EAGLE ONE

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WEAPONS AND TACTICS INSTRUCTOR COURSE 1-02 LESSONS LEARNED

The intent of the Eagle One Newsletter is to communicate lessons learned from the Weapons and Tactics Instructor course. This newsletter is also published on the MAWTS-1 home page at SIPRNET web site ***http://www.mawts1.usmc.smil.mil***.

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AV-8B FORWARD OPERATING BASES (FOB)
MAJ SOFGE, AV-8B DIVISION, TACAIR DEPARTMENT

During WTI 1-02, the AV-8Bs successfully operated from a forward base on four occasions. The FOBs allowed the AV-8Bs to keep the tempo high, reduce congestion at the main base, and ultimately increase the number of sorties available to the TAC. Using the FOB, six A/C were able to generate 18 sorties with the pilots flying three separate missions in approximately 6.5 hours. Over half the sorties were flown at night. The Litening II Targeting Pod was carried by at least three of the six A/C (minimum one per section) in every evolution. The GAU-12 was not flown during the course. Ordnance upload and refueling took slightly more than an hour (A/C touchdown to T/O), time well spent by the pilots receiving intel update briefs from the collocated intel rep and Airboss. Ordnance delivered:

OAS-5:	32Mk-82HD, 16 Mk-82LD
OAS-6:	18 Mk-83LD, 34 Mk-82LD, 8 LUU-2
FINEX 1:	12 LGTR, 26 Mk-82LD, 16-LUU-2
FINEX 2:	47 BDU-45, 24-LUU-2

The significant points:

1. Ordnance: The most difficult part of efficiently operating from a FOB is keeping the ordnance effort coordinated and focused. With only two ordnance load teams to service six A/C, strong leadership within the teams is a prerequisite to safe, quick and simultaneous loading of multiple A/C. To help simplify the problem, single type stores on parent stations were used to the maximum extent possible. One of the biggest lessons learned for the AV-8B shop was that loading a HD bomb takes more time than an equivalent LD bomb, and SUU-25s are slower still due to the stray voltage check requirements. The take-away: **the more complex the load, the slower the turn.**

2. Fuel: Cold fuel from M970s (MWSS-371) was the most efficient way to fuel the A/C. Because A/C must be shut the down to rearm, hot refueling just didn't make sense.

3. Connectivity: Since launch authority remained with the TACC, a dedicated Airboss connected to the MACCS is required at the FOB. Connectivity to the TACC and supporting functions (maint, ord, fuels) is the most critical element to smooth FOB operations.

4. FOD: There are many moving parts in a relatively austere environment. The establishment of a "clean line" helped to mitigate the FOD risk. Anything that operated near the A/C (Sats loader, demin cart, etc..) stayed in the clean area and anything that operated in the dirt stayed in the dirt (M970s, EBFL for moving ord from the build area). A/C consumables we simply "handed" over the line, checked for FOD, and loaded. Marines working in the A/C load area were made very aware of the FOD risk and did a great job keeping FOD to an absolute minimum. The sweeper truck was not used near the A/C, as it seemed to generate as much FOD as it picked up.

5. Hot Refueling/Hot Ordnance Loading: MAWTS-1 is pursuing NAVAIR clearance that that will allow the HOT loading of ordnance during WTI 2-02. This "hot load/hot gas" effort will significantly increase the fire-power available to the GCE.

AV8B LITENING II
MAJ MCPHILLIPS, AV-8B DIVISION, TACAIR DEPARTMENT

During WTI1-02 MAWTS-1 AV8B Instructors and students flew the Litening II targeting pod daily. The Litening Pod has added a significant capability to the AV8B and the MAGTF. The Litening Pod was flown in every mission area the AV8B pilot might find himself in some areas that have not traditionally been Harrier missions. We knew the self lase capability would be instrumental in keeping the AV8B at the forefront of Marine TACAIR OAS capability, but additional capabilities emerged that were unexpected.

(Continued from page 2)

WTI 1-02 marked the first time the AV8's had participated in long range DAS strikes. The AV8s were 100% successful delivering Laser guided ordnance from medium altitude in a threat dense environment by self and buddy lasing. Key lessons learned from the Long-range strikes were: 1) Self-lasing was easier to manage than buddy lasing. 2) A key feature of the Litening Pod is a coaxial IR marker visible only to NVG equipped personnel that can be used to visually mark targets at night from significant ranges and altitudes. This function was used in two ways during the strikes. First, in a buddy-lasing attack it was used to confirm target location on ingress for aircraft without laser spot tracking (LST) capability. Target location was confirmed by correlating the flashing mark from the designating aircraft with HUD target designation symbology in the non-LST equipped aircraft. Although the target coordinates were from a high quality source, using this technique the pilot was able to verify that his coordinates were correct and that the aircraft would release the guided bomb unit (GBU) at the correct point. Secondly, after the primary targets had been struck, the same buddy-lasing tactics were used by trail elements to mark secondary aim points within the target area allowing accurate visual delivery of general-purpose ordinance from medium altitude. Both techniques are very easy to execute by toggling the Laser/ Marker pushbutton. 3) The Night Attack aircraft were able to self lase and track their own laser spot for weapons delivery. By using the Angle Rate Bombing System (ARBS) the aircraft is able to track the laser spot and compute weapons release based on the laser energy generated by the Litening Pod.

The Pod provides significant enhancement to situational awareness (SA) during night Close Air Support (CAS) operations for both the Forward Air Controller (FAC) or Forward Air Controller Airborne (FAC (A)) and the pilot. By inserting the FAC derived target coordinates the marker enables the pilot to show the FAC exactly where that location is from outwards of 20NM. Once the location is confirmed the FAC has the option of using the CAS aircraft's own mark or using it to augment the primary mark. If no other mark exists the FAC provides corrections from the Litening mark during the attack. This proved to be very effective. If the location (spot) is not exactly where the FAC wants it he can provide a standard correction. Using the slewable marker the pilot is able to correct any location error. This technique provided the FAC significant assurance the aircraft was attacking the intended target and resulted in timely clearance to drop. Good success using this technique was enjoyed at ranges inside of 10nm. At very long slant ranges making a very accurate adjustment was difficult and sometimes resulted in multiple corrections from the FAC with little or no improvement in spot location. The reason for this is at 10NM or less the correction can be made by visually moving the mark across the ground in the intended direction. At long ranges this is done on the FLIR display. Due to reduced resolution at long ranges and the small field of view, the adjustment is a "best guess" movement. What appears to be a very small adjustment in the cockpit is a very large correction across the ground at long range.

The Litening Pod has excellent optics for both day and night viewing. This makes it extremely effective at detecting and identifying targets at very long ranges. Using the Litening Pod as a reconnaissance sensor has good application in the Armed Reconnaissance (AR) and Strike Coordination and Reconnaissance (SCAR) missions. The IR marker is especially suited for these missions. Some difficulty was noted in the early flights in pointing the sensor while searching for targets. Once it had been slewed away from recognizable features around the systems designation, orientation became difficult. It was simply difficult to tell where the Target Pod was looking. This was overcome by spending more time studying the objective area and focusing on Electro-Optical Tactical Decision Aid's (EOTDA), FLIR footprints, defining features or structures that would be obvious and helpful in determining Litening Pod orientation. A system of way point and waypoint offsets layered throughout the objective area provides useable control of the sensor during search.

Currently the MAWTS-1 AV-8B shop is working on both TACNOTES document and a sortie syllabus guide for fleet introduction of Litening II Pod.

SAM WEAVE QUALITATIVE ASSESSMENT

MAJ WADSWORTH, FA-18 DIVISION, TACAIR DEPARTMENT
MAJ MCPHILLIPS, AV-8B DIVISION, ADT&E DEPARTMENT
MAJ BEW, EA-6B DIVISION, TACAIR DEPARTMENT

The following is an unclassified executive summary of observations from the SAM WEAVE qualitative assessment conducted by MAWTS-1 during WTI 1-02. The final results of this demonstration will be released in a classified format. To obtain a copy of the final report, please refer to the contact information at the end of the article.

BACKGROUND

During WTI 1-02, MAWTS-1 conducted a Qualitative Assessment on the viability of the SAM Weave in the low altitude regime. While the SAM Weave is effective at countering all types of RF guided SAMs at all altitudes, questions have arisen about how to safely execute this maneuver in the LAT (Low Altitude Tactics) environment. The issues surrounding this are simply that LAT, as executed by all TACAIR (Tactical Aircraft) communities, reduce three dimensional maneuvers to a series of two dimensional turns and always culminate with a wings-level return back to low altitude. This ensures that the aircraft RADALT (radar altimeter) is functional during the most important portion of the maneuver. Additionally, the two dimensional maneuvers have allowed for the application of several rules (50%, 10° and dive recovery rules) which are effective only when flight is conducted consistent with initial assumptions. With the SAM Weave, the LAT rules do not apply because the maneuver incorporates continuous roll with constant G and an ever-changing FPA (flight path angle).

HORNET SHOP

Seven sorties were flown in the FA-18 (different lots, models A, C, D) with two tanks and five pylons. One of the sorties additionally carried three BDU-45s on parent stations. While the single sortie with a modest load of ordnance may not be statistically significant, the impressions documented by the pilot are consistent with the conclusions drawn by each of the other aircrew. MAWTS-1 now recommends that the normal SAM Weave parameters be flown by all aircrew, regardless of experience level down to a starting altitude of 1000' AGL. If an aircrew finds himself below 1000' AGL and if a three dimensional maneuver is required, modify the SAM Weave pitch attitude to no more than +/- 5° of the horizon. The only difference seen in the single sortie with ordnance, was the pilot had to immediately select full A/B (afterburner) to preclude decelerating below 400 KCAS. Sorties without ordnance only required modulation of throttles in and out of A/B, depending on whether the aircraft had 400 or 402 engines. Finally, all aircrew should have received their initial LAT Qualification prior to executing the SAM Weave below 5000' AGL.

HARRIER SHOP

One event was flown. Two pilots executed the SAM weave at low altitude. Both aircraft had ordnance loads of (2XMK-82/DECM POD/ Litening Pod). Although these flights do not constitute enough data to validate a fleet recommendation, the pilots found that the maneuver was easily executable at low altitude and well within the aircraft's sustained energy envelope. Due to on-going testing and the lack of sufficient test data at this time, we will continue to perform the SAM weave above 5000'AGL but below 5000' the SAM Weave will be terminated and interception of the standard LAT rules of conduct will take place. The AV-8B SAM Weave evaluation will continue during WTI 2-02.

