(U) Unmanned Aerial Systems (UAS) Integrated Operations in Support of Regional Command Southwest (RC (SW))

4 October 2011

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Executive Summary

(U) **Purpose:** To inform Deputy Commandants (DCs) Aviation, Combat Development and Integration (CD&I), Plans, Policies, and Operations (PP&O), Installations and Logistics (I&L), Commanding General (CG), Training and Education Command (TECOM), Director of Intelligence, operating forces, and others on results of a Marine Corps Center for Lessons Learned (MCCLL) collection conducted April - May 2011 to document lessons and observations regarding unmanned aerial systems (UAS) operations in support of Regional Command Southwest (RC (SW)) during Operation Enduring Freedom (OEF).

Bottom Line up Front

(U//FOUO) The RQ-7B Shadow UAS employed by the Marine Corps is a U. S. Army program of record. Because it is an Army program the Shadow has very high frequency (VHF) but no ultra-high frequency (UHF) retransmission capability. UHF is the primary means of communication between key elements of the Marine air command and control system (MACCS), airborne Marine Corps aviation assets, and Marine joint terminal attack controllers (JTAC) and forward air controllers (FAC). Developing a UHF retransmission capability for an organic USMC UAS was regarded as a primary need.

(U//FOUO) USMC units were dependent on joint assets for armed UAS missions and competed with virtually every other combat unit in OEF to schedule armed UAS sorties. Developing an organic armed USMC UAS was regarded as a priority.

(U//FOUO) Third Marine Aircraft Wing (MAW) Forward (Fwd) conceived and initiated a staff organization called the Marine air ground task force (MAGTF) Aerial Reconnaissance Coordination Cell (MARCC). The intent of the MARCC was to ensure that all aviation combat element (ACE) intelligence, surveillance, and reconnaissance (ISR) capabilities, manned and unmanned, were coordinated and employed to maximum effectiveness.

(U//FOUO) The establishment of the MARCC initially generated operational friction between the RC (SW) ACE and the ground combat element (GCE). The ACE regarded the MARCC as a more efficient means of conducting command and control of ACE assets. However, the GCE had been accustomed to a greater degree of autonomy in employing UASs and perceived the establishment of the MARCC as an impediment to responsiveness and their ability to dynamically retask UASs as desired.

(U//FOUO) As the ground scheme of maneuver evolved, establishing and supporting UAS "hubs" and "spokes" in proximity to ground forces posed a significant challenge to 3d MAW (Fwd) planners. [MCCLL Note: A hub is a UAS airfield base of operations used to launch and recover UASs and a spoke is a scalable outlying UAS control site supported by the hub.] In addition to requiring facilities suitable for the launch, recovery, and maintenance of UASs, a key consideration was the appropriate manning of each hub and spoke. A significant limiting factor in the MAW's ability to establish hubs and spokes was a lack of trained intelligence analysts, UAS mission commanders, and maintenance personnel (this included contract maintenance support for the ScanEagle UAS due to contractor habitability mandates subject to that contract).

(U//FOUO) The volume of UAS sorties and their importance to the MAGTF is expected to increase in the future, including the development of a logistics support UAS and a new small tactical unmanned aerial system (STUAS). This has generated a need to determine where UAS assets would best be located within the ACE of the MAGTF. The Marine Unmanned Aerial Vehicle Squadron ONE and TWO (VMU-1 / VMU-2) commanding officers believed they should be located within a Marine aircraft group (MAG) just as all USMC aviation squadrons. [MCCLL Note: The VMUs are located within the Marine air control group (MACG) in garrison. During OEF deployment the VMUs were located directly within the MAW (Fwd) because there were no deployed MAGs and the MACG was composed of a small detachment.]

