult to know what to look for or distinguish combatant from non-combatant. Vehicles were identifiable dependent on the altitude the DE was operating at. Again, in the urban environment, unless enemy disposition is in the wide open, the DE is unable to observe (CO).

7. Did the system give you the information you needed on the battlefield? If not, what was lacking?
   a. No. Need to control it at the BN level (S-2).
   b. No. Dragon Eye lacked the ability to clearly distinguish combatant from non-combatant unless flown at extremely low altitudes. It was not able to give me the intelligence

necessary to assist me in the immediate close fight. The information provided is fleeting and not always pertinent to my immediate situation (CO).

8. Did the system allow you to operate differently or do something that you could not normally do? How or why not?
   a. Not as it was employed during this experiment (S-2).
   b. It allowed me to gain an aerial view of my area of operations. This system is not capable of providing me the intelligence I require at the company level. It should be retained at the battalion level so they can process the information provided along with information from other assets and convert it into intelligence that is relevant to my current situation on the battlefield (CO).

9. What are the (UAV) system's good points?
   a. The aerial view of the battle space and ability to capture information real time. It can be difficult to detect if not focused on trying to observe the air space (CO).
   b. Decent eyes on static enemy locations such as log and cache sites (1E S-3).
   c. Ability to fill gaps in the R&S plan, easy to re-task, light weight, easy to launch, very durable (S-2).
   d. Can verify intelligence (S-3).
   e. Real-time information (CO).

10. What are the (UAV) system's bad points?
   a. The info provided by the DE is extremely fluid against a moving enemy. Other systems must be employed in order to confirm information and interpret as actual intelligence. It is a very fragile system (CO).
   b. Unable to track continuous enemy movement (S-3).
   c. Difficult to distinguish between enemy and civilian, small screen and goggles not as easy to use as a larger monitor, control box needs to be in the COC as well as the view screen, difficult to recover/land in the urban environment (S-2).
   d. Speed caused S-2 to get glimpses of enemy forces and lose them. Need way to review video without interrupting feed (S-3).
   e. Unprocessed intelligence – at the company level we do not have the time or manpower to devote to operating the system and processing its raw data into information that can be used as intel (CO).

11. What additional training would have helped you use the Dragon Eye better?
   a. Units monitoring the info feed on the Dragon Eye need to process the data quicker. You need a team of trained eyes to monitor and process the video feed (S-3).
   b. I wasn't an operator, however, as a user I would have liked to have received additional training on how to interpret the maps and information the Dragon Eye provided in order to gain an understanding/clearer picture of my battle space (CO).

Annex D – Universal Combined Arms Targeting System (UCATS)

Here are the survey results from the Marines who operated the UCATS during the Battalion RSTA (BN RSTA) experiment.

There were eight Marines who used UCATS during the battalion RSTA experiment. In this appendix, we list their complete responses to the questions posed, as well as additional comments by UCATS users and the observer-controllers (O/Cs).
We asked Marines who used UCATS to rate various characteristics of the system on a scale of one to five, one being poor and five excellent. Figure 21 shows the average rating of each characteristic. The figure shows that, while Marines felt that UCATS was rugged and easy to use, most found it too large, too heavy, and unsuitable for urban operations. We discuss below the reasons that UCATS did not work well in this experiment.

Figure D-1 UCATS User Feedback

Answers to Debrief Questionnaire

This section contains our survey results. Eight Marines (four Forward Observers, three Recon Marines, and one Scout-Sniper) filled out questionnaires, but not every Marine answered every question.

1. How many times did you calibrate the compass during this evolution?
   a. 2
   b. 2
   c. 1
   d. 3
   e. 0
   f. 0
   g. 0
   h. 0

   [Analyst note—All Marines who calibrated the compass were among the group that had several hours of training on UCATS. The first four answers are from two sets of two-man teams, while the last four answers are from one Marine per team. We do not know whether one Marine on the second two-man team calibrated the Melios once and the second Marine calibrated three times, or whether the two Marines on the team had different memories of the total number of calibrations.]

2. Did compass calibration procedures expose you to hostile fire?
   a. Done inside building
   b. Calibrated before LD, no combat calibration
   c. No
   d. N/A (didn't calibrate)
   e. N/A
   f. N/A
   g. N/A

3. Did carrying the UCATS restrict your movement in the urban environment? If so, how? If not, why?
   a. No—carried inside pack
   b. So-so—movement in urban terrain is difficult because of mouse holes and obstacles; carrying more stuff makes it worse
   c. Yes, because of bulkiness; needed to carry RHC and Melios around my neck
   d. No
   e. No—could be smaller
   f. Yes, because we were carrying daypacks and it doesn't fit well into daypacks. The use of day packs is essential for an urban environment
   g. No. It was in my pack
   h. It is an extra piece of gear to an already gear-laden Recon Marine.

4. Did UCATS restrict your choices in picking observation points in the urban environment? If so, how? If not, why?
   a. No—GPS took longer to lock on inside

b. Yes—had to worry about terrain blocking target and the laser picking up the wrong thing
c. No—As a forward observer, I could not see the targets; need stable OP
d. Yes—because of antenna reception
e. Yes—some points could expose you to fire
f. Yes—because in a covert observation post in an urban environment it is hard to pick out targets at a distance because everything is so close together
g. No—because you could set it up anywhere
h. No

5. Did you use UCATS for any application other than locating targets for supporting arms? If so, what applications?
   a. We used it to orient ourselves when we needed to catch up with the rest of our platoon
   b. Yes, for binoculars
   c. Maps, navigation, preplanned targets
   d. No, we didn't have a chance, because our field of view was so limited – Recon
   e. No
   f. No
   g. No
   h. No
   i. The three Marines who used UCATS for other than immediate targeting were among the four (of eight) who received several hours of training on the system.

6. How much training time did you receive on UCATS?
   a. A class at Twentynine Palms and another at SCLA
   b. 3-4 hours
   c. About 2 hrs
   d. 4-6 hours
   e. 10-20 min
   f. 30-45 minutes
   g. 30 min
   h. Basic

   [Analyst note—UCATS users either received several hours of training (as did the forward observers) or under an hour of training (as did the scout-snipers and recon Marines). Before MD 02, we expected that only F/Os would be using UCATS. They received training at their home base in Twentynine Palms and then again before play began in Victorville. After UCATS experiment 1E, the operations officer from 3/7 suggested that recon Marines and the surveillance and target acquisition (STA) teams might find UCATS more useful in the urban setting. As a consequence, these units only received minimal UCATS training before employing the system.]

7. Did you have any difficulty acquiring your target using UCATS?
   a. Used it out of window; the angle of the laser wasn't very good
   b. Yes—obstacles
   c. Yes—GPS reading was inaccurate thus throwing off target locations
   d. No—All targets were on screen

e. No
f. Yes—not as a result of any problems with UCATS, but because of the limited view from our OP
g. Yes. Sometimes the laser would have trouble shooting through screens
h. N/A [Analyst note—This team could not use their UCATS because the battery died during their first attempt to identify a target.]
i. Tree makes it hard to read

8. Did you use UCATS without the tripod? Why?
   a. Yes—2d story of a building didn't provide a good place for a tripod.
   b. Yes—quicker
   c. Yes—easier to set up
   d. Yes—Just felt better
   e. Yes—Didn't use tripod. It looks okay
   f. Yes, because I had no place to set the tripod on.
   g. Yes. Didn't set it up.
   h. Yes. We didn't take the tripod because it wasn't tall enough.

9. Did you have to "lase" the target more than once to get an accurate location? If so, why?
   a. Just twice on one of our targets
   b. Yes, because of obstacles and human error
   c. Yes, because of changes in GPS reading
   d. No
   e. Yes—sometimes it didn't read
   f. Yes—Sometimes because there were other objects in the way
   g. Yes—To make sure it was exact
   h. N/A

10. At what range were most of the targets you were attempting to target?
    a. All of them were less than 100 meters
    b. 100 meters
    c. Less than 200 meters
    d. 75 to 150 meters
    e. 50 to 100 meters
    f. 100 meters
    g. N/A

11. What types of targets were you attempting calls for fire on?
    a. Buildings
    b. Buildings, houses
    c. Buildings, vehicles
    d. LAVs, AAVs, buildings
    e. Buildings and vehicles [Analyst note—These Marines used UCATS to send notional Calls-for-Fire before play began.]
    f. Houses, telephone poles [Analyst note—These Marines used UCATS to send notional calls-for-fire before play began.]
    g. Buildings

12. Did UCATS setup force you to miss getting a Call-for-Fire processed for a target? How?
    a. Yes— time
    b. Yes—target relocated
    c. No—the opportunity didn't present itself. However, I turned the computer off after each use to save battery life and each time I had to restart, the computer took awhile to regain a track on the GPS satellites
    d. No
    e. No
    f. No
    g. No
    h. N/A

13. Did UCATS employment cause you to become a casualty during the experiment? How?
    a. No [Analyst note—This Marine used UCATS only for notional Calls-for-Fire before play began, but carried it during play.]
    b. Partially, because it did not fit easily into my pack and made a lot of noise trying to manipulate it. (This Marine used UCATS only for notional Calls-for-Fire before play began but carried it during play.)
    c. No, but it is bulky and has too many pieces to have out at one time
    d. No
    e. No
    f. No
    g. No

14. Did UCATS employment expose you to hostile fire more than current call-for-fire systems/procedures would? How or why not
    a. No—we were in a house
    b. You will have to expose part of your head to lase the target
    c. No—we didn't get contact
    d. No
    e. No
    f. No
    g. No

15. Describe any other problems encountered with the UCATS setup
    a. Time and enemy fire
    b. Wires got caught up in everything -- needs carrying case
    c. None
    d. Observer-Controller – notes FO team took "time & some confusion" to set up UCATS.
    e. Reception
    f. It is not capable of being hooked up to a radio and having the information sent straight to the gun line. (In reality, UCATS has this capability.)
    g. Battery went dead.
    h. Observer-Controller -- "Tinkering process to get UCATS to work." "Waiting for system to pick up reading."
    i. Observer-Controller – He notes that a FO team took "time & some confusion" to set up UCATS.

16. Describe any other problems encountered with the UCATS calls for fires.
    a. Weight and time for setup
    b. UCATS showing about 600 meters off from map position, and then jumping position all over the grid.
    c. GPS is a problem
    d. Lost comm with laser after relocating while system was running; maps would zoom all the way in if I packed up and moved with the system running
    e. Not having ability for multiple targets
    f. From FSCC SSgt—Need better scheduling and target list in UCATS and AFATDS
    g. None
    h. Size—it's rather large
    i. None
    j. Face shield gets in the way of painting the target with laser [Analyst note—from one of the O/Cs.]