PROWLER SHOP

Four sorties were flown in the EA-6B (block 82) with one tank, three pods and either a CATM or TACTS pod. The purpose was to solidify flight parameters for "normal" EA-6B employment altitudes (from 20K and 25K feet down to 15K) and make Threat Reaction recommendations for incorporation into the DEFTAC syllabus. As imagined, higher altitudes require an aggressive nose-low entry to maintain tactical airspeed. As the A/C descends to lower altitude, less nose low is required. Low-altitude weave will be covered in the Spring or Fall 02 class.

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SAM Weave parameters in a Prowler, if measured with any precision, are largely influenced by pilot technique. For this assessment, variables such as sustained or instantaneous "G" were determined by referencing performance data from the EA-6B TACMAN, and then employment/entry was baselined to gouge defensive airspeeds as referenced in the DEFTAC syllabus. Detailed guidance will be published in the classified EA-6B Threat Reaction lecture with guidance on when to Weave, when to stop, and the influence of such factors such as entry parameters, visibility, lost sight, intelligence prep, technique and stores jettison.

Sustaining target airspeeds precluded the crew from exceeding 50% rules (i.e. – would have gotten too fast to achieve best rate of turn). As this maneuver is tested into low-alt, Dive Recovery Rules and RADALT limitations will require additional scrutiny. With an EA-6B LAT program no longer being in effect, MAWTS will either recommend different tactics below 5'000 feet or modify Weave parameters for EA-6B to successfully defend throughout its tactical operating altitudes.

CONCLUSIONS

The SAM Weave is an effective SAM Countertactic, which can be executed throughout most of the TACAIR operating envelope in a safe manner. There still remains additional validation to be done by some platforms in the low altitude regime. No matter what altitude each community selects as a minimum for full-up execution, many indications are that below that altitude, aircrew would be wise to simply execute a Level S or MAC.

AIDED vs UNAIDED MULTI-TANKER AIR-TO-AIR REFUELING OPERATIONS
MAJ PATRICK, KC-130 DIVISION

During OAS-2, a night deep air strike into China Lake, the KC-130 Division provides fixed-wing aerial refueling. The tanker force consisted of 3 KC-130s in a trail formation (Option 2) with 500 feet of vertical separation. There were numerous receivers consisting of AV-8Bs "Razor", FA-18C/Ds "Latch", and EA-6Bs "Storm." During the mission brief, the KC-130 Refueling Area Commander briefed that refueling would be conducted EMCON. The EA-6Bs and KC-130s were not NVG capable.

The tankers launched first. The strike force launched late. The planned flow of receivers to the tanker formation for pre-mission tanking was thus affected. The first set of receivers was the Latch flight. Refueling went as planned. The next receiver was a single EA-6B. He joined the taker formation in the starboard observation position. Moments after the EA-6B had joined, a flight of 6 AV-8Bs arrived. Razor lead, wearing NVGs, saw the tanker formation and the single Prowler in the observation position on the trail tanker. The Prowler appeared to remain on the trail tanker but was in fact beginning a slow, deliberate movement to his pre-assigned tanker (-2 tanker). The Razor Flight Lead assumed that the Prowler was going to remain on the trail tanker and directed his flight to their tanker/hose assignments not noting the Prowlers' movement toward –2 tanker. –3 and –4 Razor approached the –2 tanker and took a slightly wide observation position. Noting that the hoses were extended the –3 Razor proceeded to move to the left hose of the –2 tanker. The Prowler was moving up the right side of the tanker formation. The Razor –3 made it to the –2 tanker before the Prowler. –3 Razor noted that the tanker's hoses were extended and began movement toward the pre-contact position. The Prowler was approaching the –2 tanker simultaneously not seeing his convergence with the –3 Razor. The unaided Prowler pilot did not see the –3 Razor until he was forced to execute an aggressive right descending turn to avoid collision.

Lessons Learned. Different levels of situational awareness existed because of the AV-8Bs capability to fly on NVGs. The Razor Flight Lead's higher level of SA and enabled him to move to his pre-briefed tanker more quickly than the Prowler. The Prowler needed the extra time in the observation on the trail tanker to stabilize in formation and find the –2 tanker. Being unaided required him to make a slower, more deliberate movement to his assigned tanker.

Overall lesson is that the pace of receiver movement around a tanker formation is quicker for aided receivers. Tankers and receivers should ensure that they understand each other's capabilities, i.e. aided vs. unaided; and is briefed for the mission.

GLOBAL POSITIONING SYSTEM (GPS) TO INSTRUMENT LANDING SYSTEM (ILS) RECOVERIES
CAPT GROSSNICKLE, ATC DIVISION, C3 DEPARTMENT

During WTI 1-02, the Air Traffic Control Division and the Tactical Air (TACAIR) Department tested a new method for the tactical recovery of aircraft to an airfield. These procedures were part of a larger study to evaluate the feasibility of the Tactical Air Navigation (TACAN) as a navigation aid in tactical conditions. The objective was to test an alternative recovery method with existing equipment to be used under tactical conditions where a TACAN or full Marine Air Traffic Control Detachment would be impractical. The approach needed to reduce radio communications, utilize the aircraft's inherent GPS/INS capability, and provide for adequate separation on final approach.

In order to accomplish these objectives, a nine-mile straight in approach to MCAS Yuma Runways 03 Right and 21 Left was used with a standard three-degree glideslope. GPS/INS waypoints were used to navigate the aircraft to the initial point on the approach and the AN/TPN-30A Marine Remote Area Approach and Landing System (MRAALS) then provided instrument landing system (ILS) information for terminal guidance. For separation procedures, each division of aircraft was provided with specific instructions to detach aircraft along the approach corridor to provide for adequate separation to land.

Several questions were to be answered by this experiment. First, would the approach provide adequate separation for aircraft and recover them quickly without bottlenecking the terminal environment? Second, would this method of recovery fill the role of a non-precision aid, like the TACAN? Third, what is the accuracy of the equipment and what are the limitations of this method?

Approximately 100 approaches were flown in support of this experiment. However, the reliability of the MRAALS was the limiting factor throughout the exercise. Only during 30 percent of the approaches did pilots receive a solid signal to provide them terminal guidance. Often the pilots would receive no signal, erratic needles, or only one needle. When they received a solid signal, the approach was extremely inaccurate bringing them in well right of course. These problems persisted even when the MRAALS alignment was verified, the ILS inspected for serviceability, and different serviceable MRAALS were used on different runways.

Adequate separation was achieved due to the procedure developed. No bottlenecks were experienced. And the theory behind the approach was sound. Had the MRAALS provided accurate glideslope and elevation information, the approach would have been a success. However, the MRAALS was far too inaccurate to provide for safe and reliable approaches. In addition, the only aircraft capable of flying the AN/TPN-30A MRAALS ILS are aircraft with an ARA-63. This limited the experiment during WTI to just Hornets and Harriers.

The limitations of the MRAALS demonstrated that it would not likely replace the TACAN in the near future. Due to the MRAALS inability to provide ILS information to all airframes, it would not be an adequate solution for most airfields without also using the TACAN modification installed on the AN/TPN-30A. In addition, the inaccuracies with the MRAALS need to be investigated to find out the source of the errors. MRAALS has been used successfully in several theaters, but it is not used often enough to overcome training and maintenance problems in the fleet, which we experienced during WTI 1-02.

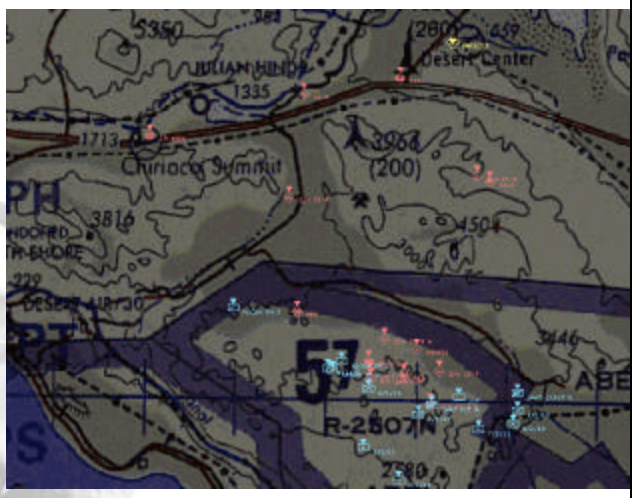
This leaves us to continue the larger process of validating the usefulness of the TACAN and search for other alternate solutions if they are needed. One potential solution is utilizing self-contained GPS/INS approaches. The approach procedure was developed by sighting a GPS waypoint at the approach end of the runway, a nine mile initial and final approach fix with a three degree slope. The three degree slope began at the final approach fix utilizing the inherent waypoint designation ability of the aircraft. In addition, the aircrew would back-up the waypoint validity with their ground radar. This procedure was not implemented in time to be flown during WTI 1-02. In the interim aviation commanders should be aware of the risk of non-certified approaches under tactical conditions using either GPS or MRAALS equipment in IMC conditions. MAWTS-1 will fly GPS/INS self contained approaches during WTI 2-02.

DATA CONNECTIVITY TO THE DASC(A) QUALITATIVE ASSESSMENT
CAPT WEAVER, C3 DEPARTMENT

The following is an unclassified executive summary of observations from the Data Connectivity to the DASC(A) qualitative assessment conducted by MAWTS-1 during WTI 1-02. The final results of this demonstration will be released in an unclassified format. To obtain a copy of the final report, please refer to the contact information at the end of the article.

The purpose of the QA was to determine the feasibility of data connectivity between the ground and airborne DASC.

The QA was first attempted during WTI 2-01 with marginal success. Data, in the form of text messages, was sent and received by the DASC (A). The initial goal of the QA was to send, aside from text messages, fire support overlays via C2PC between the DASC and DASC (A). This type of data would enable us to further evaluate the tactical relevance of employing this capability within the DASC(A). The transmission and reception of C2PC Fire Support Overlays was never accomplished during the WTI 2-01 QA. However, the capability to send and receive data with the Marine Air Support Squadron's (MASS) organic radios, the AN/PSC-5 (UHF/SATCOM) and the AN/GRC-171B (V) 4 (UHF) radios does exist. Advanced data controllers are required to make this connection operational between the radio and the computer running C2PC software. Advanced data controllers are not organic to the MASS. Via Sat Communications Group agreed to temporarily loan two VDC 400 data controllers to provide data connectivity during this QA. This QA yielded limited success; proving that data can be passed via C2PC between the DASC and DASC (A) using organic radio assets, but did not progress to point where the utility of the information could be evaluated.