Key Points:

- (U//FOUO) The MARCC worked to incorporate all ACE ISR capabilities into overall ISR planning done by RC (SW), advised RC (SW) planners and leaders on which aviation assets could best fill ISR requirements and requests, ensured air tasking order (ATO) development included the RC (SW) commander's prioritization for tasking of ISR assets, streamlined information flow regarding these assets in order to build situational awareness throughout the MACCS, and facilitated the dynamic retasking of ISR platforms as necessary.
- (U//FOUO) VMU-1 established a "hot weather schedule" during the summer months due to temperatures that could reach as high as 135 degrees Fahrenheit on the runway. This extreme heat could cause the Shadow's wings to swell and vent fuel. However, the ScanEagle did not have this significant a problem with the heat and has longer endurance, so, the VMU scheduled ScanEagle sorties earlier in the day but still sufficient to cover the hottest time of day and Shadow sorties in the morning or evening. This enabled the VMU to maintain coverage throughout the fly-day. VMU-1 also erected a large area maintenance shelter for aircraft maintenance (LAMS-A) in order to keep aircraft and personnel out of the heat. [1]
- (U//FOUO) UAS technologies and capabilities continue to be developed and fielded. Training and education of UAS users, including unit air officers, intelligence officers, FACs, JTACs, and joint fires observers (JFO), regarding new capabilities and how best to employ UASs is vital. In order to support this, sufficient UAS assets must be made available during pre-deployment training. [2]
- (U//FOUO) The Marine Corps has recently fielded the Satellite Wide-Area Network version 2 (SWANv2) that will be included in the VMU organic table of equipment. Unlike the Digital Video Broadcasting Return Channel via Satellite (DVB-RCS) system currently being used, SWANv2 is a Marine Corps program of record that will enable the VMUs to disseminate full-motion video (FMV) signals more effectively. [3]
- (U//FOUO) In July, 2010, a contract was awarded to Boeing subsidiary Insitu, Inc. for development and production of the STUAS. STUAS will be used by the U.S. Navy and Marine Corps to provide persistent maritime and land-based tactical reconnaissance, surveillance, and target acquisition (RSTA) data collection and dissemination. Unlike the current ScanEagle and Shadow UASs, STUAS will have a UHF retransmission capability and the modularity to carry "plug-and-play" mission payloads such as hyper-spectral imaging

sensors, synthetic aperture radar sensors, and potentially small precision-guided munitions (PGM) among others. [4]

- (U//FOUO) The establishment of the MARCC initially created the perception within the GCE of two separate procedures for requesting UAS support – one procedure for requesting organic support and a different procedure for requesting joint support. However, the 3d MAW (Fwd) Future Operations Officer said that, the team that developed the MARCC specifically avoided creating any new procedures for the end users. [5]
- (U//FOUO) The MARCC officer-in-charge (OIC) developed a comprehensive kneeboard card that had information regarding all of the unmanned assets that were going to be airborne during a particular fly-day. This provided aircrew with situational awareness that was critical to safety of flight and helped reduce the chance of mid-air collisions. The kneeboard card also provided time, location, and contact frequency information that could be used to more effectively and efficiently employ or retask UASs. [6]
- (U//FOUO) The RC (SW) ISR officer noted that they were building a "collection strategy playbook" that would describe different tactics, techniques, and procedures (TTP) that have proved successful in integrating different intelligence collections effects. For example: layering ground-moving-target-indicator data with dismounted-moving-target-indicator assets (two different kinds of radar) and integrating those with a wide-area surveillance sensor (such as a UAS, Ground Based Operational Surveillance System (GBOSS), or Aerostat balloon) in support of real-time operations. [7]
- (U//FOUO) The fact that there is no primary military occupational specialty (MOS) designator for UAS officers degraded the ability of the VMUs to retain corporate knowledge and experience within the UAS community. Instead, officers were assigned to VMUs for 18 – 24 month tours of duty, a substantial portion of which was spent in training, and usually never returned to the UAS community after transferring out.

(U) Recommendations suggested by content of interviews include the following topics and -associated doctrine, organization, training, material, leadership and education, personnel, and facilities (DOTMLPF) pillars.