Miscellaneous Comments.

- FO: Limited use in urban environment because targets are so close it takes out the "art" in laying down targets
- Need palm top and binocular and updated GPS. GPS took 10 minutes to lock on.
- Recon: OP in shed – couldn't see much
- GPS took a while to lock on – we put antenna on windowsill.
- Viper is better than Melios. Less bulky.
- Lieutenant and staff sergeant at FSCC: UCATS needs a designator, capability for preplanned targets, a target list.
- Observer-Controller: UCATS needs a better GPS antenna – retractable or a slinky. GPS didn't lock on properly.
- Observer-Controller: Grid on IGRS was unknown most of the time
- Two Recon team leaders after EndEX: We can do targeting faster with maps

Annex E – Casualty Evacuation Information

This Annex highlights casualty data from the Urban Combined Arms Experiment (UCAX) Phase of MD 02. This experiment involved a force-on-force engagement between battalion and company-sized forces. Each day of the UCAX was intended to help evaluate a unit's capabilities to conduct typical missions within two of the three blocks of urban warfare. Day 1 consisted of an infantry battalion in the attack and a transition into a firm base, defensive posture. Days 2 and 3 mostly consisted of satellite patrolling from a firm bases followed on day 4 by a counterattack by opposing forces. We used the casualty data resulting from these operations to determine battalion aid station (BAS) and forward resuscitative surgical system (FRSS) workload. Our dataset was compiled using a combination of MILES 2000 data, the BAS log book, and the FRSS log book.

Table 21 highlights the name of the Marine logged into the BAS, the time of initial wounding (based on the MILES 2000 data), a diagnosis of the injury, and the medical disposition of the case—killed in action (KIA), in need of immediate attention, delay medical treatment, or forward to the FRSS for surgery. We also list, when known, the time the patient was received by the BAS; the time the patient was received by the FRSS; and the time the patient was evacuated.

Table E1. CASEVAC Timelines for UCAX, 9 August – 12 August 2002

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/9	Unk	Partial amputation of arm	Immediate		1218					
8/9	Pfc	Gunshot wound to left arm	KIA		1218					
8/9	Pfc	Multiple gunshot wounds	KIA	1117	1218					
8/9	LCpl	Dead on arrival	KIA	1052	1218					
8/9	Pfc	Gunshot wound	KIA	1118	1218					
8/9	Cpl	Gunshot wound to right arm	Walking wounded	1121	1218					
8/9	LCpl	Shrapnel	Walking wounded	1128	1218	1820				
8/9	Unk	Fracture to left leg	Walking wounded		1218	1242				
8/9	LCpl	Dead on arrival	KIA	1247	1307					
8/9	Cpl	Dead on arrival	KIA	1218	1307					
8/9	LCpl	Gunshot wound to back	Non ambulatory	1108	1307					
8/9	Pvt	Gunshot wound to right arm	Walking wounded	1106	1307					
8/9	Unk	Gunshot wound to abdomen	Walking wounded	1225	1307	1320	1320	1330	1430	1500
8/9	Cpl	Gunshot wound to left foot	Walking wounded	1108	1307					

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/9	Unk	Amputation of right arm	Walking wounded		1307					
8/9	LCpl	Dead on arrival	KIA	1118	1317					
8/9	Unk	Dead on arrival	KIA		1317					
8/9	LCpl	Dead on arrival	KIA	1134	1317					
8/9	Unk	Dead on arrival	KIA		1317					
8/9	Pfc	Shrapnel in chest	Non ambulatory	1206	1317					
8/9	Cpl	Gunshot wound	Walking wounded	1305	1317	1327				
8/9	Cpl	Gunshot wound to left leg	Evac to FRSS	1150	1339	1345	1345			1410
8/9	Unk	Dead on arrival	KIA		1339					
8/9	Pfc	Dead on arrival	KIA	1144	1339					
8/9	Unk	Gunshot wound to left shoulder	Immediate		1345	1355				
8/9	Pfc	Dead on arrival	KIA	1229	1400	1410				
8/9	Unk		Delay		1410	1420				
8/9	LCpl	Gunshot wound to abdomen	Evac to FRSS	1207	1410	1408	1408	1435	1500	1610
8/9	Unk	Dead on arrival	KIA		1410					
8/9	Pfc	Dead on arrival	KIA	1229	1410					
8/9	Cpl	Dead on arrival	KIA	1132	1410					
8/9	LCpl	Dead on arrival	KIA	1242	1410					
8/9	Unk	Dead on arrival	KIA		1410					
8/9	Pfc	Dead on arrival	KIA	1740	1805					
8/9	LCpl	Dead on arrival	KIA	1144	1805					
8/9	Unk	Gunshot wound	KIA	1737	1805					
8/9	Pfc	Sucking chest wound	Immediate	1047	1918	2045				
8/9	Pfc	Sucking chest wound	Immediate	1736	1918					
8/9	Unk	Dead on arrival	KIA		1918					
8/9	LCpl	Gunshot wound	KIA	1737	1918					
8/9	LCpl	Gunshot wound to jaw	Delay	1116	1935					
8/9	Unk	Gunshot wound to jaw	Immediate		1935					
8/9	Pfc	Gunshot wound to right leg	Immediate		1935					
8/9	Pfc	Gunshot wound	Unknown	1120	1935					
8/9	LCpl	Dead on arrival	KIA		1945					
8/9	Pfc	Gunshot wound	KIA	1307	1945					
8/9	Cpl	AT4 fire	KIA	1336	1945					
8/9	Pfc	Dead on arrival	KIA	1312	1945					
8/9	Pfc	Dead on arrival	KIA	1336	1945					
8/9	Pfc	Dead on arrival	KIA	1316	1945					
8/9	Unk	Dead on arrival	KIA		2015					
8/9	Unk	Dead on arrival	KIA		2015					
8/9	Pvt	Dead on arrival	KIA	1824	2020					
8/9	Pfc	Dead on arrival	KIA	1118	2030					
8/9	Pfc	Dead on arrival	KIA	1158	2030					

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/9	Unk	Broken left arm	Immediate		2110	2140	2200			
8/9	Unk	Helo crash victim	KIA		2110	2200				
8/9	Cpl	Gunshot wound to left arm	KIA	1126	1322	1410				
8/9	Pfc	Abdominal evisceration	Evac to FRSS	1229	1435	1435	1435		1500	1520
8/9	LCpl	Gunshot wound to abdomen	Evac to FRSS	1144	1500	1500	1500	1515	1550	1615
8/9	Cpl	Gunshot wound to upper back	Evac to FRSS	1303	1545	1545	1545	1610	1655	1845
8/9	Unk	Sucking chest wound	Delay		1640					
8/9	Pfc	Face/eyes	Delay	1153	1640					
8/9	LCpl	NP burns to torso	Delay	1235	1640					
8/9	Pfc	Sucking chest wound	Evac to FRSS	1143	1640					
8/9	LCpl	Dead on arrival	KIA	1409	1640					
8/9	Unk	Dead on arrival	KIA		1640					
8/9	HA	Dead on arrival	KIA	1152	1640					
8/9	Unk	Dead on arrival	KIA		1640					
8/9	Pfc	Dead on arrival	KIA		1640					
8/9	Cpl	Dead on arrival	KIA	1136	1640					
8/9	Unk	Dead on arrival	KIA		1640					
8/9	Pfc	Dead on arrival	KIA		1640					
8/9	LCpl	Dead on arrival	KIA	1142	1640					
8/9	Unk	Gunshot wound	Return to duty		1640					
8/9	LCpl	Unknown	1640							
8/9	Unk	AT4 wound	KIA		2005	2050				
8/9	Unk	Hit by AT4	KIA	1515	2005	2050				
8/9	LCpl	Artillery fragments	KIA	1651	2005	2050				
8/9	LCpl	Artillery fragments	KIA	1646	2005	2050				
8/10	Pfc	Gunshot wound to head	KIA	2305	0140	0218				
8/10	Unk	Gunshot wound to torso	KIA		0140					
8/10	Unk	Gunshot wound to torso	KIA		0140	0155				
8/10	Unk	Gunshot wound to torso	KIA		0140	0155				
8/10	Unk	Gunshot wound to head	KIA		0140	0155				
8/10	Unk	Gunshot wound to head	KIA		0140	0218				
8/10	Unk	Gunshot wound to torso	KIA		0140					
8/10	Unk	Gunshot wound to head	KIA		0140	0155				
8/10	Unk	Gunshot wound to head	KIA		0140					

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/10	Unk	Gunshot wound to torso	KIA		0140	0155				
8/10	Unk	Gunshot wound to head	KIA		0140	0155				
8/10	Unk	Gunshot wound to head	KIA		0140					
8/10	Unk	Gunshot wound to head	KIA		0140	0155				
8/10	Unk	Gunshot wound to head	KIA		0140	0155				
8/10	Cpl	Gunshot wound to torso	KIA		0140	0155				
8/10	SSgt	Gunshot wound to torso	KIA	2308	0140	0155				
8/10	Unk	Dead on arrival	KIA		0155					
8/10	Unk	Gunshot wound to head	KIA		0155					
8/10	Unk	Gunshot wound to chest	KIA		0218					
8/10	Unk	Gunshot wound to chest	KIA		0218					
8/10	Cpl	Multiple wounds	KIA		1815					
8/10	Cpl	Multiple wounds	KIA		1815					
8/10	LCpl	Multiple wounds	KIA	1729	1815					
8/10	Pfc	Multiple wounds	KIA	1743	1815					
8/10	Cpl	Abdomen wound by sniper fire	Evac to FRSS	1759	1900	1915	1915	1915	1925	1930
8/10	LCpl	Chest wound by sniper fire	Evac to FRSS	1743	1900	1920	1925	1945	2010	2032
8/10	Unk	Multiple gunshot wounds	KIA		2005					
8/10	Pfc	Multiple sniper wounds	KIA	0819	2005					
8/10	LCpl	Multiple sniper wounds	KIA		2005					
8/10	LCpl	Multiple sniper wounds	KIA		2005					
8/10	Cpl	Multiple sniper wounds	KIA	1246	2005					
8/10	Cpl	Multiple sniper wounds	KIA	1048	2005					
8/10	Unk	Multiple wounds	KIA		2005					
8/10	Pfc	Dead on arrival	KIA		2005					
8/10	Cpl	Multiple wounds	KIA	1305	2005					
8/10	LCpl	Multiple sniper wounds	KIA	1312	2005					
8/10	Pfc	Multiple sniper wounds	KIA	1326	2005					