During WTI 1-02, the QA was conducted for a second time. This time the QA was largely successful. Fire support overlays and text messages were sent and received between the DASC (A) and DASC. This was conducted using a laptop with C2PC software, the VDC-400 data controller, and AN/GRC-171B (V) 4. The data connectivity to the DASC (A) contributed to the overall success of their mission. During Offensive Air Support (OAS 6) flight evolution, voice communications between the ground and airborne DASC were only used for the first five minutes. A C2PC chat session incorporating Via Sat email, and overlays were used to convey information between the DASC and DASC (A) personnel for the remaining six hours and fifty-five minutes of the flight evolution. Transmission times ranged from two to five seconds for text messages or OPNOTES and approximately 40 seconds for an overlay, such as the one seen here. The QA proved that data connectivity between the DASC and DASC (A) increased the situational awareness of the operators. Their heightened situational awareness was a direct result of the quantity and quality of information that was sent and received via C2PC.

Based on the success of this QA MAWTS-1 forwards the following recommendations:

1) MAWTS-1 will continue to employ DASC/DASC(A) Data Connectivity during WTI courses.

2) MAWTS-1 will recommend to the MACG OAG the purchase of two VDC 400s and associated equipment to enhance the effectiveness of the DASC/DASC(A)'s connectivity.

3) Results of employing a data capability within the DASC(A) needs to continually be compiled and shared between units. This will serve us well as we look into the requirements of the CAC2S Airborne Command and Control Platform of the future.

ELECTRONIC WARFARE COORDINATION CENTER
LCDR W.K. STUCKI, AC2W/ISR DIVISION, C3 DEPARTMENT
MAJ R.T. BEW, EA-6B DIVISION, TACAIR DEPARTMENT
MAJ M.L. ROSS, TACC DIVISION, C3 DEPARTMENT

Background

WTI 1-02 saw the first-ever employment of an Electronic Warfare Coordination Center (EWCC) in the Marine Tactical Air Command Center (TACC). Conceptual to date, many of the envisioned responsibilities of the EWCC have been addressed through the use of EW "cells" or other adhoc staff-related working groups within the air operations center (AOC) during joint operations (note: current discussion is focused on the use of the Information Operations (IO) cell).

The requirement to integrate, coordinate, and execute theater-wide EW operations that enhance a JFC's overall C2W plan as well as contribute to the attainment of air superiority (i.e. SEAD) is well documented. The EWCC is specifically tasked to not only balance the traditional requirements of exploitation (ELINT/ COMINT) and electronic attack (EA), but to also provide real-time control and re-tasking primarily of airborne C2W assets. The promised benefits of the EWCC include:

-reductions in electronic fratricide of friendly forces
-increased EW flexibility and responsiveness to the threat
-improved effects on target for electronic fires
-improved tactical/operational support for in-theater airborne C2W/EW aircrews
-focused C2W/EW expertise available to the air commander at the AOC
-mechanism for converting sensitive national capabilities into actionable intelligence
-potential to convert operational/strategic collection into tactical C2W attack

Airborne extensions of the EWCC would include the airborne EW coordinator (EWC). Just as airborne C2 & targeting assets such as AWACS provide a direct path from the air commander to the individual strike lead/mission commander, the airborne EWC provides a direct path from the EWCC to the individual electronic warfare officer (EWO)/SEAD package commander. The preferred airborne assets for assignment as EWC would be the E-3 Sentry (AWACS) or E-2C Hawkeye (AEW).

WTI 1-02 Employment

The EWCC was stood-up in the TACC to provide comprehensive EW coordination between EA-6B Prowlers (EA/ES), EC-130H COMPASS CALL (EA/ES), and Radio Battalion (EA/COMINT). In preparation to man up a TACC EWCC, prospective WTIs from the Prowler, TACC, and AC2W/ISR divisions received specific academic training provided by an instructor from the 563rd Flying Training Squadron (USAF EWO/EWCC training squadron based at Randolf AFB).

Real-time coordination of the airborne EW/C2W assets was accomplished via a dedicated UHF SECURE VOICE circuit (EW COMMON). A secondary HF CLEAR VOICE circuit (EA CONTROL) was utilized to terminate EA in response to CEASE BUZZER or tactical requirements. Coordination with deployed RADBN teams was accomplished via PSC-5 (DAMA) from the teams to the RADBN leader (co-located in the EWCC). Real-time exploitation and targeting were routed from the deployed RADBN teams to the airborne C2W/EW assets via EW COMMON.

Additional staffing controls were provided with an exercise Joint Restricted Frequency List (JRFL) and published CEASE BUZZER procedures (provided to MACCS, EWCC, and aircrew). Jamming Control Authority (JCA) was assigned to either the EWCC or Prowler lead depending on mission planning and pre-briefed criteria.

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WTI 1-02 Data Points

A number of data points were collected during WTI 1-02. Some of the specifics include:

- dedicated and functioning comm links directly to the TACC/EWCC were difficult to achieve (UHF, HF, SAT-COM).

- HF comms with EA-6B Prowlers was difficult to achieve (typical block 82 HF problems).

- when the comm links worked, COMPASS CALL, EA-6B Prowlers, and RADBN could be dynamically re-tasked to maximize EW employment.

- comm exploitation from RADBN could be turned around for aircrew targeting and attack rapidly (as little as a minute...depending on nodal analysis).

- direct coordination between airborne C2W/EW assets and ground RADBN teams often "cut the EWCC out of the pattern" since information passed from the deployed teams directly to the aircrew could not be monitored in the EWCC.

- the ability of the EWCC to fully integrate EW operations with TACAIR missions was significantly reduced without the support of an airborne EWC.

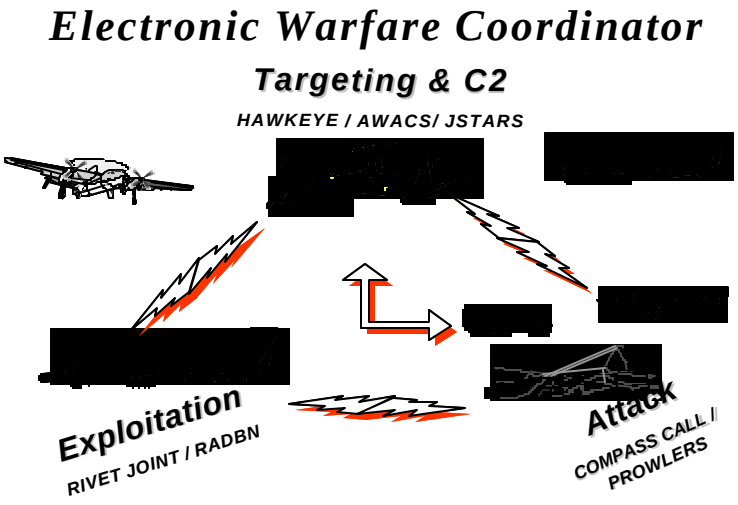
- TACC personnel identified for assignment to the EWCC must hold TS/SCI.

- TACC personnel identified for assignment to the EWCC must receive additional training regarding EW in order to support EWCC requirements (MACCS T&R does not really support the training and expertise required...we're into new territory here).

-national system data should be integrated as a queuing source for dynamic EW tasking.

EWCC During WTI 2-02

Expanded employment of the EWCC/EWC concept is envisioned for WTI 2-02 to include possible employment of the EA-6B Prowler in the airborne EWC role during Marine-only operations. Continued training support from the 563rd FTS is anticipated and AC2W/ISR, EA-6B Prowler, TACC, RADBN, TERPES, and INTEL participants should make preparations to take advantage of composite EW/C2W training opportunities.



MARINE INTRA-SQUAD RADIO I.S.O. MARINE AIR TRAFFIC CONTROL MOBILE TEAM (MMT) QUALITATIVE ASSESSMENT
GYSGT FRAZIER, C3 DEPTARTMENT

The following is an unclassified executive summary of observations of the Marine Intra-Squad radio ISO MATC MMT qualitative assessment conducted by MAWTS-1 during WTI 1-02. The final results of this demonstration will be released in an unclassified format. To obtain a copy of the final report, please refer to the contact information at the end of the article.

During WTI 1-02, Marine Air Traffic Control Mobile Team (MMT), incorporated and conducted a Qualitative Assessment of the Marine Intra-Squad Radio (ISR) in support of Tactical Landing Zones, Helicopter Landing Zones, and Forward, Arming and Refueling Points. The basic operational characteristics of the Marine ISR include line of sight (LOS) operation with an operational frequency spectrum of 396.875 – 399.975 MHz, 14 channels with 38 separate codes for each channel. Each channel is assigned a specific frequency within the spectrum. The advertised range of this radio is up to two miles in open terrain. Studies during the course support this claim. The radio produced stellar results for team leader control and coordination of team members during MMT operations. Since the Marine ISR operates in the military UHF spectrum (225-399.975), it alleviates the possibility of interference from the widely used Family Radio Service (FRS) radios. The FRS radios operate in a FCC approved frequency spectrum from 418 to 422 MHz. The Marine ISR UHF-FM operation does not allow communication with aircraft. Headsets with the ability for Push to Talk (PTT) or Voice activated transmission (VOX) can be purchased separately. The VOX option on the headset allows for hands free operation of the radio, which is essential for landing zone set up. The VOX option of the headset was tested for sensitivity to outside noise. Operation of the radio within 50 meters of operating helicopters resulted in no activation of the radio until operator spoke. Normal tone of voice will activate the radio and the ear piece accessory associated with the headset gives the operator security for receiving transmissions by reducing his noise signature. Team members were unable to wear the headset while wearing a helmet but it did not interfere with wearing of soft covers.

The Marine ISR allows 38 separate code selections within each channel selection. This option allows the operator to filter out unwanted transmissions on that channel. The selection of a specific code within a channel will ensure that operators only receive transmissions form individuals operating on that channel and code. The operator should be aware that the code selection does not provide complete security of information within the group. Any individual operating on that channel can receive the transmission. Additionally, selection of a code automatically applies it to all channels. Operators can change channels without losing the group code.

This radio is being incorporated into ground and aviation units. The connectivity provided to units operating in and around landing zones is crucial to ensure proper control and movement of personnel and vehicles operating in close proximity to aircraft.