Recommendation	**D**	**O**	**T**	**M**	**L**	**P**	**F**
1. (U//FOUO) Ensure expeditious fielding of USMC UAS upgrades, including UHF retransmission capability, hyper-spectral imaging sensor, and capacity for armed attack.			**X**	**X**			
2. (U//FOUO) Continue to evaluate the advantages and potential drawbacks of maintaining the MARCC as a staff component.	**X**	**X**					
3. (U//FOUO) Further develop procedures for requesting and dynamically retasking organic and joint UAS support that are responsive, efficient, and commonly understood across the MAGTF.	**X**		**X**		**X**		
4. (U//FOUO) Provide sufficient UASs and manned aircraft with video downlink capability during unit pre-deployment training (PTP) in order to validate/update doctrine and adequately prepare air officers, intelligence officers, FACs, JTACs, and JFOs for employing these resources in combat.	**X**		**X**	**X**			

Recommendation	D	O	T	M	L	P	F
5. (U//FOUO) Determine the optimum location of VMU squadrons within the ACE. Determine whether to leave them in the MACG or place them in existing fixed-wing or rotary-wing MAGs, or establish UAS-specific MAGs.		X					
6. (U//FOUO) Educate Marines throughout the chain-of-command regarding UAS capabilities, TTPs, and integration with other ISR systems.	X		X		X		
7. (U//FOUO) Deploy sufficient MOS 0231 intelligence specialist and 0241 imagery analysis specialist Marines to provide analysis and dissemination of data provided by UAS capabilities in support of units conducting distributed operations throughout RC (SW).		X				X	

(U) The remainder of this report contains more detailed background and rationale on the above and other topics.

(U) Table of Contents

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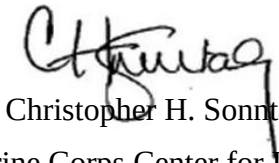
Prologue

(U) This report is one of many publications addressing a wide array of topics assembled and produced by the Marine Corps Center for Lessons Learned. The MCCLL library is not to be considered a sole or authoritative source, and was not designed as such. MCCLL provides a vehicle to inform the operating forces in the queue for subsequent deployments, the DOTMLPF stakeholders, and the advocates of the unvarnished experiences of Marines engaged in operations. Reporting or relaying these experiences may provide the impetus to effect a change in any or all of the DOTMLPF pillars.

(U) MCCLL relies on the individual Marine and commands to provide their hard learned lessons in order to disseminate them throughout the Marine Corps. The goal is to get these knowledge jewels into the MCCLL Lesson Management System in order to disseminate them in such a timely manner as to make them invaluable to the next Marine in the deployment queue.



Christopher H. Sonntag

Director, Marine Corps Center for Lessons Learned

Background

(U//FOUO) UASs have the potential to be employed in multiple roles in support of the MAGTF. At present, Marine Corps UAS assets perform air reconnaissance (one of the six functions of Marine Corps Aviation), target laser spotting and designation (a component of offensive air support – another of the six functions), and VHF communications relay. Future USMC UAS assets will have the ability to perform assault support, increased offensive air support, and electronic warfare. This MCCLL collection focused on UAS command relationships, command and control, planning and operations, training, equipping, and manning in support of RC (SW) in Afghanistan.

Operations

Command Relationships

(U//FOUO) The volume of UAS sorties and their importance to the MAGTF is expected to increase in the future, including the development of a logistics support UAS and the STUAS. This has generated a need to determine where UAS assets would best be located within the MAGTF ACE. The VMU-1 and VMU-2 commanding officers believed they should be located within a MAG just as all USMC aviation squadrons. The VMUs are located within the MACG in garrison. During OEF deployment the VMUs were located directly within the MAW (Fwd) because there were no deployed MAGs and the MACG was composed of a small detachment. [8]