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/10	LCpl	Multiple sniper wounds	KIA	1302	2005	2019				
8/10	Unk	Multiple sniper wounds	KIA		2005					
8/10	Pfc	Multiple sniper wounds	KIA	1628	2005					
8/10	LCpl	Multiple sniper wounds	KIA		2005					
8/10	Unk	Multiple sniper wounds	KIA		2005					
8/10	LCpl	Multiple sniper wounds	KIA		2005					
8/10	Unk	Multiple sniper wounds	KIA		2005					
8/10	Pfc	Multiple sniper wounds	KIA		2005					
8/10	Unk	Amputation of right arm	Delay		2020	2040				
8/10	LCpl	Shrapnel to left jaw	Delay	1550	2020	2040				
8/10	Pfc	Gunshot wound to the jaw	Delay		2020					
8/10	Pvt	Gunshot wound to the jaw/shoulder	Immediate	1509	2020	2045				
8/10	Unk	Shrapnel to the face	KIA		2020	2040				
8/10	Unk	RPG to the groin	KIA		2020					
8/10	Unk	Arterial bleeding of neck	KIA		2020	2040				
8/10	Unk	Shrapnel in right shoulder	Delay		2040	2100				
8/10	LCpl	Bleeding left arm	Delay	1940	2040	2120				
8/10	Unk	Gunshot wound to jaw	Delay		2040	2115				
8/10	LCpl	Open jaw wound	Delay	1940	2040	2115				
8/10	Unk	Compound fracture	Delay		2040					
8/10	LCpl	Grenade fragments in femoral artery	Evac to FRSS	2006	2040	2045	2045		2100	2125
8/10	LCpl	Shrapnel to the stomach	Evac to FRSS	1940	2040	2043	2043	2100	2205	
8/10	Pfc	Gunshot wound to face	KIA	2012	2040					
8/10	Unk	Gunshot wound to face	KIA		2040					
8/10	Unk	Open skull fracture	KIA		2040					
8/10	LCpl	Smoke grenade injury	Walking wounded	2002	2040					
8/10	Pfc	Gunshot wound to leg	Immediate	1939	2100					
8/10	Unk	Burned legs	Immediate		2100	2120				
8/10	Unk	Fragments to head/chest	KIA		2100					

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/10	HM1	Gunshot to right jaw/ frag to right ribs	Walking wounded		2100					
8/10	Unk	Gunshot wound	Unknown	1940	2100					
8/10	Cpl	Open fracture of right leg	Delay	1939	2110	2120				
8/10	Unk	Puncture wound right index finger	Return to duty		2110					
8/11	Unk	Gunshot wound to head	KIA		0715					
8/11	Pfc	Sniper shot to body	KIA	0811	0835					
8/11	Unk	Left hand cut	Unknown		0850					
8/11	Cpl	Shrapnel wound to left glute	Delay		1025	1050				
8/11	Unk	Sucking chest wound	Immediate		1025	1030				
8/11	1stLt	Closed fracture of left arm	Walking wounded		1025	1050				
8/11	Unk	Gunshot wound to head	Expectant		1035					
8/11	1stLt	Frag to face/shoulder	Evac to FRSS	1043	1100	1110	1110			1135
8/11	Unk	Gunshot wound to head	Immediate		1100					
8/11	Pfc	Shrapnel in right lower extremity	Evac to FRSS	1050	1110	1118		1115		1300
8/11	Unk	Scrap metal in upper extremities	KIA		1110	1131				
8/11	Unk	Gunshot wound to face	KIA		1200					
8/11	Pfc	Gunshot wound to face	KIA	2101	1200					
8/11	LCpl	Gunshot wound to face	KIA	2103	1200					
8/11	Unk	Frag on right side	KIA		1210					
8/11	Pfc	Frag on right side	KIA	1121	1210					
8/11	Unk	Frag to left thigh	Delay		1340	1350				
8/11	Unk	Frag to left thigh	Delay		1340	1350				
8/11	Pvt	Frag to face/neck/chest	Evac to FRSS	1330	1340	1340	1340	1350	1535	1555
8/11	Cpl	Sniper shot to head	KIA	1750	1340					
8/11	LCpl	Sniper fire to chest	KIA	1603	1640					
8/11	Unk	Gunshot wound to left leg	Delay		1700	1715				
8/11	Unk	Foot blown off by arty fire	Immediate		1715	1730				
8/11	LCpl	Sniper fire to left shoulder	Evac to FRSS	1700	1720	1720	1720	1725	1815	1825
8/11	LCpl	Multiple gunshot wounds	KIA	1627	1730					

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/11	Unk	Gunshot wound to left leg	Delay		1740					
8/11	Unk	Sucking chest wound	Immediate	1720	1740	1813	1820	1820	1910	2035
8/11	Pfc	Frag arty	KIA	1706	1740					
8/11	Unk	Frag to head	KIA		1740					
8/11	Unk	Shot to head	KIA	1703	1740					
8/11	Pfc	Sniper shot to head	KIA	1711	1740					
8/11	LCpl	Sniper shot to head	KIA		1740					
8/11	Unk	Frag arty	KIA		1740					
8/11	Pfc	Gunshot wound to left arm	Delay	1748	1745	1800				
8/11	LCpl	Gunshot wound to left leg	Delay		1745	1800				
8/11	LCpl	Amputated left leg	Delay	1742	1745	1815				
8/11	Unk	Gunshot wound to head	Expectant		1745	1810				
8/11	LCpl	Gunshot wound to left leg	Immediate	1740	1745	1800				
8/11	LCpl	Frag to chest	Immediate	1706	1745	1810				
8/11	Pfc	Gunshot wound to left arm	Immediate	1704	1745	1755				
8/11	Cpl	Gunshot wound	Immediate	1706	1745	1800				
8/11	Unk	Gunshot wound to abdomen	Immediate		1745					
8/11	Unk	Gunshot wound to leg	Immediate		1745	1805				
8/11	Pfc	Gunshot wound to left shoulder	Immediate	1706	1745					
8/11	LCpl	Multiple gunshot wounds	KIA	1702	1745					
8/11	LCpl	Grenade fragments to right chest	Delay		1750					
8/11	Cpl	Sniper shot to abdomen	Expectant	1729	1750					
8/11	Unk	Gunshot wound to left jaw	Immediate		1750	1755	1755			
8/11	Unk	Frag to legs	Delay		1755					
8/11	Unk	Gunshot wound to jaw	Immediate		1755					
8/11	Unk	Shrapnel to left arm	Walking wounded		1800					
8/11	Unk	Sucking chest wound	Immediate		1805					
8/11	Unk	Amputated right foot	Evac to FRSS		1830	2000	2000			2030
8/11	Pfc	Frag to right face/neck/chest	Immediate	1826	1830					
8/11	Unk	Left leg missing	Immediate		1830					
8/11	Unk	Gunshot wound to right leg	Delay		1845	1850				
8/11	LCpl	Shrapnel in left eye	Delay	1745	1845	1850				

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/11	SN	Multiple gunshot wounds	Evac to FRSS	1725	1845	1856	1905	1925	2000	2030
8/11	LCpl	Burns	KIA	1248	1845	1850				
8/11	Pfc	Gunshot wound to right thigh	Evac to FRSS	1832	1854	1859	1910	2000	2015	2030
8/11	Unk	Multiple gunshot wounds	KIA		1900					
8/11	LCpl	Frag to right arm	Delay	1716	1900	1910				
8/11	LCpl	Gunshot wound to thigh	Delay	1741	1900					
8/11	Pfc	Gunshot wound to right knee	Delay	1717	1900					
8/11	LCpl	Sucking chest wound	Immediate	1649	1900	1910				
8/11	9709	Multiple gunshot wounds	KIA	1313	1900					
8/11	Unk	Frag to right knee	Unknown		1930					
8/12	Unk	Shrapnel to left leg	Delay		0545					
8/12	Unk	Shrapnel to left shoulder	Delay		0545	0600				
8/12	LCpl	Shrapnel to right groin	Evac to FRSS		0548	0555	0602	0615	0645	0730
8/12	Cpl	Gunshot wound to jaw	Delay	0535	0610	0730				
8/12	Unk	Sniper shot to left leg	Delay		0610	0615				
8/12	Pfc	Gunshot wound to right leg	Evac to FRSS		0610	0615	0630	0650	0720	0735
8/12	Pfc	Gunshot wounds	Immediate	0523	0610	0730				
8/12	Unk	Gunshot wound to left leg	Immediate		0615	0750				
8/12	LCpl	Multiple sniper wounds	KIA	0548	0615					
8/12	LCpl	Sniper shot to head	KIA	0543	0615	0731				
8/12	Unk	Gunshot wound to thigh	Immediate		0625	0730				
8/12	LCpl	Frag to face/neck/chest	KIA	0513	0625	0630				
8/12	Unk	Amputated left hand	Delay		0630	0635				
8/12	Cpl	Gunshot wound to upper thigh	Immediate		0630	0631	0645	0720		0730
8/12	LCpl	Sniper shot to head	KIA	0546	0645					
8/12	Cpl	Gunshot wound to left hand	Delay	0537	0650					
8/12	Pfc	Multiple gunshot wounds	KIA	0514	0652					
8/12	Cpl	Sucking chest wound	Immediate	2046	0700	0725				
8/12	Pfc	RPG wound to neck/chest	Immediate		0720	0725				
8/12	Unk	Gunshot wound to head	KIA		0725					

CASEVAC Timelines for UCAX, 9 August – 12 August 2002										
Date	**Rank**	**Diagnosis**	**Disposition**	**Time of Wound**	**Time to BAS**	**Time out BAS**	**Time to FRSS**	**Time to OR**	**Time to Post Op**	**Time out**
8/12	LCpl	Multiple gunshot wounds	KIA	0709	0725					
8/12	Unk	AT4 shot	KIA		0725					
8/12	Unk	Gunshot wound	KIA		0725					
8/12	LCpl	RPG wound	KIA		0735					
8/12	Cpl	RPG wound	KIA	0530	0735					
8/12	LCpl	Sniper wound	KIA	0549	0735					

Annex F – Forward Resuscitative Surgery Suite (FRSS)

This highlights FRSS activities during UCAX. It was compiled by FRSS personnel based on key events that occurred during the experiment. Table 23 provides a chronology of events beginning with STARTEX on 9 August and going through ENDEX on 12 August.