The ISR yielded positive results during numerous MMT FOB/FARP operations. As a result MAWTS-1 will release a message to the Marine Air Control Group Operational Advisory Group recommend a T/E for the ATC detachment. The suggested change would include no less than 12 Marine ISRs to support two MMTs.

AN/PRC-112B RADIO INTEGRATION WITH THE QUICKDRAW INTERROGATOR
MAJ HARP, ADT&E DEPARTMENT
LCDR BLOW, ADT&E DEPARTMENT
CAPT GLASGOW, CH-53 DIVISION, ASD DEPARTMENT

The AN/PRC-112B survival radio has been in service for several years, yet has not been effectively integrated into MAGTF training. In addition to the voice and beacon modes found in the standard PRC-90 and PRC-112, the PRC-112B also includes the ability to send encrypted databurst transmission of survivor position and text messages to an interrogator known as the AN/PRC-112B QUICKDRAW. There are insufficient assets of both the PRC-112B and the QUICKDRAW to meet the demand of deployed squadrons. Currently 3rd MAW has 55 radios and 2 QUICKDRAWs available to support MEU operations and 35 radios and 1 contingency QUICKDRAW asset available to support OSW requirements. 2nd MAW has a total of 84 radios and 2 QUICKDRAWs deployed with the MEU and 20 radios supporting Operation Northern Watch. OSW and NW SPINS

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require that all aircrew fly with an AN/PRC-112B radio. In response to the high demand, NAVAIR is now involved in buying additional radios and QUICKDRAW interrogators. It is important that sufficient assets are procured to meet the expanding need.

System: The PRC-112B QUICKDRAW is simple to use, requiring only 10-15 minutes of demonstration and practice in order to employ properly. No modification was necessary to the aircraft other than connecting the QUICKDRAW inline to the ICS cord. The display screen and keys were hard to read without adjusting the contrast significantly. Kneeboard design: The strap across the top of the kneeboard interfered with the viewing of information and was thus a minor distraction. Volume knob and box on the side of the QUICKDRAW kneeboard interfered with the collective on the helicopter but did not interfere at all with the aircrew in the EA-6B. Most right-handed pilots fly with actual kneeboards on their right legs and would presumably fly with the QUICKDRAW on their left (thus interfering with collective movement).

Summary of the evolution

Pilots were equipped with the PRC-112B survival radio and the EA-6B and CH-53E TRAP Mission Commander were equipped with QUICKDRAW kneeboards. This allowed for the interrogation of a downed pilot by either the EA-6B or TRAP mission commander in the event the TRAP mission was executed.

An F/A-18 was shot down while conducting a DAS strike on an enemy airfield. Once on deck, the downed aircrew pulled out his PRC-112B and almost instantly his encrypted burst transmission was received by the EA-6B (flying at 25,000 and 30 nm away.) Within six minutes of the downed aircrew's first transmission, his location was plotted as a 10 digit grid by the TACC, 100 miles away.

As the TRAP force launched to find the downed pilot, information was fed to the TRAP Mission Commander that allowed her to localize the position and decide on the course of action and routing to recover the downed aviator, despite the fact that the rescue vehicle (CH-53) did not have line of site to the PRC-112B until 1 km after IP inbound (flying a 50' profile inbound through the terrain).

Data transfer from QUICKDRAW to QUICKDRAW was not successful. Although both QUICKDRAW units were set up properly only the EA-6B got the initial information via the QUICKDRAW data burst. The CH-53 never received the information via the QUICKDRAW, which could be a line of sight issue, and needs to be researched.

Conclusion: The QUICKDRAW will allow for quick location of down aircrew with minimal comms in the clear, which reduces loiter time in the objective area.

Recommendation: MAWTS-1 recommends the purchase of one PRC-112B loader, three QUICKDRAWS and 100 radios per MEU in order to relieve the difficulties involved in cross-decking the system while in theater. The PRC-112B/QUICKDRAW combination should be an integral part of any deployed MEU. It will allow quick response in any downed aircrew scenario and may have long-term implications for TRAP/CSAR tactics. MAWTS-1 will initiate discussion with HQMC on this issue.

HIND/HIP DACT/DM
MAJ ADAMS, AH-1W DIVISION, ASD DEPARTMENT

FSU Adversary Support for Rotary Wing DM/DACT Training

During WTI 1-02, the MAWTS-1 AH-1, CH-53 and UH-1 Divisions had the opportunity to conduct engagements against an actual Mi-24D and an Mi-17 from the Army Test and Evaluation Command in order to validate the tactics practiced during DM and DACT evolutions. The following information is a compilation of the unclassified lessons learned from each community.

(Continued from page 11)

AH-1W Division Lessons Learned:

The AH-1 Division conducted DACT against the Mi-24D HIND. The tactics used by the AH-1 aircrew against the Mi-24 proved very effective. These tactics were developed through a thorough study of the specific excess power and energy maneuverability charts. Additionally, during the academic phase, the students were afforded the opportunity to glean lessons learned from two former MAWTS-1 Instructors who participated in some of the original exploitation efforts conducted in Yuma during the 1990's. DACT qualified AH-1W pilots were used in the front seat of the adversary aircraft in order to ensure that the profiles and line numbers flown by the Hind were in accordance with the MAWTS-1 DACT Manual. When fighting the Hind, the requirement for effective lookout doctrine was validated. During the 2 v 1 engagements, the aircrew who obtained the first tally was more often than not victorious for that specific engagement. Even fighting a large aircraft like the Hind, initial visual acquisition proved difficult, particularly at tactical altitudes. Initial acquisition by the Hind aircrew was almost always caused by excessive movement (rotor flashes, high AOB maneuvering, etc) by the AH-1 aircraft. Additionally, shadow movement over the ground provided cueing for the Hind crew. Air-to-air PGM (Hellfire/TOW) tracking versus maneuvering adversaries proved difficult, but not impossible to obtain. It should be noted that outside of 1 mile, even with a great deal of specific excess power, the Mi-24 could not break the track of the gunner during simulated TOW or Hellfire shots. PGM shots against non-maneuvering (unobserved) adversaries proved very effective. Using the AIM-9 missile proved effective only after "luring" the Hind into a climb, creating a blue sky background situation. This was done very effectively by having the engaged aircraft commence a pre-merge climb while the free aircraft remained low and in position to engage with AIM-9. The key to this type of tactic was ensuring the low aircraft drove the flight and transmitted a break off call prior to engaging with AIM-9 (preventing the engaged aircraft from being inside the missile FOV upon release). Once the AH-1s were above and behind the Hind (post merge), the Hind did not have the ability to disengage and could not see the AH-1s.

CH-53 Division Lessons Learned:

The CH-53 Division conducted DM against the Mi-17 HIND. The PWTIs were able to develop a sound tactical gameplan through an analysis of the Specific Excess Power and Energy Maneuverability charts. During the engagements pilot skill was seen as the largest factor for acquisition and breaking the engagement. Acquisition was very difficult in the terrain around CP Star in the R2507S due to paint scheme and altitudes. The two most difficult line numbers for acquisition of the Mi-17 was the abeam attack and the rear hemisphere due to the aforementioned factors. The camouflage paint scheme blended with the terrain in the 2507S causing acquisition ranges to be well within threat rings of the weapons systems on board the Hip. Even with a very active lookout doctrine and two extra sets of eyes in back, we had difficulties acquiring the adversary, further reinforcing lookout doctrine and aircrew coordination. Also, the Hip crew used the terrain to their advantage, masking and unmasking, giving a very realistic look. Overall, even though it is a large aircraft, the Hip was difficult to acquire but could be maneuvered against to get out of its weapons parameters. The static displays and classes received increased everyone's knowledge of the aircraft and shattered some myths on power margins, maneuverability, and speed limitations.

UH-1 Division Lessons Learned:

Although the Hind is a formidable opponent, solid section tactics with emphasis on mutual support proved to be the key to success for the UH-1N Division. Through multiple encounters the following tactics and trends proved most effective. Prior to the merge, and post tally, it was imperative for the section to rapidly increase separation in order to more readily determine Free and Engaged roles. This tactic also made it more difficult for the bandit to shift from one target to the next in the pre-merge phase. An additional benefit was that the bandit tended to lose awareness of where the Free aircraft was perching. Optimal position for the Free aircraft tended to be roughly 500 feet higher than and turning towards the merging fight. This position enabled frequently unobserved beam to rear aspect diving fire on the Hind during the post merge phase. Meanwhile, the Engaged aircraft needed to maneuver to avoid ATGM shots while maintaining closure with the adversary. Based on the clockwise rotation of the Hind's rotor system, a noticeable advantage existed for the Huey in a right-to-right pass culminating in a right-hand turning fight. Prior to the flight there was a great deal of information gleaned from the static Hind display and through conversations with the pilots. Important point of note is how much armor is utilized throughout the aircraft including the cockpit glass with ballistic tolerance up to .50 cal sized ammunition. Also, even though the aircraft is limited in Angle of Bank with respect to H-1s, the experienced Hind pilot can utilize a number of techniques

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to improve its turn radius including "stomping on the pedals" to bring the nose through the turn more rapidly. Finally, having sat in the cockpit seats, it was apparent that the Hind was extremely limited in its Field of View. In fact, anything past abeam has a good chance of remaining undetected.

Conclusions: MAWTS-1 will continue to bring these assets to the WTI course to expose the PWTIs to this very effective training environment. Through these evolutions we will continue to refine the TTPs designed to win in this demanding environment.

USE OF THE GCP-1B IN THE UH-1N QUALITATIVE ASSESSMENT
LCDR BLOW, ADT&E DEPARTMENT

The following is an unclassified executive summary of observations from the use of the GCP-1B in the UH-1N qualitative assessment conducted by MAWTS-1 during WTI 1-02. The final results of this demonstration will be released in a unclassified format. To obtain a copy of the final report, please refer to the contact information at the end of the article.

The Infrared Laser Pointer (IRLP) has become one of the primary means of detecting targets in the night environment, and possible the most flexible in the FAC/FAC(A) toolbox. Unfortunately the only IRLP authorized for use in the cockpit was the LPL-30 that, with a 16.2 mW output is far too dim to be seen under High Light Level (HLL) conditions. In recent years IRLPs with higher output power have become available. All rotary wing platforms are authorized to use the GCP-2A or GCP-2C (Ground Commander's Pointer) on their Crew Served Weapons.