(U//FOUO) The MARCC was a 3d MAW (Fwd) staff section located in the sensitive compartmented information facility (SCIF) at RC (SW) Collections. This placed the MARCC in proximity to the lead ISR collection planners while also maintaining a direct link to the MAW tactical air command center (TACC) to better ensure UAS accountability within the MACCS. The MARCC facilitated a consolidated means of tasking ACE ISR assets to support the regional command. According to the 3d MAW (Fwd) G-2, co-locating the MARCC with RC (SW) Collections on the "ISR watch floor" amounted to establishing a doctrinal surveillance and reconnaissance cell (SARC). [9]

(U//FOUO) Prior to the establishment of the MARCC, the 3d MAW (Fwd) G-3 described the VMUs as having almost a direct support (DS) relationship with the GCE. However, because of this "quasi-DS relationship" other elements of the MAGTF, such as the logistics combat element (LCE), were not as readily supported. [10]

(U//FOUO) At one point early in the development of the MARCC, the GCE submitted an urgent universal needs statement (UUNS) to deploy its own organic UAS assets. [11] This UUNS was subsequently withdrawn and, as the 1st Marine Division (MARDIV) commander noted, "*If you have it organic, it means you own the tail and the tail on these things is huge, so I've got no problem with the doctrinal approach, but we might want to look at a DS-type arrangement similar to fires*."

BGen Joseph Osterman
Commanding General
1st Marine Division (Fwd)

(U//FOUO) While the U. K. forces had their own organic Hermes 450 UAS, they still required occasional augmentation by Marine UASs. This would reduce the number of sorties available to the rest of the regional command and impacted the level of support the MARDIV received. [12]

(Material is omitted from the preceding section due to classification. See classified report: "UAS Integrated Operations ISO RC (SW)".)

Command, Control, Communications, Computers (C4)

(U//FOUO) One of the primary factors that led to the establishment of the MARCC was the lack of command and control of UAS assets above the regimental combat team (RCT) level. In addition to safety of flight issues with large numbers of unmanned aircraft operating within USMC airspace outside of the MAW planning process, another consequence was that ACE ISR assets, other than UASs, were not being integrated in collection planning and execution as effectively as possible. This was particularly significant because there were not enough UAS assets to meet the demand for ISR throughout RC (SW). [13]

(U//FOUO) "*No matter what you do with any of these type of assets, I think the ACE needs to have a say and have visibility on what exactly they are doing and where they are going to be so they can plan for it…I'm not saying they are going to own it, but the rest of the ACE needs to understand what's out there, what's flying, and what it's doing.*"

MajGen Andrew O'Donnell
Commanding General
3d MAW (Fwd)

(U//FOUO) Maintaining an effective balance between ACE requirements to execute command and control over RC (SW) airspace and GCE requirements for responsive allocation, tasking, and retasking of UAS assets was particularly challenging. From the GCE perspective, the MAW should be responsible for the air space control of UASs, but tasking and allocation of UAS sorties scheduled in support of the GCE should reside within the GCE where the requisite situational awareness exists to respond to the enemy. [14]

(U//FOUO) UASs were a high-demand, low-density resource and battlespace commanders consistently requested more UAS coverage than the ACE had the ability to provide. Effective prioritization of sorties was vital. However prior to the establishment of the MARCC, requests for ISR support from the GCE would go directly to the MARDIV G-2. The G-2 would develop a collection plan and task the VMUs directly, bypassing the MAW (Fwd) altogether. Additionally, because of the way the collection plan was developed, the RC (SW) C-3 was also not involved, so neither the ACE nor the regional command operations officer had operational control of UAS assets that were flying over the battlespace. In fact, requests to retask UASs in-flight were routed via the MARDIV G-2. Establishing the MARCC in September 2010 essentially transferred tactical ownership of the UASs from the MARDIV G-2 to the RC (SW) ACE G-3 chain of command. [15]