Table F-1. FRSS Activity Log

FRSS Activity Log		
Date	**Time**	**Activity**
9-Aug-02	0730	Safety Brief
9-Aug-02	0830	Checked out vehicles and staged at BAS
9-Aug-02	1045	Moved into shelter of opportunity, co-located with rear BAS, started clean-up
9-Aug-02	1107	Clean-up complete, began moving in gear
9-Aug-02	1125	All gear inside
9-Aug-02	1155	Pause-Ex
9-Aug-02	1205	Back on
9-Aug-02	1255	FRSS up and running
9-Aug-02	1710	Pause-Ex
9-Aug-02	1730	Back on
9-Aug-02	2130	Taps, on stand-by
10-Aug-02	0700	Reveille
10-Aug-02	0820	2nd Med arrives
10-Aug-02	0900	Changed out miles gear with 2nd med
10-Aug-02	0920	Pause-Ex
10-Aug-02	1000	Back on
10-Aug-02	1005	Team 1 begins pack up
10-Aug-02	1110	Pack up complete; pass down and change over to team 2
10-Aug-02	1430	Mount up for move to co-locate with consolidated BAS
10-Aug-02	1438	Convoy rolling
10-Aug-02	1455	Convoy arrives
10-Aug-02	1545	FRSS up
10-Aug-02	1710	Pause-Ex
10-Aug-02	1800	Key leaders meeting bldg v-7
10-Aug-02	1900	Back on
11-Aug-02	0600	Reveille
11-Aug-02	0730	FRSS surgeon's brief and after action
11-Aug-02	0800	Standing by
11-Aug-02	1700	Team 1 arrives
11-Aug-02	1705	Turn over complete
11-Aug-02	1720	First Pt arrives for Team 1
11-Aug-02	2130	Light/sound secure
11-Aug-02	2200	Move to OR for greater security, cut power
12-Aug-02	0600	Power on, receiving patients
12-Aug-02	0800	Pause Ex, End Ex, began tear down
12-Aug-02	1000	Tear down complete

Annex G – MILES Data

Here are the details for casualty figures as reconstructed using the MILES 2000 data that we received. We used this information as the basis for our estimates of the time that a casualty was wounded. The dataset reflects the actual kill times for all participants whose MILES gear went off during the UCAX. That is, we have eliminated duplicate records and various administrative downloads. The appendix highlights date, time, and first name of the Marine who was "killed," as well as information about the attacker. This information was used to help us establish casualty rates for the UCAX and kill ratios between the opposing forces.

Table G-1. MILES Hit Data from UCAX, 9-12 August 2002

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
9-Aug	9:43	Small Arms	Unkn	BLUFOR	LCpl	LUCAS	6592
9-Aug	9:49	Small Arms	Unkn	BLUFOR	Cpl	ED	3267
9-Aug	9:53	N/A	Unkn	BLUFOR	Cpl	ROBERT	2705
9-Aug	9:53	N/A	Unkn	BLUFOR	Cpl	C	5719
9-Aug	9:54	N/A	Unkn	BLUFOR	Pfc	D	8776
9-Aug	9:54	N/A	Unkn	BLUFOR	Cpl	M	1682
9-Aug	10:08	N/A	Unkn	BLUFOR	Sgt	DENNIS	1964
9-Aug	10:22	N/A	Unkn	BLUFOR	LCpl	MATTHEW	1303
9-Aug	10:27	Machine Gun	Unkn	BLUFOR	Pfc	MARCUS D	2441
9-Aug	10:47	Small Arms	OPFOR	BLUFOR	Pfc	BRIAN	633
9-Aug	10:48	Small Arms	OPFOR	BLUFOR	Cpl	BRANDON	6977
9-Aug	10:52	Small Arms	OPFOR	BLUFOR	LCpl	M	6380
9-Aug	10:53	N/A	Unkn	OPFOR	LCpl	MANUEL	4759
9-Aug	11:01	Small Arms	OPFOR	BLUFOR	2nd Lt	DANIEL	7660
9-Aug	11:01	Small Arms	OPFOR	BLUFOR	Pfc	JAYSON	8964
9-Aug	11:01	Small Arms	OPFOR	BLUFOR	Sgt	BOBST	762
9-Aug	11:01	Small Arms	OPFOR	BLUFOR	LCpl	ROACH	3440
9-Aug	11:05	Small Arms	BLUFOR	BLUFOR	LCpl	AGNEW	3408
9-Aug	11:07	Small Arms	BLUFOR	OPFOR	Cpl	RENE	374
9-Aug	11:08	Small Arms	Unkn	BLUFOR	LCpl	JAMES A	2596
9-Aug	11:08	Small Arms	OPFOR	OPFOR	Cpl	NELSON	7759
9-Aug	11:08	Small Arms	OPFOR	BLUFOR	Cpl	MICHAEL	7705
9-Aug	11:09	Small Arms	OPFOR	BLUFOR	Pfc	ENOS	8658
9-Aug	11:09	Small Arms	OPFOR	BLUFOR	Cpl	LEE	4644
9-Aug	11:10	Small Arms	Unkn	BLUFOR	LCpl	CODY	9939
9-Aug	11:10	Small Arms	OPFOR	BLUFOR	LCpl	P	106
9-Aug	11:10	Small Arms	Unkn	BLUFOR	LCpl	SEAN	3396
9-Aug	11:11	Small Arms	Unkn	BLUFOR	Pfc	J	4162
9-Aug	11:11	Small Arms	BLUFOR	OPFOR	LCpl	CARLOS	4571
9-Aug	11:13	Small Arms	BLUFOR	BLUFOR	SSgt	CARL	8117

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
9-Aug	11:14	Small Arms	Unkn	BLUFOR	Pvt	FERNANDO	7607
9-Aug	11:14	N/A	Unkn	BLUFOR	Pvt	SANG P	6505
9-Aug	11:14	Small Arms	OPFOR	BLUFOR	Pfc	SLAUGHTER	6442
9-Aug	11:16	Small Arms	OPFOR	BLUFOR	LCpl	DANIEL	9179
9-Aug	11:17	Small Arms	OPFOR	BLUFOR	SSgt	CHRIS	4003
9-Aug	11:17	Small Arms	Unkn	BLUFOR	Pfc	DANIEL	4581
9-Aug	11:18	Small Arms	OPFOR	BLUFOR	LCpl	MATTHEW	9335
9-Aug	11:18	Small Arms	OPFOR	BLUFOR	Cpl	JUSTIN	6340
9-Aug	11:18	Small Arms	OPFOR	BLUFOR	HN	JUSTIN	5209
9-Aug	11:18	Small Arms	OPFOR	BLUFOR	Pfc	RUBEN	1743
9-Aug	11:18	Small Arms	OPFOR	BLUFOR	Pfc	THADDEUS	5008
9-Aug	11:20	Small Arms	BLUFOR	OPFOR	LCpl	MARIO	7574
9-Aug	11:20	Small Arms	OPFOR	BLUFOR	Pfc	RICHARD	988
9-Aug	11:21	Small Arms	Unkn	BLUFOR	Cpl	M	3630
9-Aug	11:21	Small Arms	OPFOR	BLUFOR	Pfc	WING	8012
9-Aug	11:21	Small Arms	OPFOR	BLUFOR	Pfc	JULIO M	8643
9-Aug	11:22	Small Arms	OPFOR	BLUFOR	LCpl	W	8991
9-Aug	11:22	Machine Gun	Unkn	OPFOR	LCpl	TIMOTHY	3317
9-Aug	11:25	Small Arms	OPFOR	BLUFOR	LCpl	L	7181
9-Aug	11:25	Small Arms	OPFOR	BLUFOR	LCpl	BRADLEY	6403
9-Aug	11:25	Small Arms	OPFOR	BLUFOR	2nd Lt	FLEMING	4951
9-Aug	11:26	Small Arms	BLUFOR	OPFOR	LCpl	FERNANDO	2753
9-Aug	11:26	Small Arms	BLUFOR	BLUFOR	Cpl	LEMOINE L	4113
9-Aug	11:28	Small Arms	Unkn	BLUFOR	LCpl	GAVIN	6247
9-Aug	11:29	N/A	Unkn	BLUFOR	Pfc	JOSHUA	4640
9-Aug	11:31	Small Arms	Unkn	BLUFOR	Sgt	ROBERT A	3824
9-Aug	11:32	N/A	Unkn	BLUFOR	Cpl	JOSE R	7014
9-Aug	11:34	Small Arms	OPFOR	BLUFOR	Pfc	M	2231
9-Aug	11:34	Small Arms	OPFOR	BLUFOR	LCpl	J	6813
9-Aug	11:35	Small Arms	OPFOR	BLUFOR	Pfc	ZACHARY	565
9-Aug	11:36	Small Arms	OPFOR	BLUFOR	Pfc	JASON	1686
9-Aug	11:36	Small Arms	OPFOR	BLUFOR	Cpl	CHARLIE	8648
9-Aug	11:37	Small Arms	OPFOR	BLUFOR	Pfc	RYAN	2060
9-Aug	11:42	N/A	Unkn	BLUFOR	LCpl	FRANCISCO	5901
9-Aug	11:43	Small Arms	OPFOR	BLUFOR	Pfc	JAMES	7571
9-Aug	11:44	Small Arms	OPFOR	BLUFOR	LCpl	SHAWN	4603
9-Aug	11:44	Small Arms	BLUFOR	BLUFOR	LCpl	J	2993
9-Aug	11:44	Small Arms	BLUFOR	BLUFOR	LCpl	JASON	4009
9-Aug	11:44	N/A	Unkn	BLUFOR	Pfc	R	5209
9-Aug	11:46	Small Arms	Unkn	BLUFOR	Pfc	STRUECKER	4796
9-Aug	11:48	Small Arms	OPFOR	BLUFOR	2nd Lt	S	862