The IRLP comes in a handheld version (GCP-1B) which at 100mW is visible under all light level conditions, but which comes with a significant eye hazard when used incorrectly. This requires the use of suitable eye protection, appropriate for the 830-850 nm wavelength of an IRLP. For the purposes of this QA, the FV-9 LEP (Laser Eye Protection) was chosen due to its previous performance in other aircraft platforms. During ground testing the FV-9 performed well in the UH-1 cockpit. It was perceived as the "Same as Unaided" in six different areas. No modifications were necessary to any aircraft lighting when the LEP were donned or when they were removed after the assessment.

MAWTS-1 evaluated the GCP-1B in the UH-1N aircraft. During Ground Testing it was found that the cockpit boot design was not suitable. The flexible rubber folded over easily and obscured the IRLP beam or it failed to seal adequately on the canopy. In addition, the boot has a manufactured hole in the side that is left over from the molding process which allows reflected light to leak through the boot and into the cockpit workspace. It also presented significant blooming around the aperture of the IRLP, which would degrade the cross-cockpit visibility of the flying pilot. It was determined that the best in flight configuration would be to use the IRLP by extending it out the window.

Once in use the GCP-1B was found to be a vast improvement over the LPL-30, both in target detection distance and output power. The boot needs to be redesigned before it will be suitable for use inside the cockpit. Even at its significantly higher power level, the GCP-1B can be difficult for fixed wing aircrew to acquire. FAC (A) aircrews are already looking forward to even more high powered devices to enhance control of fixed wing assets in the terminal area.

M3M .50 CALIBER CREW SERVED MACHINE GUN QUALITATIVE ASSESSMENT

CAPT T. L. BAGGETT, ADT&E DEPARTMENT
GYSGT D. R. HAMMER, CH-53 DIVISION, EAD DEPARTMENT

The following is an unclassified executive summary of observations from the M3M .50 caliber crew served machine gun qualitative assessment conducted by MAWTS-1 during WTI 1-02. The final results of this demonstration will be released in an unclassified format. To obtain a copy of the final report, please refer to the contact information at the end of the article.

Mission Needs Statement (MNS) AAS 34.2 identifies the need for an assault support helicopter defensive armament system capable of countering current and predicted threats. The Marine Corps Assault Support (AS) Operations Advisory Group (OAG) has repeatedly identified the need for a replacement for the XM-218 and GAU-16, listing this requirement in the top five at the 2001 AS OAG. The M3M is a single barrel .50 caliber machine gun that is advertised as offering several improvements over similar currently fielded weapons: (1) 1100 round per minute rate of fire, (2) integrated shock absorbing mount, (3) increased mean rounds between failures, and (4) open bolt firing.

During WTI 1-02, MAWTS-1 examined M3M effectiveness and suitability for employment aboard the UH-1N. M3M performance was assessed through qualitative comparison to currently fielded .50 caliber crew-served weapon systems and by comparison to the constraints set forth in the MNS for the common assault support defensive armament system.

A total of 7,518 rounds were fired through five M3M systems. The weapons were employed on a static training mount for initial familiarization and on 15 airborne sorties, both during the daytime and at night. They were operated in flight by seven UH-1N aircrewmen and two CH-46E aircrewmen.

The following conclusions were reached.

- The M3M, with some modifications, can be effectively employed aboard the UH-1N to provide suppressive and destructive fires.

- The M3M satisfies the majority of the requirements set forth in the MNS for a common assault support defensive armament system. The weapon could be modified to meet several of the constraints that it currently does not satisfy. Some constraints appear unattainable with the M3M, specifically the requirement for a selectable rate of fire and the option to operate crew served or fixed-forward, or in a turreted configuration.

- The weapon exhibited excellent reliability, however it was maintained and preflighted by a cadre of technical support personnel from the manufacturer, not by Marines.

- The rate of fire was impressive and the shock-absorbing mount very stable, resulting in a high volume of fire that was accurate throughout the duration of a firing burst once on target.

- The 100 round ammunition magazine, combined with the high rate of fire, resulted in limited duration of suppressive fires. Reload times were significantly greater than those of the XM-218 or GAU-16. Lengths of rounds were repeatedly pulled from the ammunition magazine by the air stream, resulting in stoppages and hazards to personnel and equipment. A 600 round feed systems is available that may eliminate these deficiencies.

- The weapons had no flash suppression system and severely degraded NVG operation. The manufacturer is examining a flash suppression system that may eliminate this deficiency.

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- The suitability/maintainability of the M3M must be examined in a more comprehensive manner in order to determine whether the system can be maintained and logistically supported in the current USMC maintenance concept.

Assessment of the M3M will continue during WTI 2-02, when 20 systems will be on hand for employment aboard CH-46E, CH-53E, and UH-1N aircraft.

USE OF THE RESTRICTIVE FIRE LINE (RFL) IN THE PLANNING AND EXECUTION OF COMBAT ASSAULT TRANSPORT FIRES
MAJ HALE, GROUND COMBAT DEPARTMENT
MAJ JONES, ASSAULT SUPPORT DEPARTMENT

When planning helicopterborne assault operations, a common expressed intent is for this mission profile to provide speed, shock, surprise, and violence of action. A critical component in providing these battlefield effects is the integration of combat assault transport fires during the insert and extract phases of the operation. These fires are usually planned during any given exercise using sectors of fire within the landing zones (LZ) and a weapon control status (weapons hold, weapons tight, or weapons free) enroute and within the landing zones. However, the execution of these fires in training is invariably minimal at best. An overriding shortfall, whether due to misconceptions or lack of clarity, is a hesitancy to employ rotary wing suppressive, non-precision fires in support of ground maneuver.

An additional factor limiting the employment of these fires, is the mindset that the assault helicopter door gun is a defensive weapon system designed to provide reactive defensive fires for the aircraft, aircrew, and cargo only. This mindset does not go far enough in making the most of a very capable weapon system. A high volume of suppressive fire also provides protection for that helicopterborne force in the most vulnerable phases of any helicopterborne operation, namely the transition from air transport to ground maneuver within the landing zone on insertion and vice versa during extraction. The protection afforded comes in many forms: suppressing enemy direct fire weapons, covering the initial maneuver of ground forces, disguising the nature and size of an insertion, and limiting enemy observation of the insertion through the chaos and confusion caused by the fires.

One tool which can be very effective in facilitating the planning and execution of combat assault transport fires is the restrictive fire line (RFL) fire support coordinating measure (FSCM). Doctrinally, as stated in MCRP 5-2A, the RFL is "a line established between converging friendly forces (one or both may be moving) that prohibits fires or the effects from fires across the line without coordination with the affected force." Because of the volume of assets typically devoted to the objective area to support and enable helicopterborne operations, the RFL is a good fit for these type of operations. By using this FSCM, which should be tied to recognizable terrain and/or man-made features, to define where combat assault transport fires cannot be employed within an area of operations, it becomes a relatively easy task to determine where they may be employed. Additionally, as mentioned above, sectors of fire are typically only planned within the LZ itself. By employing RFLs, combat assault transport fires can be defined for the approach to the LZ as well as the egress from the LZ, which are as important as the fires within the LZ itself. RFLs can be employed to protect reconnaissance assets moving within a reconnaissance area of operations (RAO) vice static observation posts, additional helicopterborne forces in nearby LZs, as well as restricting fires in an urban environment, and clarifying enroute fires while still facilitating vital suppressive fires.

Combat assault transport fires are an underutilized yet vital component of helicopterborne operations. The RFL enhances the integration of these fires in planning and execution to achieve the speed, shock, surprise, and violence of action we must have for effective helicopterborne operations. MAWTS-1 will continue to evaluate the effectiveness of using RFLs in support of helicopterborne operations. Additional assessments will be conducted during WTI 2-02. The results of this training and conclusions drawn will be captured in the spring edition of the Eagle One.

IMPLEMENTATION OF TAWS 2.3/NOWS 6.1/AREPS 2.0
CAPT BOHANNON, WEATHER OFFICER, AGS DEPARTMENT

Background

WTI 1-02 saw the implementation of the latest upgrade build in TAWS 2.3, (Target Acquisition Weather Software), NOWS, (Night Vision Goggles Weather Software), and AREPS 2.0 (Atmospheric Refractive Electromagnetic Prediction Software). The primary purpose of the TAWS 2.3 software is to provide a performance prediction of the maximum effective range of aircraft weapon sensors in a given environment. NOWS 6.1 software is closely related to TAWS 2.3 in that it provides a range capability of night vision devices against various targets in a given environment. NOWS 6.1 software also provides range capabilities of enemy night vision devices. Finally, AREPS 2.0 provides a capability that gives the warfighter information as to how both friendly and threat platforms would perform in a given environment. The meteorological environment is a major consideration in how effectively we can employ the sensors of our weapons systems. The requirement to effectively integrate this software into the WTI tactical scenario was paramount in that it provided personnel with a unique capability in receiving a performance prediction of the weapon sensors, NVG devices, and friendly and threat platform capabilities prior to mission execution. All the above mentioned software provides a rich data base for consideration for tactically employed weapon systems, navigational systems, and friendly and threat platforms.

-Specifically TAWS 2.3 provided performance predictions in maximum detection range of all fixed and rotary wing sensors assigned to WTI 1-02.

-NOWS 6.1 primarily provided output ranges for the ANVIS 6, ANVIS 9, and PVSA-5.

-AREPS 2.0 provided performance capability and ranges for a wide range of friendly and threat emitters and platforms during WTI 1-02.

WTI 1-02 Employment

The above mentioned weather related software was effectively integrated into both the planning and execution phase of WTI 1-02 during operations listed below;

-During the Student/Instructor Flight Phase
-During the Common Flight Phase
-During all Major Flying evolutions
-During all ground and tactical evolutions where TAWS 2.3, NOWS 6.1, and AREPS 2.0 software could be employed.

The primary goal was to provide the aviation community with the best performance prediction ranges for the assets employed against various targets. Overall, the software provided excellent to satisfactory range predictions. Weather was not a factor during the course since flying conditions were excellent. The software was integrated into the tactical scenario during the WTI 1-02 in a variety of scenarios. Real time performance predictions were provided and what we found was interesting. For example, while using TAWS 2.3 for both fixed and rotary wing assets, the software had trouble with the FLIR systems in the narrow field of view. These ranges were typically farther than what is considered realistic. Wide field of view provided realistic detection ranges. Laser sensors were generally accurate no matter what sensor provided output. We noted for TV systems that the ranges provided were satisfactory. The AV8 LTD or Litening POD provided detection ranges that were inaccurate even in the best weather. During several occasions while employing the NOWS 6.1 software, the PVS-5 yielded a greater distance than the ANVIS-9 NVG device could actually detect, which is completely unrealistic. AREPS 2.0 performed well and there were no noted deficiencies.