(U//FOUO) The MARCC better enabled RC (SW) to regard its organic ISR assets holistically and apportion these resources more efficiently. These included UASs and also manned systems such as FA-18Ds with the Advanced Tactical Aerial Reconnaissance System (ATARS), FA-18s and AV-8s with Litening video downlink, UH-1Ys with the Bright Star multi-sensor imaging system, and Harvest Hawk armed KC-130Js with the target sight sensor (TSS) electro-optic/infrared targeting pod. It also included AH-1Ws with tactical video data link (TVDL) that provides the pilots with live UAS video and targeting information combined with the ability to retransmit UAS and on-board sensor video to other aircraft and ground forces. This holistic approach to ISR reinforced the concept of end-users submitting requests for specific effects

rather than specific systems. [MCCLL Note: These manned ISR missions, previously known as nontraditional ISR (NTISR), are now categorized as multispectral imagery and reconnaissance (MIR).] [16]

(U//FOUO) The MARCC helped mitigate the complexities of requesting and tasking non-organic ISR missions in OEF, which was being done via three separate requesting chains: one for UASs and two distinct chains for manned ISR - one for coalition, non-U. S. assets and one for joint U. S. assets - all operating different software that was linked to the combined air operations center (CAOC) for inclusion in the OEF ATO. [17]

(U//FOUO) Executing command and control over joint and combined UASs was complicated by a lack of technological commonality regarding some of the platforms, such as the Hermes 450, that impacted the ability of RC (SW) to receive their UAS feeds and communicate with their mission commanders. Another compatibility issue was a lack of awareness and experience regarding procedures for working within USMC controlled airspace on the part of NATO and U. S. Army planners and mission commanders. One step taken to address this was assigning a USMC Air/Naval Gunfire Liaison Company (ANGLICO) detachment to support the U. K.'s Task Force Helmand. [18]

(U//FOUO) The Marine Corps has recently fielded the Support Wide-Area Network version 2 (SWANv2) (Figure 1) that will be included in the VMU organic table of equipment. Unlike the Digital Video Broadcasting Return Channel via Satellite (DVB-RCS) system that was also being used, SWANv2 is a Marine Corps program of record that enables the VMUs to disseminate FMV signals more effectively. [19]

(U//FOUO) Figure 1. SWANv2

(U//FOUO) Installing the Persistent Surveillance and Dissemination System of Systems (PSDS2) enabled RC (SW) to collect every UAS video feed received from throughout the area of operations (AO) into a single archive system and make this data available for 30 days via a searchable web-based access. Prior to PSDS2, archiving video data was done by recording video feeds to DVDs or CD-ROMs. [20]

(U//FOUO) The only asset other than PSDS2 available for long term storage and archiving of UAS feeds was the Multimedia Analysis and Archive System (MAAS) located in a tent in the command and control (C2) compound. It was originally expected that the MAAS would be queried often for second and third order processing and analysis. However, in actual practice the MAAS wasn't utilized very extensively. Typically, supported commanders only required FMV for the conduct of current operations or for immediate situational awareness. On only a few occasions was information in this data base queried for further processing. [21]

(U//FOUO) "*Our experience has been with about a three day archive because within three days you usually knew whether you were going to need it or not if someone asked for it.*"

LtCol Jeffrey Stimpson
2d MAW (Fwd) G-2

(U//FOUO) In addition to the live feed, when requested, operating forces could receive video recordings directly from the VMUs the same day or next day. They also received a mission report (MISREP) at the conclusion of the flight. Recordings requested from joint assets such as the Predator or Reaper UAS commands would take between two or three days to receive. [22]

(U//FOUO) The principle means for RC (SW) end-users to coordinate active UAS missions or submit immediate requests for support was via multiuser internet relay chat (MiRC). However, this system was resident on the Secret Internet Protocol Router Network (SIPRNET), which restricted its availability to coalition partners such as the British, Danish, Afghans, and others. The solution was to also route much of this information via transverse chat (T-Chat) on the Combined Enterprise Regional Information Exchange System (CENTRIXS) and by November 2010 almost all of this coordination was able to be done on coalition systems where available. [23]

(U//FOUO) MiRC was also used to communicate with joint UAS providers via the U. S. Air Forces Central Command (AFCENT) server, which enabled users to coordinate directly with the UAS pilots and mission commanders. [24]