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
9-Aug	11:50	Small Arms	Unkn	BLUFOR	Cpl	JOSHUA	7317
9-Aug	11:52	N/A	Unkn	BLUFOR	HA	SAMUEL	2377
9-Aug	11:54	Small Arms	Unkn	BLUFOR	Pfc	M	1647
9-Aug	11:56	Small Arms	BLUFOR	BLUFOR	Cpl	RAQMIL	2038
9-Aug	11:57	Machine Gun	Unkn	OPFOR	Sgt	JESSIE	3086
9-Aug	11:58	N/A	Unkn	OPFOR	LCpl	MIGUEL	6921
9-Aug	11:58	N/A	Unkn	BLUFOR	Pfc	AUDIE	8573
9-Aug	11:59	N/A	Unkn	OPFOR	LCpl	LUIS	5715
9-Aug	12:07	N/A	Unkn	BLUFOR	LCpl	J	5543
9-Aug	12:07	Small Arms	OPFOR	BLUFOR	LCpl	KEVIN	2084
9-Aug	12:14	Small Arms	BLUFOR	OPFOR	LCpl	SETH	9164
9-Aug	12:18	Small Arms	BLUFOR	OPFOR	Cpl	JAMES	6043
9-Aug	12:18	Mortar	BLUFOR	BLUFOR	Cpl	MICHAEL E	8503
9-Aug	12:22	Small Arms	OPFOR	BLUFOR	HA	ARIC	8599
9-Aug	12:26	Small Arms	OPFOR	BLUFOR	Pvt	PHILIP	9578
9-Aug	12:26	Small Arms	OPFOR	BLUFOR	Cpl	RAUL	5545
9-Aug	12:26	Small Arms	Unkn	BLUFOR	LCpl	NICHOLAS	2346
9-Aug	12:26	Small Arms	Unkn	BLUFOR	Cpl	BIN	1002
9-Aug	12:27	Small Arms	OPFOR	BLUFOR	LCpl	MIGUEL	614
9-Aug	12:29	Small Arms	OPFOR	BLUFOR	Pfc	DANTZ	6534
9-Aug	12:29	Small Arms	OPFOR	BLUFOR	Pfc	C	5084
9-Aug	12:29	Small Arms	OPFOR	OPFOR	Pfc	KEITH	2323
9-Aug	12:30	Machine Gun	Unkn	BLUFOR	Pfc	SHAWN	3205
9-Aug	12:31	Small Arms	OPFOR	BLUFOR	Pfc	ERIC	6938
9-Aug	12:31	Small Arms	BLUFOR	OPFOR	LCpl	GUSTAVO	3397
9-Aug	12:31	Small Arms	OPFOR	BLUFOR	Pfc	SETH	3790
9-Aug	12:31	Small Arms	OPFOR	BLUFOR	Cpl	MICHAEL	601
9-Aug	12:32	Artillery	BLUFOR	OPFOR	LCpl	E	7255
9-Aug	12:34	Small Arms	Unkn	OPFOR	Cpl	RUBEN	469
9-Aug	12:35	Small Arms	Unkn	OPFOR	LCpl	RICHARD	6465
9-Aug	12:35	Small Arms	OPFOR	BLUFOR	LCpl	HECTOR	9385
9-Aug	12:35	Small Arms	OPFOR	BLUFOR	Pfc	JAMES	4248
9-Aug	12:36	Small Arms	OPFOR	BLUFOR	Pfc	JOHN	9563
9-Aug	12:36	Small Arms	BLUFOR	BLUFOR	LCpl	ROBERT	9007
9-Aug	12:36	Small Arms	OPFOR	BLUFOR	Cpl	RAUL	4322
9-Aug	12:37	Small Arms	BLUFOR	OPFOR	LCpl	CLIFORD	7268
9-Aug	12:37	Small Arms	BLUFOR	OPFOR	LCpl	JUAN	9465
9-Aug	12:41	N/A	Unkn	BLUFOR	Cpl	DENNIS	4249
9-Aug	12:42	Small Arms	OPFOR	BLUFOR	LCpl	JOSE	2171
9-Aug	12:42	Machine Gun	Unkn	BLUFOR	Pfc	MAHAN	6612
9-Aug	12:45	Small Arms	BLUFOR	OPFOR	LCpl	HAROLD	6722

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
9-Aug	12:46	Small Arms	Unkn	BLUFOR	Cpl	WILLIAM	9029
9-Aug	12:47	Artillery	BLUFOR	BLUFOR	LCpl	FELIX	8349
9-Aug	12:47	Artillery	BLUFOR	BLUFOR	Cpl	STEVEN W	441
9-Aug	12:49	Artillery	BLUFOR	BLUFOR	Cpl	MICHAEL	6934
9-Aug	12:54	Artillery	BLUFOR	BLUFOR	LCpl	C	9688
9-Aug	12:56	Small Arms	BLUFOR	OPFOR	Cpl	JOSE	1588
9-Aug	13:01	Machine Gun	Unkn	BLUFOR	Cpl	SCOTT J	9999
9-Aug	13:02	Small Arms	OPFOR	BLUFOR	LCpl	RUSSELL	2390
9-Aug	13:02	Small Arms	OPFOR	BLUFOR	Cpl	RYAN	40
9-Aug	13:03	Small Arms	OPFOR	BLUFOR	Cpl	J	9294
9-Aug	13:03	Small Arms	OPFOR	BLUFOR	Pfc	J	5894
9-Aug	13:03	Small Arms	OPFOR	BLUFOR	LCpl	I	4783
9-Aug	13:03	Small Arms	OPFOR	BLUFOR	LCpl	W	1546
9-Aug	13:05	Small Arms	OPFOR	BLUFOR	Cpl	D	3786
9-Aug	13:05	Small Arms	Unkn	BLUFOR	Pfc	R	2536
9-Aug	13:05	SMAW	BLUFOR	BLUFOR	Cpl	AUSTIN	7391
9-Aug	13:07	Small Arms	OPFOR	BLUFOR	LCpl	A	7367
9-Aug	13:07	Small Arms	Unkn	BLUFOR	Pfc	W	7150
9-Aug	13:08	N/A	Unkn	BLUFOR	LCpl	LANGLAND	5779
9-Aug	13:11	Small Arms	OPFOR	BLUFOR	Pfc	D	3183
9-Aug	13:12	Small Arms	OPFOR	BLUFOR	LCpl	CLARENCE	2631
9-Aug	13:12	AT4	BLUFOR	BLUFOR	LCpl	MICHAEL	8463
9-Aug	13:12	Small Arms	OPFOR	BLUFOR	LCpl	TIMOTHY	4137
9-Aug	13:12	Small Arms	Unkn	BLUFOR	LCpl	A	5302
9-Aug	13:12	AT4	BLUFOR	BLUFOR	Pfc	RICH	9727
9-Aug	13:12	Small Arms	Unkn	BLUFOR	LCpl	A	6731
9-Aug	13:12	Small Arms	BLUFOR	BLUFOR	Pfc	B	4119
9-Aug	13:13	Small Arms	OPFOR	BLUFOR	Cpl	J	8381
9-Aug	13:13	Small Arms	BLUFOR	OPFOR	LCpl	JOSUE	9709
9-Aug	13:13	Small Arms	BLUFOR	BLUFOR	LCpl	D	3070
9-Aug	13:14	Small Arms	BLUFOR	BLUFOR	Pfc	DUSTIN	6475
9-Aug	13:16	Small Arms	OPFOR	BLUFOR	LCpl	W	885
9-Aug	13:16	Small Arms	OPFOR	BLUFOR	Pfc	WESLEY	7932
9-Aug	13:16	N/A	Unkn	BLUFOR	Cpl	DANIEL	6885
9-Aug	13:17	Small Arms	OPFOR	BLUFOR	Cpl	DAVID	743
9-Aug	13:17	Small Arms	OPFOR	BLUFOR	Cpl	J	8945
9-Aug	13:18	N/A	Unkn	BLUFOR	LCpl	TRAVIS	4101
9-Aug	13:24	Small Arms	OPFOR	BLUFOR	LCpl	L	1299
9-Aug	13:26	Small Arms	BLUFOR	OPFOR	Sgt	ALFREDO	2268
9-Aug	13:26	Small Arms	BLUFOR	OPFOR	LCpl	ROBERT	599
9-Aug	13:26	Small Arms	OPFOR	BLUFOR	Pfc	KYLE	9876

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
9-Aug	13:27	Small Arms	OPFOR	BLUFOR	LCpl	B	8680
9-Aug	13:29	Small Arms	Unkn	BLUFOR	PVT	SERGIO F	764
9-Aug	13:30	Artillery	BLUFOR	BLUFOR	Cpl	TREJO	6908
9-Aug	13:36	AT4	Unkn	BLUFOR	Cpl	KEVIN	1122
9-Aug	13:36	AT4	Unkn	BLUFOR	Pfc	CARLOS	5782
9-Aug	13:37	N/A	Unkn	BLUFOR	Pfc	DANIEL	2879
9-Aug	13:37	Small Arms	Unkn	BLUFOR	LCpl	CHRIS	5709
9-Aug	13:50	Small Arms	BLUFOR	BLUFOR	Pfc	FERMIN	2302
9-Aug	13:50	Machine Gun	Unkn	BLUFOR	LCpl	AUSTIN	5977
9-Aug	14:09	Small Arms	Unkn	BLUFOR	LCpl	J	6513
9-Aug	14:29	Small Arms	OPFOR	BLUFOR	Pfc	CHRIS	5804
9-Aug	14:32	Small Arms	BLUFOR	BLUFOR	Cpl	RONALD	8128
9-Aug	14:44	Small Arms	BLUFOR	OPFOR	LCpl	MARCIONILO	254
9-Aug	14:58	Small Arms	OPFOR	BLUFOR	LCpl	AARON M	6780
9-Aug	14:59	Small Arms	OPFOR	BLUFOR	Cpl	IAN	4886
9-Aug	14:59	Small Arms	OPFOR	BLUFOR	Pfc	GUY	9076
9-Aug	15:00	Machine Gun	Unkn	BLUFOR	Pfc	DUSTIN	3975
9-Aug	15:10	Small Arms	BLUFOR	OPFOR	LCpl	EDGAR	3960
9-Aug	15:21	Machine Gun	Unkn	OPFOR	LCpl	KIN	726
9-Aug	15:30	Machine Gun	Unkn	BLUFOR	PVT	SERGIO F	764
9-Aug	16:14	N/A	Unkn	BLUFOR	Cpl	RUBEN	6569
9-Aug	16:41	N/A	Unkn	BLUFOR	LCpl	DENNIS	1174
9-Aug	16:46	N/A	Unkn	BLUFOR	LCpl	CHRIS	4304
9-Aug	16:51	Mortar	BLUFOR	NCOMB	CIV	GREG	7750
9-Aug	16:51	Mortar	BLUFOR	BLUFOR	Sgt Maj	RICK	4005
9-Aug	16:51	Mortar	BLUFOR	BLUFOR	SSgt	JAMES	8949
9-Aug	16:51	Mortar	BLUFOR	BLUFOR	LCpl	ALLAN	9293
9-Aug	17:01	N/A	Unkn	OPFOR	LCpl	GABRIEL	2304
9-Aug	17:09	N/A	Unkn	BLUFOR	Cpl	CARY	7886
9-Aug	17:09	N/A	Unkn	BLUFOR	LCpl	MARLIN	6288
9-Aug	17:09	N/A	Unkn	BLUFOR	1st Lt	KENT	2844
9-Aug	17:11	Small Arms	BLUFOR	OPFOR	Sgt	ANTONIO	6814
9-Aug	17:11	N/A	Unkn	BLUFOR	LCpl	T	8451
9-Aug	17:15	Machine Gun	Unkn	BLUFOR	Pfc	ERIC	4641
9-Aug	17:20	Small Arms	BLUFOR	OPFOR	LCpl	STEVEN	9078
9-Aug	17:23	Small Arms	OPFOR	BLUFOR	LCpl	PAUL	6425
9-Aug	17:24	Machine Gun	Unkn	OPFOR	LCpl	J	1049
9-Aug	17:29	Small Arms	BLUFOR	OPFOR	MAJ	RICHARD	7725
9-Aug	17:30	Small Arms	BLUFOR	OPFOR	Sgt	J	1733
9-Aug	17:32	Small Arms	OPFOR	OPFOR	LCpl	S	3649
9-Aug	17:35	Small Arms	BLUFOR	OPFOR	LCpl	JASON	8845