WTI 1-02 Data Points

A number of data points were collected during WTI 1-02. Some of the specifics include:

- TAWS 2.3 should be used as a planning tool and consideration only. The software uses specific temperature parameters only to determine output. Aviators should not expect exact detection ranges when the programs consider 50 percent detection only.

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-TAWS 2.3 provided unrealistic FLIR detection ranges for the F-18 FLIR, AV8B FLIR, and NTS FLIR in the narrow field of view. Until the software in corrected and upgraded, it is suggested that the narrow field of view not be used.

-TAWS 2.3 presented a problem with the system default when using F/A 18 LTDR. When using mode 1 to compute the receiver range, the final product yielded the incorrect designator range that in turn provided the incorrect output range required. It is a default parameter error since 9.1 miles is considered each time. This will be corrected in the next upgrade due December 5th 2001.

-NOWS 6.1 consistently provided greater view ranges for the PVS-5 in comparison to the ANVIS 9 NVG system. The PVS-5 is a second-generation set of binoculars used by enemy forces. The output ranges are not realistic considering the generation model and the capabilities of the ANVIS 9. Conclusions drawn suggest that the amount of lunar illumination, location of the moon in reference to the target, and the moon's degree of azimuth above the horizon are all considerations that may aid in determining why this occurs. A review of the output by the NOWS program is being completed and results will be sent to the program manager. The next upgrade to this software should contain corrections.

-AREPS 2.0 provided realistic atmospheric views as to the state of the atmosphere. Better than 80 percent of the time during the major evolution phase, super refractive conditions were observed. This marginally degraded the capability of the TPS-59 and TPS-73 radar systems.

-METOC personnel identified the need for two additional sensors for the TAWS program. TAWS 2.3 does not support sensor systems for the ATARS or the UH-1 Bright star FLIR systems. These sensors will be included into the next build for the TAWS program. Both sensors will be used during WTI 2-02.

-MAWTS-1 personnel have contacted NRL (Naval Research Lab) and other agencies connected with the development of the above mentioned software. The primary concerns are the parameters required to build the database for the additional sensors. MAWTS-1 will continue to work with agencies to ensure requested sensors are added into the software database. Implementation should be complete by February 2002.

METOC LEAD

Expanded employment of the TAWS 2.3, NOWS 6.1, and AREPS 2.0 is anticipated for WTI 2-02.

TRS-TO-IOS CONNECTIVITY
MAJ SHARP, INTELLIGENCE DEPARTMENT

During the conduct of WTI 1-02, the intelligence dissemination architecture included both data and voice capabilities for passing intelligence throughout the Marine Air Command and Control System (MACCS). Tactical Data Processors (TDPs) connected to the MACCS data network formed the backbone of the intelligence dissemination system. The MAWTS-1's Intelligence Operator Server (IOS) served as the focal point for building the intelligence picture of the enemy situation, as well as, the friendly situation and pushing that information to two Intelligence Operator Workstations (IOWs). The IOW terminals were geographically dispersed to the Tactical Air Command Center (TACC) and Tactical Air Operations Center (TAOC), and were linked together via the SIPRNET. This configuration provided the students and augments keen situational awareness throughout each evolution.

In addition to SIPRNET connectivity, the TACC maintains the Commander's Tactical Terminal (CTT). The CTT is a tactical receiver designed to receive intelligence/information broadcast (e.g., TRAP Data Dissemination System (TDDS)/Tactical Information Broadcast Service (TIBS)) data for display on workstations within the TACC via its organic Multi-source Correlation System (MSCS). An example of the data that is supposed to be displayed through this configuration is theater ballistic missile (TBM) warning information. In past WTI evolutions, this hardware configuration has not proved to be a reliable vehicle for displaying TBM threat-warning information. As a preemptive measure, MAWTS-1, with the help of Mr. Tim Estes (NRO/OSO field representative), established a data connection between the MAWTS-1 Tactical Receive Equipment (TRE)/Tactical Receive

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Segment (TRS) and the IOS in addition to maintaining the connectivity to the Generic Area Limitations Environment (GALE)-Lite for ELINT exploitation.

This first-time-tried connectivity proved to be an overwhelming success. The tactical information pushed to the IOS from the TRS was instantaneously pushed to the geographically dispersed IOWs providing near-real-time indications/threat warning. In several instances, where a TBM event was received by the TRS from the TDDS broadcast, this connectivity provided the only indication within the MACCS system that a threat event had occurred even though the MACCS had a commander's tactical terminal (CTT) broadcast receiver within the TACC and, in theory, had the same capability to receive and display the threat information as the TRS-to-IOS-to-IOW connection did.

Two shortfalls were identified with the TRS-to-IOS configuration. The first shortfall stemmed from the large number of "unidentified" ELINT reports that appeared on the IOS terminal. In order for IOS to properly display ELINT contacts, those contacts must be sent in an OTH-Gold format. MAWTS-1's TRS currently hosts the Standard Tactical Receive Equipment Display (STRED) software version 6.4, which does not have the ability to create the required OTH-Gold format. However, the newest release of STRED (version 7.0) reportedly possesses the required message format conversion capability. MAWTS-1 is in the process of acquiring the new software in order to enhance the future operational capability of the TRS-to-IOS connection. The second shortfall was the lack of an audible alarm on the IOS/IOW terminals to indicate that a threat event had occurred. Because of this shortfall, there were several instances where the IOS/IOW operator(s) missed a TBM launch indication because the operators attention was focused on another task. This shortfall could be easily overcome by attaching a set of external speakers to each of the workstations.

Establishing connectivity between the IOS and a tactical receiver proved to be an excellent method of ensuring that threat information was passed throughout the MACCS in a timely manner. Although MAWTS-1 utilized the TRS broadcast receiver, this connectivity should be possible with any tactical receiver (e.g., CTT, JTT (Joint Tactical Terminal) or any other similar tactical receiver).

VMU DYNAMIC RETASKING
MSGT BONNER, UAV DIVISION, C3 DEPARTMENT

Marine Unmanned Air Vehicle Squadron 2 (VMU-2) participated in the several Time Critical Targeting and dynamic re-tasking operations during WTI 1-02. During the planning stage for each evolution the student planner was tasked with integrating the Pioneer Unmanned Air Vehicle (UAV) into a tactically viable mission related to the evolution's simulated concept of operations. As a white force, Marine Aviation Weapons and Tactics Squadron 1 (MAWTS-1) Instructors planned to re-task the Pioneer while performing a mission as directed by the Air Tasking Order (ATO). The VMU-2 Mission Commander was directed to re-task the Pioneer in order to locate mobile targets, artillery, and personnel on the ground. Once the target was located, the VMU-2 Mission Commander would obtain the target's coordinates and pass them to a designated agency.

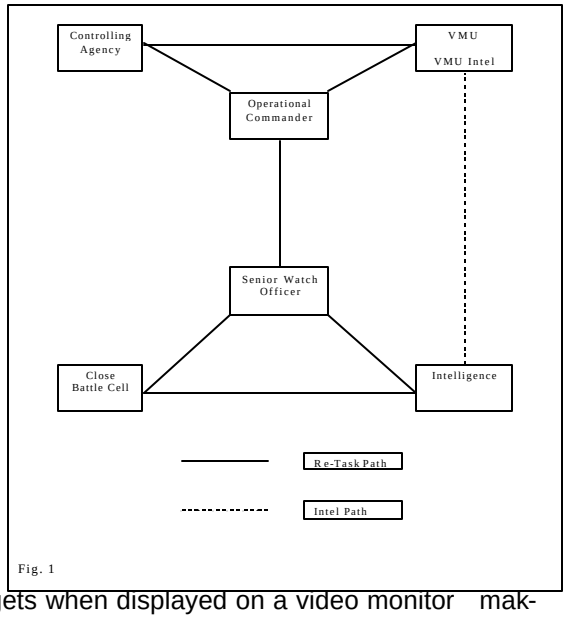

Fig. 1

The Pioneer UAV proved capable of being dynamically re-tasked to located Time Critical Targets within the limitations of the system's performance characteristics which include, Line of Sight (LOS) limitations when operating near mountainous areas or long distances from the Tracking and Communications Unit (TCU), the altitude flown to maintain LOS may lessen the resolution of targets when displayed on a video monitor making it difficult for the Payload Operator (PO) and Intelligence personnel to locate targets on the desert floor, and the time required to fly to a new target area. When using the Pioneer UAV for dynamic re-tasking, commanders should be reminded of such limitations associated with long-range operations with the Pioneer UAV.

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There was friction associated with these operations that had not been previously experienced by the VMU or other agencies involved in the operation. When participating in an operation in support of the MAGTF commander, the VMU is required to maintain communication with a controlling agency and either direct or indirect communication with the supported agency. In the case of these re-tasking operations during WTI 1-02 the VMU maintained communication with the Direct Air Support Center (DASC), for procedural control of the UAV's movement through the Objective Area (OA); and the Tactical Air Command Center (TACC), to ensure tactical communication with the Tactical Air Commander (TAC), Senior Watch Officer (SWO), Close Battle Cell (CBC), and the Intelligence Watch Section (IWS). Friction arose when the VMU was tasked by multiple agencies during the same operation to provide imagery and data in different areas of the OA. The IWS, communicating with the VMU's intelligence section, requested UAV movement and the TAC, communication with the VMU's Mission Commander, requested UAV movement both in response to the rapidly changing tactical situation. In addition, the DASC would move or restrict UAV movement within the OA in order to maintain procedural separation from other aircraft. All of this input from outside agencies created a fog within the UAV Ground Control Station (GCS) that the Mission Commander had to work through, and in the end, only provided limited support to the MAGTF commander because information did not flow in a coordinated manner.

During the planning phase, the UAV planner addressed communication requirements with each individual agency. However, in practical application, friction arose when these agencies began to develop conflicting requirements as the tactical situation began to unfold; each agency pressed the VMU Mission Commander to satisfy their individual information requirements. Divert authority was given to the DASC, but the DASC was unaware of the needs from the TAC and IWS personnel. Therefore, three different agencies were directing the UAV Mission Commander to fly in three different directions for three different reasons.

In order to facilitate the effective re-tasking of UAV operations a single authority must be appointed as the sole agency responsible for coordinating with both the UAV Mission Commander and the UAV's controlling agency. Each agency must be aware that the UAV is being re-tasked. The UAV Mission Commander and the controlling agency can then ensure the UAV is re-directed in the most efficient manner for that event.