(U//FOUO) A Department of Defense (DoD) Joint Test and Evaluation program called the Joint UAS Digital Information Exchange (JUDIE) is developing doctrine and TTPs for standardizing the exchange of UAS information that will enable quick access to UAS data and rapid cross-queuing of resources across all services. [25]

(U//FOUO) While MiRC was the primary means of coordination, dynamic retasking of UASs would also be initiated or followed-up by utilizing Voice over Secure Internet Protocol (VoSIP) telephone systems. Tertiary means of communication were SIPRNET electronic mail (email) and on a few occasions, VHF radio. One persistent challenge was communicating consistently with Task Force Helmand battalions because many lacked VoSIP or CENTRIXS connections in more remote locations. [26]

(U//FOUO) Even though RC (SW) UASs lacked a UHF communications relay capability, RC (SW) units were able to effectively employ the VHF retransmission capability on the Shadow UAS. [27]

(U//FOUO) Coordinating UAS support was difficult for the LCE. MiRC was the primary UAS coordination tool used throughout RC (SW). Due to the highly distributed nature of logistics operations in RC (SW), LCE components were often in a perpetual state of resupply and delivery of logistics support. This would regularly take the LCE outside of VHF/UHF radio communications ranges. In those circumstances, the only reliable connectivity available to the LCE other than satellite communications (SATCOM) was Blue Force Tracker (BFT) text messaging. A convoy commander who required UAS support would send a BFT message to the Marine logistics group (MLG) combat operations center (COC) with the request. This request for support would then be forwarded to the MARCC to determine if/when a UAS would be tasked. [28]

(U//FOUO) RC (SW) frequency managers had to be vigilant regarding UAS control frequency allocations in order to mitigate any potential frequency saturation issues. [29] [MCCLL Note: The use of digital wingtip antennas on UASs could help eliminate this as a possible problem and future variants are expected to include this modification. [30]]

(Material is omitted from the preceding section due to classification. See classified report: "UAS Integrated Operations ISO RC (SW)".)

Planning and Conduct of Operations

(U//FOUO) UASs were originally developed as an intelligence asset and there is ISR doctrine in the intelligence community that includes UAS-related operations. However, this doctrine appears to have not kept pace with emerging technology and the integration of all available airborne ISR platforms. [31] Also, due to the advent of armed UASs, advanced on-board targeting systems, communications relay, and other associated capabilities, these aircraft are emerging as an operational asset as well. UAS operational doctrine continues to evolve and there are a variety of issues being encountered, including multi-role mission planning, sortie apportionment competition between intelligence and operations, and optimizing payload capacity in current and future UASs. [32]

(U//FOUO) "*Limited assets, manpower, and range space hinder the development of doctrine in a proper sense. If doctrine is being developed in the field, there is currently no way to test this with the proper metrics*."

Maj Lawrence Green
MAWTS-1 UAS Division

(U//FOUO) Information gained from ISR assets such as Shadow and ScanEagle UASs (Figures 2 and 3) was used across RC (SW) by all elements. In addition to intelligence gathering, targeting, and maneuver support, ISR was used in vehicle recovery operations as an advance planning tool and supported information operations as a visual means to counter enemy propaganda. [33]

(U//FOUO) Figure 2. RQ-7B Shadow

(U//FOUO) Figure 3. ScanEagle Launcher and "Sky Hook" Recovery System

(U//FOUO) There were instances where the ACE was unable to fly manned aircraft due to low weather ceiling conditions and the unacceptable risk of encountering enemy low altitude anti-air weapons systems or flying into unseen terrain features. However, in these circumstances the ACE was usually able to employ low flying organic UASs to provide some measure of aviation support. [34]

(U//FOUO) RC (SW) operations planning teams often lacked an experienced UAS planner. There was also a lack of UAS operational experience among the members of the MARCC. This resulted in battle plans that occasionally included requirements that were beyond the capability of the VMUs or were incorrectly prioritized and would have to be revised. This could have been avoided by involving a dedicated UAS planner early in the process. [35]