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
9-Aug	17:36	Small Arms	BLUFOR	OPFOR	Capt	PAUL	2447
9-Aug	17:36	Small Arms	Unkn	BLUFOR	Pfc	JOHN	4410
9-Aug	17:37	Small Arms	Unkn	BLUFOR	LCpl	JONATHAN	5462
9-Aug	17:37	Small Arms	Unkn	BLUFOR	Pvt	LEE	7801
9-Aug	17:40	Small Arms	Unkn	BLUFOR	Pfc	RAYMOND	9525
9-Aug	17:42	Small Arms	OPFOR	BLUFOR	Pfc	EDGAR	925
9-Aug	17:43	Small Arms	OPFOR	BLUFOR	Cpl	JUAN	5368
9-Aug	17:44	Small Arms	OPFOR	BLUFOR	LCpl	CLEVENGER	3961
9-Aug	17:45	Small Arms	BLUFOR	BLUFOR	Pfc	MARIO	1074
9-Aug	17:51	Small Arms	OPFOR	BLUFOR	Pfc	BRANDON	6624
9-Aug	17:53	Small Arms	BLUFOR	OPFOR	LCpl	JOSEPH	2801
9-Aug	17:53	Small Arms	BLUFOR	BLUFOR	LCpl	KEVIN A	8737
9-Aug	17:53	Small Arms	BLUFOR	BLUFOR	Capt	BEN	2102
9-Aug	17:54	Small Arms	OPFOR	BLUFOR	LCpl	JESSIE	8466
9-Aug	17:54	Small Arms	BLUFOR	BLUFOR	LCpl	RUSTY	3945
9-Aug	17:55	Small Arms	OPFOR	BLUFOR	LCpl	RUBEN A	3521
9-Aug	17:55	Small Arms	BLUFOR	BLUFOR	LCpl	BRETT	5708
9-Aug	17:56	Small Arms	Unkn	OPFOR	SSgt	WILLIAM	577
9-Aug	17:58	Small Arms	BLUFOR	OPFOR	Cpl	ROGELIO	3887
9-Aug	18:01	Small Arms	OPFOR	BLUFOR	SN	ADOLFO	44
9-Aug	18:05	Small Arms	OPFOR	BLUFOR	Cpl	GUSTIN	1010
9-Aug	18:09	N/A	Unkn	BLUFOR	LCpl	LANCE	5854
9-Aug	18:10	Small Arms	BLUFOR	BLUFOR	Pfc	ERIC	4641
9-Aug	18:10	Machine Gun	Unkn	BLUFOR	Pfc	JIMMY S	8662
9-Aug	18:17	Small Arms	BLUFOR	BLUFOR	Pfc	KEN	8910
9-Aug	18:18	Small Arms	BLUFOR	BLUFOR	Pfc	DAVID	8737
9-Aug	18:20	N/A	Unkn	BLUFOR	Pfc	MAT	2241
9-Aug	18:23	N/A	Unkn	BLUFOR	LCpl	ANTHONY	489
9-Aug	18:23	N/A	Unkn	BLUFOR	Pfc	JAMES	1614
9-Aug	18:24	N/A	Unkn	BLUFOR	PVT	NICHOLAS	5820
9-Aug	18:51	Small Arms	OPFOR	BLUFOR	Cpl	STRADFORD	1666
9-Aug	19:09	Small Arms	BLUFOR	BLUFOR	LCpl	RYAN	2401
9-Aug	19:26	Small Arms	Unkn	BLUFOR	Pfc	ELDAR	8713
9-Aug	19:46	N/A	Unkn	BLUFOR	Pfc	ROCKY E	984
9-Aug	19:58	N/A	Unkn	OPFOR	LCpl	ALLAN	6568
9-Aug	20:15	N/A	Unkn	BLUFOR	HN	BRENT	3799
9-Aug	20:15	N/A	Unkn	BLUFOR	Pfc	KAEHL	4246
9-Aug	20:42	N/A	Unkn	OPFOR	LCpl	ERNESTO	4272
9-Aug	22:06	Small Arms	OPFOR	OPFOR	LCpl	JUAN	3238
9-Aug	22:08	Small Arms	Unkn	OPFOR	LCpl	JONATHAN	9765
9-Aug	22:19	Machine Gun	Unkn	OPFOR	LCpl	EDWIN	8555

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
9-Aug	22:20	Small Arms	Unkn	OPFOR	LCpl	SABAS	2818
9-Aug	22:43	N/A	Unkn	OPFOR	LCpl	RICHARD	6465
9-Aug	22:44	N/A	Unkn	OPFOR	LCpl	LIBNI	8635
9-Aug	22:45	N/A	Unkn	OPFOR	Sgt	JOAQUIN	6555
9-Aug	22:49	Small Arms	Unkn	OPFOR	Cpl	ALFONS	4296
9-Aug	22:50	Small Arms	Unkn	OPFOR	LCpl	JEFFERY	6650
9-Aug	23:01	Small Arms	Unkn	OPFOR	LCpl	JUSTIN	6172
9-Aug	23:05	Small Arms	Unkn	OPFOR	Cpl	MARTIN	8893
9-Aug	23:05	Small Arms	Unkn	BLUFOR	Cpl	ROBERT	4178
9-Aug	23:05	Small Arms	OPFOR	BLUFOR	Cpl	JUSTIN A	396
9-Aug	23:05	Small Arms	OPFOR	BLUFOR	Pfc	DANIEL L	2753
9-Aug	23:06	Small Arms	OPFOR	BLUFOR	2nd Lt	W	3653
9-Aug	23:06	Small Arms	BLUFOR	OPFOR	Cpl	JOSE	1444
9-Aug	23:06	Small Arms	BLUFOR	OPFOR	LCpl	ERICK	210
9-Aug	23:08	Small Arms	Unkn	BLUFOR	SSgt	JEROME	9968
9-Aug	23:09	N/A	Unkn	OPFOR	LCpl	YAMIL	8912
9-Aug	23:58	N/A	Unkn	BLUFOR	Cpl	JUSTIN	9744
9-Aug	23:58	N/A	Unkn	BLUFOR	Cpl	JOSHUA	1182
10-Aug	7:31	Machine Gun	Unkn	BLUFOR	2nd Lt	S	862
10-Aug	7:36	Machine Gun	Unkn	BLUFOR	LCpl	JONATHAN	587
10-Aug	7:38	N/A	Unkn	BLUFOR	LCpl	JUSTIN	9457
10-Aug	7:39	N/A	Unkn	BLUFOR	LCpl	JUSTIN	9457
10-Aug	7:44	Small Arms	Unkn	BLUFOR	LCpl	L	1299
10-Aug	7:59	Small Arms	Unkn	BLUFOR	Pfc	SEAN	7240
10-Aug	8:13	N/A	Unkn	BLUFOR	LCpl	L	7181
10-Aug	8:19	Grenade	Unkn	BLUFOR	Pfc	T	7548
10-Aug	8:55	N/A	Unkn	BLUFOR	Pfc	RAYMOND	9525
10-Aug	8:59	N/A	Unkn	BLUFOR	Pfc	DAVID	8169
10-Aug	9:11	Machine Gun	Unkn	BLUFOR	Pfc	MARCUS D	2441
10-Aug	9:16	N/A	Unkn	BLUFOR	LT	STEVEN	6797
10-Aug	9:28	N/A	Unkn	BLUFOR	LCpl	AUSTIN	5977
10-Aug	10:05	Machine Gun	Unkn	OPFOR	LCpl	ERNESTO	4272
10-Aug	10:30	Small Arms	Unkn	OPFOR	LCpl	TIMOTHY	3317
10-Aug	10:47	N/A	Unkn	BLUFOR	LCpl	GREG	4992
10-Aug	11:59	Small Arms	Unkn	BLUFOR	Cpl	JOSHUA	1182
10-Aug	12:00	Machine Gun	Unkn	BLUFOR	Cpl	GLYNN	1496
10-Aug	12:10	Machine Gun	Unkn	BLUFOR	LCpl	TRAVIS	4101
10-Aug	12:23	Maverick	Unkn	BLUFOR	LCpl	BENJAMIN	6840
10-Aug	12:46	Machine Gun	Unkn	BLUFOR	Cpl	J	8381
10-Aug	12:50	N/A	Unkn	BLUFOR	Pvt	LEE	7801
10-Aug	12:53	Machine Gun	Unkn	BLUFOR	PVT	SERGIO F	764