EA-6B EW IN SUPPORT OF AV-8B CAS OPERATIONS

MAJ SOFGE, AV-8B DIVISION, TACAIR DEPARTMENT
CAPT NOTHELFER, EA-6B DIVISION, TACAIR DEPARTMENT

BACKGROUND

For the second consecutive WTI course, the first integrated flight for both the EA-6Bs and AV-8Bs was the Electronic Warfare in support of Close Air Support (EWCAS) evolution. The purpose of the flight is to demonstrate the tactical utility of proper EWCAS techniques. The EWCAS techniques are flown by EA-6Bs to combat surface-to-air threat simulators attempting to engage CAS aircraft delivering inert ordnance. While the technique itself is not new, the learning opportunities afforded by the training ranges and threat system simulators provided excellent feedback to both communities.

ELECTRONIC WARFARE IN SUPPORT OF CLOSE AIR SUPPORT (EWCAS)

EWCAS was designed primarily to address the emerging threat presented by mobile surface-to-air threats that are not destroyed in the early stages of hostilities. EWCAS is essentially force protection. The technique is used by EA-6Bs in support of fixed-wing CAS assets flying in close proximity to known/probable surface-to-air threats. By maintaining situational awareness of the location/profile of CAS assets and surface-to-air threat locations, EA-6Bs strive to keep CAS aircraft "aligned" between themselves and the threat. By maintaining alignment while jamming radar organic to the threat systems, radar operators will be unable to effectively engage the CAS aircraft.

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EVOLUTION SCENARIO

The EWCAS flight evolution involved two specific flight windows – one in the morning and one in the afternoon. During each window, one section of EA-6Bs supported multiple sections of AV-8Bs over a 1½-hour period. With a TACP team from the GCD providing positive control, AV-8Bs practiced low- and medium-altitude deliveries against targets in the Urban CAS Training Range (Yodaville) using inert rockets and laser-guided training rounds (LGTRs). As part of the scenario, (notional) enemy forces were protected by mobile SAMs, which were cued by an early warning (EW) radar. The EW radar was a new addition to the Yuma Tactical Training Range. To more accurately simulate realistic employment, the EW radar operators were given a series of radio frequencies that they could use to cue the threat simulator operators who had moved within the vicinity of the CAS targets. EA-6B PWTIs were presented with a mission-planning problem: prevent cueing to SAM operators by jamming the EW radar and by selectively jamming the communications nets used by the EW operators, thereby forcing SAM operators to act autonomously in order to engage CAS aircraft. The EA-6B crews could then expect to reactively suppress any surface-to-air threats that might attempt to autonomously engage the AV-8Bs.

Flight Execution

One section of AV-8Bs executed their morning sorties as scheduled, with only one EA-6B on-station to support. During the afternoon window, a division of AV-8Bs were supported by two EA-6Bs. Judicious use of radar and communications jamming proved very successful during the morning flight evolution. When jammed, radar operators could not build a recognized air picture on the display, and could not communicate to threat system operators when their radios were jammed.

While the AV-8Bs repeated multiple runs from low- and medium-altitude in the afternoon, different tactics were employed by the section of EA-6Bs during the second flight window. Wideband radar jamming proved to be a problem for EA-6B aircrew due to the real world electromagnetic interference (EMI) it placed on local ATC radar. In addition, all communications nets were jammed concurrently, instead of selectively.

LESSONS LEARNED

The EWCAS evolution proved to be very successful from a learning perspective. EW targeting is key to effective EA-6B employment. Proper EA-6B alignment with CAS assets is important for radar jamming effectiveness. Maintaining that alignment becomes very difficult when two or more aircraft attack similar targets from different directions over a short time period. In such situations, the necessity to deny effective cueing, therefore, becomes critical. Selective narrowband jamming during key periods of the engagement process proved successful. That success was further improved when it was coupled with communications jamming in an effort to force threat operators to chatter mark while trying to acquire, locate, and engage targets.

Radar and communications jamming must be viewed as a form of fires, and therefore integrated with other fires. The problems with EMI demonstrated how important thorough pre-mission planning is to EW targeting. In addition, the most successful electronic attacks against enemy EW, threat, and communications systems occurred when integrated simultaneously with the attacking CAS aircraft.

TIME CRITICAL TARGETING
MAJ DOBSON, ADT&E DEPARTMENT

The following is an unclassified executive summary of observations from the Time Critical Targeting Tactical Demonstration conducted by MAWTS-1 during WTI 1-02. The final results of this demonstration will be released in classified format. To obtain a copy of the final report, please refer to the contact information at the end of the article.

During WTI 1-02, MAWTS-1 conducted a tactical demonstration (TACDEMO) of time critical targeting (TCT). The purpose was "using assets organic to a Marine Air Ground Task Force (MAGTF), operating under a larger Joint Force Commander (JFC), develop the Tactics, Techniques, and Procedures (TTPs) to rapidly and accurately target threats of a time critical nature and determine the effects of this targeting." Equipment used in this TACDEMO included FA-18D aircraft outfitted with the Advanced Tactical Air Reconnaissance System (ATARS) and Radar Upgrade 2 (RUG2), the Common Imagery Ground/Surface Station (CIG/SS) (a precursor to the Tactical Exploitation Group (TEG)), and the Squadron Ground Station (SGS). Cueing assets included the EA-6B ICAP II onboard system, Pioneer UAV, and Joint Surveillance Target and Reconnaissance System (JSTARS). The TACDEMO consisted of four phases: 1) Validate TCT Connectivity/Time Lines/C2 Management/Hardware/Software integration; 2) IDF Kill Chain TTPs; 3) Mobile SAM/EW radar Kill Chain TTPs; 4) Evaluate TCT Kill Chain process while ACE tasked with executing the 6 functions of Marine Aviation and TMD Attack Ops. The target set included stationary targets for phase 1, an artillery battery for phase 2, a Roland and TPS-63 for phase 3 and 4, and a SS-21 simulator for phase 4. The lessons learned will be broken down into 5 functional areas: 1) general lessons learned, 2) ATARS specifics, 3) CIG/SS specifics, 4) SGS specifics, and 5) Intelligence specifics.

Overall, the TACDEMO consisted of 21 events with 23 sorties scheduled and 21 sorties flown. During the TACDEMO, ATARS imaged 90 SAR images, 37 Medium Altitude Electro-Optic (MAEO) images, 14 Infrared Line Scanner (IRLS) images, and 3 Low Altitude Electro-Optic (LAEO) images. Twenty of the 21 sorties flown involved data linking imagery, with the primary area of focus being SAR imagery. 131 attempts were made to data link the SAR images taken. There is a known software bug with the ATARS data link system that causes sporadic data link operation with mixed imagery operations, i.e. one recorder initialized as SAR and the other as ATARS (EO or IR)[1]. Flying mixed mode configurations, 25% of the SAR images data linked were actually received in a useable format (24 out of 95). When changing to single mode operations, i.e. SAR/SAR, the percentage of successful data linked images went up to 47% (17 out of 36). The percentage of SAR images not received, 75% and 53%, were for a number of reasons: delayed data link acquisition, data link clocks not synchronizing, imagery being received by the Common Imagery Processor (CIP) but not being displayed on the screener software, and general hardware failures in the CIG/SS and ATARS. While the CIG/SS was absolutely necessary to carry out this TACDEMO at this time, but components of the system are very fatigued and in need up an upgrade. With a newer system, such as the TEG, the failure rate could be reduced based upon our observations.

While SAR is the only imaging means that is all weather, it is not a universal solution. SAR by itself may not be sufficient identification means, depending on theater rules of engagement. The TACDEMO generally provided a second means of confirmation for all targets such as corresponding ELINT hits, artillery shell tracking, UAV video footage, Theater Ballistic Missile (TBM) route of flight analysis, or JSTARS cueing of a rotator/mover.

ATARS Lessons Learned

There currently exists no means to indicate to the ATARS aircrew where the data link antenna is pointing. This complicated troubleshooting during the initial stages by not allowing for the elimination of potential problems. Solutions to this problem include an antenna pointing indicator or a means to manually bore site the antenna. Another problem for ATARS are the tapes themselves. While originally chosen for their capacity to record a large amount of data at a high speed, the tapes are very environmentally sensitive, often requiring as much as 30 minutes cooling time before they can be put into the Squadron Ground Station for ground processing. Airborne, the tapes complicated the ability to pass specific images to the ground station via the data link. If aircrew determined images 6 and 8 to be useful and decided to send them to the ground station,

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the options are to send images 6, 7, and 8, or to send image 6, break the data link, reestablish the data link, and send image 8. By converting ATARS and the ground stations to some form of digital media, the environmental and data management problems could be greatly reduced[2] .

Because of limitations on both ATARS and the ground side, detailed mission planning and airborne record keeping are critical for timely exploitation of images. With waypoints, reconnaissance points, and automatic and manual events to track, a well thought out information management plan for the ATARS aircrew is a requirement. Failure to do so will result in delays during ground station exploitation. Aircrew have the ability to view ATARS imagery in the cockpit, and are therefore able to determine airborne which images are of good quality and a priority to data link. There is, however, no ability to view SAR images in the cockpit. This lack of ability, coupled with the added complexity of data linking SAR images, contributes to the generally poor showing of useful SAR images at the ground station.

While TAMPS simplifies the pre-mission planning problem by providing a relatively easy to use interface, TAMPS labels input during preflight planning are not visible in the cockpit. Therefore, the aircrew information card must include the different planned missions and corresponding mission numbers.

An additional issue is the lack of full integration between the Reconnaissance Management System (RMS) and the FA-18's Inertial Navigation System (INS). While aircrew can view ATARS imagery in the cockpit, there is no capability to make a system designation off of ATARS imagery. Also, the RMS will only accept Cartesian coordinates (DD MM SS) for Pre Briefed target images while the INS will accept both Cartesian and Military Grid. Additionally, while more precise cueing may be available (DD MM SS.ss), this cueing must be truncated when input into the RMS.

Finally, errors in the Hornet inertial navigation solution are carried down through the imaging process. The RMS images an area based on a range and bearing from the aircrafts position. If the aircraft position is off, the area on the ground imaged will be off the same amount. Given the small size of SAR spots, this can be a major concern. One means do determine fine deviations in the imaged area, and save the time of additional image runs and data link attempts, is to provide the aircrew the ability to review SAR images prior to transmission.