(U//FOUO) Utilizing the joint tactical air strike request (JTAR) process and bringing UAS scheduling into the RC (SW) ATO production cycle improved situational awareness and enabled better integration of manned aircraft in the ISR asset allocation. However, the strict ATO 72 – 96 hour cycle was often not responsive enough to keep pace with GCE operations and would result in in-flight dynamic retasking of UASs. [36]

(U//FOUO) The 3d MAW (Fwd) G-3 passed a recommendation (which was heeded) to his counterpart at 2d MAW prior to relief-in-place/transfer of authority (RIP/TOA) to send an ATO development officer as part of their advance party (ADVON). The reason was to get that individual up-to-speed as quickly as possible regarding drafting the ATO and then include him/her as part of the MARCC, because it was important that the MARCC staff understand the ATO process. [37]

(U//FOUO) From a planning and guidance perspective, it was critical that the RC (SW) commander understand the ISR allocation system. He also needed to understand the ISR capabilities of his other NATO components. It was important to be able to effectively evaluate resource requirements and ensure allocations were equitable to avoid creating a "them and us" mentality among the various units. [38]

(U//FOUO) In addition to employing organic ISR capabilities, other NATO units also had unique national considerations that influenced their operations and TTPs. [39] For the most part, national systems supported their national units. The exception to this was that as a regional command, RC (SW) would task ScanEagle or Shadow sorties in support of Task Force Helmand if, for whatever reason, the Hermes could not fly or provide enough coverage. [40]

(U//FOUO) SOF had priority in allocation of joint UASs. These requests were initiated and routed through the joint pipeline. [41]

(U//FOUO) RC (SW) Collections executed decentralized control of UASs in support of counter-insurgency (COIN) operations. This was different than the doctrinal collections methodology of dividing the battlespace geo-spatially, calculating which resource could best cover particular areas, factoring in the MAGTF commander's priorities, and publishing a collections plan accordingly. Instead, RC (SW) would allocate ISR resources for collections to be executed at the lowest level possible. [42]

(U//FOUO) RC (SW) hosted a daily collection managers working group that included representatives from RC (SW), MARCC, MARDIV, MLG, and the combined joint special operations task force (CJSOTF). The working group would review planned or ongoing operations and determine and prioritize intelligence collection requirements 48 hours in advance.[43]

(U//FOUO) The RC (SW) collection plan would be briefed to the commander and staff at the daily 0900 operations/intelligence briefing and was updated every night at the commander's battle update. Also, the collection plan resided on a dashboard function resident on the RC (SW) SharePoint website. [44]

(U//FOUO) RC (SW) collection managers at all levels in the chain of command could not be certain which ISR assets would be allocated to them until the day prior. So, operations were designed under the assumption that they would have access to their typical ATO collection sorties. They also understood that if they were planning a named operation, this would increase their allocation priority. [45]

(U//FOUO) The RC (SW) ISR officer noted that they were building a "collection strategy playbook" (currently in-work) that would describe different TTPs that have proved successful in integrating different intelligence collections effects. For example, layering ground-moving-target-indicator data with dismounted-moving-target-indicator assets (two different kinds of radar) and integrating those with a wide-area surveillance sensor (such as a UAS, GBOSS, or Aerostat balloon) in support of real-time operations. [46]

(U//FOUO) The RC (SW) C-2 observed that ISR has become almost too synonymous with FMV and there needed to be a refocus from an intelligence collections perspective on better integrating the capabilities of signals intelligence (SIGINT), imagery intelligence (IMINT), and measurement and signature intelligence (MASINT) collection assets. [47]

(U//FOUO) RC (SW) units competed with every other unit in-theater for joint UASs, such as Predator (Figure 4) and Reaper. These were high-demand, low-density resources and in addition to ISR, provided the only armed UAS capability in OEF. [48]

(U//FOUO) "*It was a complicated issue for a number of reasons. First of all, the number of joint assets you have allocated to you, but don't belong to you, and dealing with that was probably*

our number one concern. Two, was operating within a NATO, combined environment and ensuring the needs of non-U.S. forces under our command were also covered. Lastly, was the huge drain that the SOF was on ISR/UAS assets."