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
10-Aug	13:04	Machine Gun	Unkn	BLUFOR	Pfc	CHRISTOPHE	5804
10-Aug	13:43	Machine Gun	Unkn	BLUFOR	Pfc	GUY	9076
10-Aug	13:57	Machine Gun	Unkn	BLUFOR	LCpl	J	6513
10-Aug	14:05	Machine Gun	Unkn	BLUFOR	HN	JUSTIN	5209
10-Aug	14:05	Machine Gun	Unkn	BLUFOR	Pfc	RUBEN	1743
10-Aug	14:06	Machine Gun	Unkn	BLUFOR	GySgt	KEITH N	364
10-Aug	14:22	N/A	Unkn	OPFOR	Pfc	KEITH	2323
10-Aug	14:33	N/A	Unkn	BLUFOR	Pfc	WESLEY	7932
10-Aug	14:38	Machine Gun	Unkn	OPFOR	LCpl	JONATHAN	9765
10-Aug	14:42	Artillery	Unkn	BLUFOR	Cpl	JOSHUA	7317
10-Aug	14:48	N/A	Unkn	BLUFOR	Cpl	ROBERT	4178
10-Aug	14:57	N/A	Unkn	BLUFOR	LCpl	BRADLEY	6403
10-Aug	15:09	Small Arms	Unkn	BLUFOR	PvtT	FERNANDO	7607
10-Aug	15:15	Small Arms	Unkn	BLUFOR	LCpl	JASON	1761
10-Aug	15:15	Machine Gun	Unkn	OPFOR	Sgt	JOAQUIN	6555
10-Aug	15:16	N/A	Unkn	BLUFOR	Pfc	RICHARD	988
10-Aug	15:50	Small Arms	Unkn	BLUFOR	LCpl	I	4783
10-Aug	15:51	Small Arms	Unkn	BLUFOR	Pfc	R	5209
10-Aug	16:03	Small Arms	Unkn	BLUFOR	LCpl	CHRISTOPHER	5709
10-Aug	16:07	Small Arms	Unkn	BLUFOR	Cpl	TERRENCE	4502
10-Aug	16:22	Small Arms	Unkn	BLUFOR	1st Lt	JEREMY	909
10-Aug	16:28	Machine Gun	Unkn	BLUFOR	Pfc	DUSTIN	4397
10-Aug	16:46	N/A	Unkn	BLUFOR	LCpl	JOSE	2171
10-Aug	16:48	N/A	Unkn	BLUFOR	LCpl	NICHOLAS	2346
10-Aug	16:48	N/A	Unkn	BLUFOR	Cpl	BIN	1002
10-Aug	17:05	N/A	Unkn	BLUFOR	1st LT	ANTHONY	8541
10-Aug	17:15	N/A	Unkn	BLUFOR	LCpl	DANNY	9277
10-Aug	17:29	N/A	Unkn	BLUFOR	LCpl	B	8680
10-Aug	17:32	N/A	Unkn	BLUFOR	Cpl	DANIEL	6885
10-Aug	17:43	Small Arms	Unkn	BLUFOR	Pfc	DUSTIN	6475
10-Aug	17:59	Small Arms	OPFOR	BLUFOR	Cpl	ROBERT	2705
10-Aug	17:59	Small Arms	OPFOR	BLUFOR	LCpl	NATHAN	2158
10-Aug	17:59	Small Arms	OPFOR	BLUFOR	Cpl	C	5719
10-Aug	17:59	Small Arms	OPFOR	BLUFOR	LCpl	S	3040
10-Aug	18:02	Small Arms	Unkn	BLUFOR	Pfc	JARRAE	8275
10-Aug	18:04	Machine Gun	Unkn	OPFOR	LCpl	MIGUEL	6921
10-Aug	18:14	Small Arms	Unkn	OPFOR	LCpl	SABAS	2818
10-Aug	18:40	Small Arms	Unkn	BLUFOR	Pfc	RAYMOND	9525
10-Aug	18:54	N/A	Unkn	BLUFOR	Pfc	C	5084
10-Aug	18:59	N/A	Unkn	BLUFOR	Pfc	EDGAR	925
10-Aug	19:09	N/A	Unkn	BLUFOR	LCpl	JOHN	8810

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
10-Aug	19:09	N/A	Unkn	BLUFOR	Cpl	JACOB	5375
10-Aug	19:25	20mm Chain	Unkn	OPFOR	LCpl	MANUEL	4759
10-Aug	19:35	N/A	Unkn	BLUFOR	HN	JOHNATHAN	5324
10-Aug	19:39	Mine	BLUFOR	BLUFOR	Cpl	GREGORY	913
10-Aug	19:39	Mine	BLUFOR	BLUFOR	Pfc	JOSE E	9238
10-Aug	19:40	Mine	BLUFOR	BLUFOR	LCpl	MICHAEL	1926
10-Aug	19:40	Mine	BLUFOR	BLUFOR	LCpl	STEVE	217
10-Aug	19:40	Mine	BLUFOR	BLUFOR	Pfc	JASON	8904
10-Aug	19:57	Machine Gun	Unkn	BLUFOR	Pvt	PHILIP	9578
10-Aug	20:02	N/A	Unkn	OPFOR	LCpl	BENJAMIN	4028
10-Aug	20:06	Machine Gun	Unkn	BLUFOR	LCpl	DAVIN	3239
10-Aug	20:12	Machine Gun	Unkn	BLUFOR	Pfc	JAMES	4248
10-Aug	21:00	Small Arms	Unkn	OPFOR	Cpl	RENE	374
10-Aug	21:11	Machine Gun	Unkn	OPFOR	LCpl	JOSEPH	2801
10-Aug	21:14	25MM	Unkn	OPFOR	Capt	PAUL	2447
11-Aug	6:15	Machine Gun	Unkn	BLUFOR	Pfc	LERIN	881
11-Aug	7:11	N/A	Unkn	BLUFOR	Pvt	SERGIO F	764
11-Aug	7:23	Machine Gun	Unkn	BLUFOR	LCpl	B	8680
11-Aug	7:55	Small Arms	Unkn	BLUFOR	Pfc	T	7548
11-Aug	8:03	Small Arms	Unkn	BLUFOR	Pvt	LEE	7801
11-Aug	8:11	Small Arms	BLUFOR	BLUFOR	Pfc	RAYMOND	9525
11-Aug	8:43	N/A	Unkn	BLUFOR	Pfc	C	5084
11-Aug	10:02	Machine Gun	Unkn	BLUFOR	Pfc	SHAWN	3205
11-Aug	10:35	Small Arms	BLUFOR	OPFOR	Pfc	S	1726
11-Aug	10:43	Machine Gun	Unkn	BLUFOR	1st LT	KENT	2844
11-Aug	10:43	Machine Gun	Unkn	BLUFOR	LCpl	D	6411
11-Aug	10:54	N/A	Unkn	BLUFOR	LCpl	JONATHAN	7198
11-Aug	11:17	N/A	Unkn	BLUFOR	Cpl	JOSHUA	7317
11-Aug	11:18	Machine Gun	Unkn	OPFOR	Cpl	MARTIN	8893
11-Aug	11:20	Small Arms	Unkn	BLUFOR	LCpl	CHRISTOPHER	5709
11-Aug	11:21	Grenade	Unkn	BLUFOR	Pfc	PETER	1774
11-Aug	11:27	Small Arms	Unkn	BLUFOR	LCpl	JASON	1761
11-Aug	11:47	Machine Gun	Unkn	BLUFOR	LCpl	JUSTIN J	5690
11-Aug	11:53	Machine Gun	Unkn	BLUFOR	Pfc	MANUEL	4736
11-Aug	11:55	N/A	Unkn	BLUFOR	LCpl	TRAVIS	4101
11-Aug	12:02	N/A	Unkn	OPFOR	LCpl	EDHARDO	8937
11-Aug	12:06	Mine	Unkn	BLUFOR	Cpl	GREGG	384
11-Aug	12:26	N/A	Unkn	BLUFOR	Cpl	RYAN	1807
11-Aug	12:48	30mm	Unkn	BLUFOR	Pfc	DUSTIN	6475
11-Aug	13:00	N/A	Unkn	BLUFOR	Cpl	SCOTT J	9999
11-Aug	13:17	N/A	Unkn	BLUFOR	HM1	ANGELA	6147

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
11-Aug	13:19	N/A	Unkn	BLUFOR	SN	ADOLFO	44
11-Aug	13:20	N/A	Unkn	BLUFOR	Pfc	MAHAN	6612
11-Aug	13:24	N/A	Unkn	BLUFOR	LCpl	DAVID L	1901
11-Aug	13:57	N/A	Unkn	BLUFOR	LCpl	NICHOLAS	2346
11-Aug	13:57	N/A	Unkn	BLUFOR	Cpl	BIN	1002
11-Aug	14:27	N/A	Unkn	BLUFOR	LCpl	CHRISTOPHE	7722
11-Aug	14:59	Small Arms	BLUFOR	BLUFOR	LCpl	DEAN	7574
11-Aug	15:26	N/A	Unkn	OPFOR	LCpl	STEVEN	9078
11-Aug	15:28	Small Arms	Unkn	BLUFOR	Pfc	FRANCISCO	1845
11-Aug	15:38	Small Arms	BLUFOR	OPFOR	LCpl	J	1049
11-Aug	16:03	Small Arms	BLUFOR	BLUFOR	Pfc	ADAM	8325
11-Aug	16:03	Small Arms	BLUFOR	BLUFOR	LCpl	ROBERT	658
11-Aug	16:07	N/A	Unkn	BLUFOR	HN	JUSTIN	5209
11-Aug	16:07	N/A	Unkn	BLUFOR	Pfc	RUBEN	1743
11-Aug	16:27	Small Arms	BLUFOR	OPFOR	LCpl	JONATHAN	9765
11-Aug	16:42	Small Arms	BLUFOR	BLUFOR	LCpl	KEVIN A	8737
11-Aug	16:42	Small Arms	BLUFOR	BLUFOR	Capt	BEN	2102
11-Aug	16:47	N/A	Unkn	BLUFOR	LCpl	ADAM	9402
11-Aug	16:49	N/A	Unkn	OPFOR	LCpl	TIMOTHY	3317
11-Aug	17:02	Small Arms	BLUFOR	OPFOR	LCpl	CARLOS	4571
11-Aug	17:03	Small Arms	BLUFOR	BLUFOR	Pfc	JOSEPH	5103
11-Aug	17:04	Small Arms	BLUFOR	BLUFOR	Pfc	R	2336
11-Aug	17:04	Small Arms	BLUFOR	BLUFOR	LCpl	NATHAN	2158
11-Aug	17:05	Small Arms	BLUFOR	OPFOR	LCpl	LIBNI	8635
11-Aug	17:05	Small Arms	BLUFOR	OPFOR	LCpl	CLIFORD	7268
11-Aug	17:05	Small Arms	BLUFOR	BLUFOR	LCpl	WILLIAM	6802
11-Aug	17:06	Small Arms	BLUFOR	BLUFOR	Pfc	JOHN	9563
11-Aug	17:06	Small Arms	BLUFOR	BLUFOR	LCpl	JUSTIN	9076
11-Aug	17:06	Small Arms	BLUFOR	BLUFOR	Pfc	D	8776
11-Aug	17:06	Small Arms	BLUFOR	BLUFOR	Cpl	RAUL	4322
11-Aug	17:06	Small Arms	BLUFOR	BLUFOR	Pfc	ANDREW	9438
11-Aug	17:11	Small Arms	OPFOR	BLUFOR	Pfc	E	8344
11-Aug	17:13	Small Arms	OPFOR	BLUFOR	LCpl	S	3040
11-Aug	17:14	Small Arms	BLUFOR	BLUFOR	1st Lt	FRANCIS	5321
11-Aug	17:16	Small Arms	BLUFOR	OPFOR	Cpl	JAMES	6043
11-Aug	17:16	Artillery	Unkn	BLUFOR	HA	SAMUEL	2377
11-Aug	17:17	Small Arms	BLUFOR	OPFOR	Pfc	MATHEW	4122
11-Aug	17:17	Small Arms	Unkn	NonComb	CIV	GREG	7750
11-Aug	17:17	Small Arms	Unkn	BLUFOR	Sgt MAJ	RICK	4005
11-Aug	17:17	Small Arms	Unkn	BLUFOR	SSgt	JAMES	8949
11-Aug	17:17	Small Arms	Unkn	BLUFOR	LCpl	ALLAN	9293