CIG/SS Lessons Learned

As far as the CIG/SS is concerned, lessons learned will be restricted to those that have applicability to the TEG. First, the CIG/SS antenna must have a precise means of location and orientation. CIG/SS has neither a GPS nor a reliable aiming means. The CIG/SS was located via a GPS receiver (Latitude, Longitude, and Elevation) and was sited in using the sight glass shooting azimuths to known points. TEG addresses part of this problem by incorporating a GPS in the antenna system to precisely locate the system. There is still a requirement for orienting the antenna to either magnetic or true North.

A data link control point aided data link operations, particularly long-range links. When data links were to be attempted beyond UHF communication means, a point was established to give the CIG/SS personnel a place to focus the antenna and wait for the data link's RF energy. Coordination must include a predetermined altitude and imagery type anticipated as well as an estimated time of data link. On one occasion, the aircraft data link RF was received from 120 miles out, while UHF communications were not established until 75 miles out.

One thing that hampered the time critical targeting process is the naming convention used by the Common Imagery Processor (CIP). It is an unintelligible string of approximately 20 characters with no discernable pattern to distinguish one name from another. Because of this poorly conceived naming convention, screeners are forced to open all images as they come down, searching for the one that looks like the correct image. This problem is exacerbated by the tape problem discussed in the ATARS section that requires aircrew to transmit all images in a sequence or terminate and reestablish the data link. With TEG, this problem will be even more convoluted due to the six-workstation configuration, all pulling off of a single CIP. There is currently no reliable means to easily give the files meaningful names by the screener in order to facilitate more rapid processing by the remaining workstations.

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One problem peculiar to CIG/SS is the server configuration. In CIG/SS, the network uses two servers, each of which processes successive images of a SAR strip. With a one-processor failure, the SAR strip shows up as alternating stripes of data with blank stripes in between. Because of the two processor, parallel configuration of TEG, this problem should be eliminated. Additionally, the CIG/SS was configured with one screening and 2 exploitation workstations. During the TACDEMO, MAWTS-1 added a single mensuration workstation and planned to add an additional mensuration workstation. After further analysis, MAWTS determined that what was required for TCT was not additional mensuration workstations, but rather additional screening and exploitation workstations. TEG should address this problem by having six workstations that can be configured to exploit, screen or mensurate.

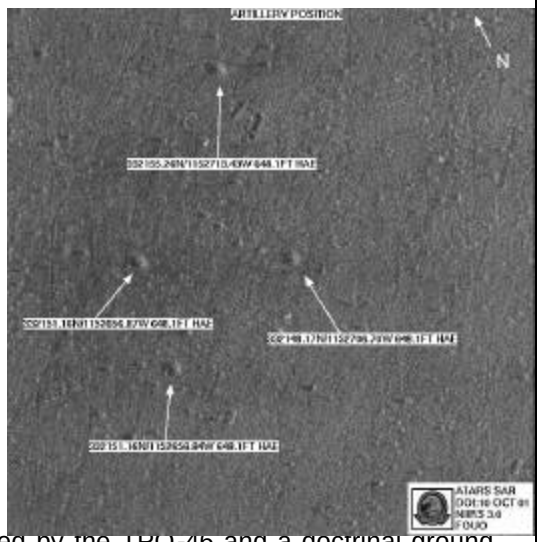
Squadron Ground Station Lessons Learned

With regards to the Squadron Ground Station, the first and biggest issue is the sensitivity of the 19 mm tape. If they are put into the SGS tape machine without adequately cooling, the tape heads will crack. This cooling process alone adds at least 10 minutes and up to 30 minutes to a process that is already too long. A second problem that hampered SGS operations is a known software bug which caused the system to periodically lock up. While the causes of the lockup are not well defined, Raytheon Corporation seems to have identified the problem.

In order for the SGS analysts to be effective, a face to face debrief with the aircrew is essential. This includes a description of the areas imaged as well as a description of anticipated targets. Finally, if anyone other than the ATARS squadron is going to gain useful information from the processed tapes, bandwidth and a communication means is required. The SGS currently has no mensuration capability, so there is a requirement to transmit "clipped" images to an agency with mensuration capability. Alternatively, the tapes can be dropped off to a Joint Service Imagery Processing System (JSIPS) or downloaded and burned to a CD in order to be hand carried to a mensurating point. Further exacerbating this problem is that SGS is not certified to operate on the SIPRNET, forcing data dissemination via removable electronic media, i.e. compact disc. This process adds between 30 minutes and up to 4 hours, depending on the mission length and imagery file sizes.

Intelligence Lessons Learned

Finally, with intelligence processing of the imagery, there were a number of lessons learned. First, with Raindrop 3.2 mensuration software, there was a very specific screen resolution and software configuration required which hampered the initial attempts to integrate the Raindrop system with the CIG/SS and MAWTS-1 Unix based systems. With technical support from PRB-Grumman, this issue was eventually resolved. Additionally, because of the configuration used, there was very little integration between the various software suites. Images were simply passed using a file transfer protocol (FTP) from one software suite to another. Lastly, the Raindrop mono image window would be greatly improved with a means to display a coordinate system over the image. This requirement is perhaps peculiar to TCT, where being able to pick out a single point from cueing is essential.



Beyond software lessons learned, a number of exploitation issues also became apparent. First, it was very easy to locate the artillery using both SAR and MAEO. This was due to a number of things, not the least of which were the accuracy of the cueing provided by the TPQ-46 and a doctrinal ground layout (readily identified in both SAR and MAEO images). When relying on assets organic to the MEF alone, the Roland was never found within a time window that would have gotten bombs on target prior to the Roland displacing. When the scenario

included JSTARS (operations under a JFC), the cueing effectiveness improved greatly and showed tremendous

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promise to streamline the entire process. In order to increase the effectiveness of TCT efforts, teams must conduct a complete intelligence preparation of the battlefield, studying not only No-Go/Slow-Go terrain, but specifically which roads the mobile SAM is likely to use, units that doctrinally would possess the SAM, and where in those units the SAM would be doctrinally employed. This analysis must also include all known sensors and their anticipated effectiveness against the sought target. Finally, teams must have situational awareness as to aircraft ordnance loadouts, time on station remaining, and time-space-distance relationships to the desired target area. During the TACDEMO, the ATARS aircraft were loaded out with notional JSOW in order to facilitate rapid targeting of developed targets. This configuration, if applicable to the theater, greatly reduces the time from completion of mensuration to bombs on target due to the aircrew's familiarity with the targeted area.

The TACDEMO final report will include more specific information as well as any classified information omitted from this article. Anticipated publication date for this report is December 1, 2001. To request a copy of the final report, please e-mail Major Oneto at onetotj@mawts1.usmc.smil.mil. Include a secret mailing address for your command as well as a number where you can be reached. The report will also be posted on the MAWTS-1 SIPRNET web site: http://www.mawts1.usmc.smil.mil.

Footnotes

[1] DT/OT Transition Report, NAWCADPAX/DTOT-2001/26, pg. 10.

[2] Briefed as a proposed change to the October Marine Air Board by LtCol R. Jones, APW.

MAWTS-1 SUBJECT MATTER EXPERT'S
DSN (269-XXXX) COM (520) 269-XXXX

SUBJECT	P.O.C.	EXT
RF SAMS:	Capt Suggs	2643
IR SAMS:	Maj Jones	3469
AAA Threat:	Capt Abrams	2968
F/W Threat:	Maj Bergad	2276
R/W Threat:	Maj Watkins	2582
Surface to Surface:	Capt Gros	3359
UAV Threat:	Capt Gros	3359
Threat IR AAMs:	Maj Leiblein	5302
Threat RF AAMs:	Maj Bergad	2276
TOW:	Capt McKay	3361
Hellfire:	Maj Watkins	2582
HARM:	Maj Bergad	2276
JDAM/JSOW:	Capt Rowell	2276
Maverick:	Maj Sofge	2752
LGBs:	Maj Bergad	2276
Cluster Munitions:	Capt Rowell	2276
Conventional Ord:	Maj Sofge	2752
Reactive Wpns:	Maj Sofge	2752
Fuzes:	Maj Huff	2024
AIM-9:	Maj Leiblein	5302
AIM-7	Maj Boyles	6025
AIM-120:	Maj Palmer	2527
M61A1/2:	Maj Reed	5303
APG-65/73:	Maj Wadsworth	3668
	Maj Sofge	2752
FLIR/LDT:	Maj Wadsworth	3668
ALE-39:	Capt Abrams	2968
	Maj McPhillips	2498
ALE-47:	Maj Pappas	2008
ALR-67:	Maj McPhillips	2498
ALQ-157:	Maj Jones	3496
ALQ-164:	Maj McPhillips	2498
APR-39:	Capt Abrams	2968
APR-44:	Maj Harp	2684
RSEAD:	Capt Suggs	2643
Self Escort Tactics:	Maj Bergad	2276
TACP:	Maj Palmer	2576
TAC(A):	Maj Bergad	2276
NVDs:	LCDR Blow	3652
Urban CAS:	Maj Adams	3361
TRAP:	Capt Glasgow	2133
ROE:	Maj Reimer	5773
NEO:	Capt Gillard	2199
RWC2/ASC(A)	Capt Baggett	3681
TBFDS:	SSgt Wright	3363

INSTRUCTOR STANDARDIZATION

DIVISION	P.O.C.	EXT
NSI:		
AH-1:	Maj Hackett	2967
UH-1:	Maj Jordan	2132
CH-53:	Capt Abrams	2968
CH-46:	Capt Woods	3469
AV-8B:	Maj McPhillips	2752
FA-18:	Maj Huff	2024
KC-130:	Maj Patrick	3547
ACTI/DMI/DACTI/DEFTACI:		
AH-1:	Maj Adams	3361
UH-1:	Maj Wise	2132
CH-53:	Capt Bridgewater	2133
CH-46:	Capt Grenier	2199
AV-8B:	Maj Woodard	2752
FA-18:	Maj Lieblein	5302
KC-130:	Maj Patrick	3547
EA-6B:	Maj Bew	3573
LATI:		
AV-8B:	Capt Huber	2752
FA-18:	Maj Leiblein	5302
KC-130:	MajPatrick	3547
FAC(A)I:		
AH-1:	Maj Moore	3361
UH-1:	Maj Darby	2132
FA-18:	Maj Bergad	2276

EAGLE ONE

COMMANDING OFFICER
MAWTS1
PO BOX 99200
YUMA AZ 85369 9200

MAWTS-1