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
11-Aug	17:17	Small Arms	BLUFOR	BLUFOR	Pfc	R	2536
11-Aug	17:25	Machine Gun	Unkn	BLUFOR	SN	ALBERT W	6582
11-Aug	17:29	Small Arms	OPFOR	BLUFOR	Cpl	J	8381
11-Aug	17:34	Small Arms	BLUFOR	OPFOR	LCpl	EDGAR	3960
11-Aug	17:40	Small Arms	OPFOR	BLUFOR	LCpl	W	8991
11-Aug	17:41	Small Arms	BLUFOR	OPFOR	LCpl	ADAM	3819
11-Aug	17:42	Small Arms	OPFOR	BLUFOR	LCpl	RAUL	585
11-Aug	17:45	Small Arms	Unkn	BLUFOR	LCpl	JONATHAN	587
11-Aug	17:46	Small Arms	BLUFOR	OPFOR	LCpl	EDWIN	8555
11-Aug	17:48	Small Arms	BLUFOR	BLUFOR	Pfc	THOMAS	7726
11-Aug	17:50	Machine Gun	Unkn	BLUFOR	Cpl	MITHIN	3226
11-Aug	17:51	N/A	Unkn	BLUFOR	Cpl	BRENDAN	2605
11-Aug	17:52	N/A	Unkn	BLUFOR	Cpl	MICHAEL	601
11-Aug	17:59	Small Arms	BLUFOR	OPFOR	Pfc	DANIEL	6530
11-Aug	18:01	N/A	Unkn	BLUFOR	Cpl	ERIC	1841
11-Aug	18:19	Small Arms	BLUFOR	OPFOR	LCpl	ERNESTO	4272
11-Aug	18:22	N/A	Unkn	OPFOR	LCpl	ALLAN	6568
11-Aug	18:26	Grenade	Unkn	BLUFOR	Pfc	WING	8012
11-Aug	18:29	Small Arms	Unkn	BLUFOR	Pfc	DANTZ	6534
11-Aug	18:32	Small Arms	BLUFOR	BLUFOR	Pfc	MAT	2241
11-Aug	18:42	Machine Gun	Unkn	BLUFOR	LCpl	JOHN	8810
11-Aug	18:42	Machine Gun	Unkn	BLUFOR	Cpl	JACOB	5375
11-Aug	18:43	N/A	Unkn	BLUFOR	LCpl	J	6513
11-Aug	18:43	SMAW	Unkn	BLUFOR	Cpl	STRADFORD	1666
11-Aug	18:44	N/A	Unkn	BLUFOR	Pfc	JAMES	1614
11-Aug	18:45	Machine Gun	Unkn	BLUFOR	1st Lt	BRIAN	4746
11-Aug	18:54	Machine Gun	Unkn	BLUFOR	LCpl	JONATHAN	7198
11-Aug	18:56	N/A	Unkn	BLUFOR	Pvt	PHILIP	9578
11-Aug	18:58	Machine Gun	Unkn	BLUFOR	LCpl	DAVIN	3239
11-Aug	18:58	N/A	Unkn	BLUFOR	Capt	INNES	7881
11-Aug	18:59	N/A	Unkn	BLUFOR	LCpl	MICHAEL	2994
11-Aug	19:12	N/A	Unkn	OPFOR	Pfc	KEITH	2323
11-Aug	19:12	Machine Gun	Unkn	BLUFOR	Pfc	JOSE E	9238
11-Aug	19:15	Machine Gun	Unkn	BLUFOR	Cpl	EDWARD	3782
11-Aug	19:20	Machine Gun	Unkn	BLUFOR	LCpl	AGNEW	3408
11-Aug	20:43	Small Arms	OPFOR	OPFOR	LCpl	S	3649
11-Aug	20:46	152mm	Unkn	OPFOR	Cpl	L	5460
11-Aug	21:01	Small Arms	OPFOR	BLUFOR	Pfc	DUNSING	9111
11-Aug	21:01	Small Arms	BLUFOR	BLUFOR	Pfc	MICHAEL	9180
11-Aug	21:03	Small Arms	OPFOR	BLUFOR	LCpl	ARNOLDO	2471
11-Aug	22:24	Small Arms	Unkn	OPFOR	Maj	RICHARD	7725

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
11-Aug	22:54	Small Arms	OPFOR	BLUFOR	Pfc	VADIM	6916
12-Aug	2:50	Small Arms	OPFOR	BLUFOR	LCpl	T	8451
12-Aug	2:50	Small Arms	OPFOR	BLUFOR	Cpl	RICKY	1749
12-Aug	2:51	Small Arms	OPFOR	BLUFOR	LCpl	D	6411
12-Aug	4:35	Small Arms	BLUFOR	OPFOR	SSgt	JOSÉ MARIA	968
12-Aug	4:37	Small Arms	OPFOR	BLUFOR	Pfc	JAMES	7571
12-Aug	4:45	Small Arms	BLUFOR	OPFOR	LCpl	JUAN	3238
12-Aug	5:10	Small Arms	BLUFOR	OPFOR	Sgt	JOAQUIN	6555
12-Aug	5:10	Small Arms	OPFOR	BLUFOR	Pfc	JEREMY	1152
12-Aug	5:10	Small Arms	BLUFOR	OPFOR	LCpl	ERNESTO	4272
12-Aug	5:11	Small Arms	BLUFOR	OPFOR	LCpl	CLIFORD	7268
12-Aug	5:11	Small Arms	BLUFOR	OPFOR	Sgt	JESSIE	3086
12-Aug	5:12	Small Arms	OPFOR	BLUFOR	SN	ALBERT W	6582
12-Aug	5:12	Small Arms	OPFOR	BLUFOR	SSgt	JEROME	9968
12-Aug	5:13	Small Arms	OPFOR	BLUFOR	LCpl	J	2993
12-Aug	5:14	Small Arms	OPFOR	BLUFOR	Pfc	R	5209
12-Aug	5:15	N/A	Unkn	OPFOR	LCpl	TYLER	6039
12-Aug	5:15	Small Arms	OPFOR	OPFOR	LCpl	GUSTAVO	3397
12-Aug	5:17	Small Arms	Unkn	OPFOR	LCpl	JUSTIN	6172
12-Aug	5:18	N/A	Unkn	OPFOR	LCpl	S	3649
12-Aug	5:19	Small Arms	BLUFOR	OPFOR	Sgt	ALFREDO	2268
12-Aug	5:22	Small Arms	OPFOR	BLUFOR	Cpl	JUSTIN A	396
12-Aug	5:23	Small Arms	OPFOR	BLUFOR	Pfc	JOSHUA	4640
12-Aug	5:29	AT4	Unkn	BLUFOR	LCpl	A	6731
12-Aug	5:30	AT4	Unkn	BLUFOR	Cpl	A	3351
12-Aug	5:31	Small Arms	OPFOR	BLUFOR	Pfc	K	3169
12-Aug	5:34	Small Arms	BLUFOR	OPFOR	Cpl	ROGELIO	3887
12-Aug	5:34	Small Arms	OPFOR	BLUFOR	Cpl	RONALD	8128
12-Aug	5:35	Small Arms	OPFOR	BLUFOR	Cpl	BRIAN	1782
12-Aug	5:36	Small Arms	OPFOR	BLUFOR	Pfc	JASON	1686
12-Aug	5:36	Small Arms	BLUFOR	OPFOR	LCpl	JASON	8845
12-Aug	5:37	Small Arms	OPFOR	BLUFOR	Cpl	JUSTIN	6340
12-Aug	5:43	Small Arms	OPFOR	BLUFOR	LCpl	RYAN	2831
12-Aug	5:46	Small Arms	OPFOR	BLUFOR	LCpl	J	6513
12-Aug	5:48	Small Arms	OPFOR	BLUFOR	LCpl	MATTHEW	9335
12-Aug	5:49	N/A	Unkn	BLUFOR	LCpl	P	2902
12-Aug	5:49	Small Arms	OPFOR	BLUFOR	Cpl	C	5340
12-Aug	6:18	Small Arms	BLUFOR	OPFOR	LCpl	STEVEN	9078
12-Aug	6:40	Machine Gun	Unkn	OPFOR	Sgt	J	1733
12-Aug	6:43	Small Arms	BLUFOR	OPFOR	SSgt	JOSÉ MARIA	968
12-Aug	6:57	Machine Gun	Unkn	BLUFOR	Pfc	DUSTIN	3975

Miles Data from UCAX							
Date	**Time**	**Weapon**	**Attacking Side**	**Victim Side**	**Rank**	**First Name**	**ID**
12-Aug	7:05	Small Arms	Unkn	BLUFOR	Pvt	SCOTT C	4120
12-Aug	7:08	Machine Gun	Unkn	BLUFOR	LCpl	W	885
12-Aug	7:09	Small Arms	Unkn	BLUFOR	LCpl	D	8745
12-Aug	7:11	Small Arms	OPFOR	BLUFOR	Capt	INNES	7881
12-Aug	7:14	AT4	Unkn	BLUFOR	Pfc	B	4119
12-Aug	7:16	Small Arms	Unkn	BLUFOR	LCpl	B	8680
12-Aug	7:23	Small Arms	BLUFOR	OPFOR	LCpl	JUAN	9465
12-Aug	7:29	Small Arms	Unkn	BLUFOR	Pfc	THOMAS	7726
12-Aug	7:29	N/A	Unkn	BLUFOR	Cpl	ED	3267
12-Aug	7:40	Machine Gun	Unkn	BLUFOR	LCpl	DON W	3169
12-Aug	7:52	Machine Gun	Unkn	BLUFOR	Cpl	DANIEL	6885
12-Aug	7:55	Machine Gun	Unkn	BLUFOR	LCpl	J	4261
12-Aug	8:08	Machine Gun	Unkn	BLUFOR	Pfc	AUDIE	8573
12-Aug	8:11	Small Arms	Unkn	BLUFOR	Pfc	S	2286
12-Aug	8:11	Machine Gun	Unkn	BLUFOR	Pfc	FERMIN	2302
12-Aug	8:15	Small Arms	OPFOR	BLUFOR	LCpl	GREGORY	1174
12-Aug	8:18	Weapon 'X'	Unkn	BLUFOR	LCpl	GARRETT	5295
12-Aug	8:28	N/A	Unkn	BLUFOR	Pfc	DANIEL	4581