MajGen Richard Mills
Commanding General
RC (SW)

(U//FOUO) International Security Assistance Force (ISAF) Joint Command (IJC) allocated a certain number of joint ISR sorties, or "ATO lines", to each RC every day. RC (SW) had to request and compete for any additional sorties above that allocation and was usually informed whether these specific missions were approved or denied 48 hours prior to execution. [49]

(U//FOUO) Subordinate units would submit a combined forces air component commander (CFACC) ISR request in a standardized format for submission into the IJC ISR Division (ISRD) collection management board process. IJC would use a mathematic formula that assigned points based on the type of mission being requested, the targets being engaged, and whether the requester was a main effort or supporting effort. This resulted in a numeric score IJC would use to prioritize the allocation. [50]

(U//FOUO) "*The whole time we were there, it was what everyone referred to as "BCS math",* [referencing the US college football ranking system] *in terms of putting together named operations and using the right terminology in order to have your request ranked high enough to get the theater assets dedicated to you*."

Col Robert Gardner
1st Marine Division G-3

(U//FOUO) Figure 4. MQ-1B Predator

(U//FOUO) The CAOC would not specifically schedule armed UASs on request. If a unit asked for a UAS, it might not get a Reaper; it might just get an unarmed Predator, which made it difficult to plan for specific operations. The only caveat to this was SOF. If they requested an armed UAS, they always got an armed UAS. However, in actual practice, RC (SW) was in the top two or three OEF priorities according to ISAF and there was usually an armed UAS assigned to both of the RCTs at some point during the ATO day. [51]

(U//FOUO) The primary function of the MARCC was to be the MAW (Fwd) representative for organic aviation and the ISR collection management process. Additionally, the MARCC conducted liaison with the RC (SW) C-3, Fires and Effects Coordination Cell (FECC), to ensure coordination and deconfliction between fires and collections and then translate these requests into aviation tasks for inclusion in the daily ATO. [52]

(U//FOUO) RC (SW) units would submit a monthly CFACC support request and then supplement that with daily requests. The MARCC would determine which requests could be

filled by ACE assets, prioritize the requests, and, if not submitted in the JTAR format, write all the bids to JTARs. Once these JTARs were entered in the ATO data base (72 to 96 hours prior to the beginning of the applicable ATO day) the ATO development cell would write a draft ATO and submit it to 3d MAW (Fwd) G-3 for review. Any necessary adjustments would be made and a final version of that day's ATO was posted 12 hours before execution. Once the ATO was posted, any changes or additional requests were received from the end-users usually in the form of 8-Line briefs (Figure 5) that the MARCC would evaluate, convert to immediate JTARs, and forward to the TACC for execution. [53]

Dynamic/Immediate ISR Request (8-Line)
1. Desired ISR support or effect (full motion video, positive ID, EO, IR, MIT)
2. Target Name
3. Target Location
4. Essential Elements of Information (EEI's)
5. Latest Time Information of Value (LTIOV)
6. Reporting instructions (MiRC, IPL, Classification)
7. ISR asset detection concern (low, medium or high)
8. Airspace deconfliction information if you need to stay clear of an area for deconfliction
Remarks: Lines 1-6 are mandatory, 7 and 8 are optional.

(U//FOUO) Figure 5. ISR 8-Line Brief

(U//FOUO) The MARCC prioritized UAS support requests based on the RC (SW) commander's priorities and then determined allocations across all RC (SW) units. Therefore, it was incumbent upon the end-users to submit requests with sufficient detail to be accurately prioritized. The MARCC would also integrate available manned ISR capabilities into the ATO in order to address shortfalls to the greatest extent possible. [54]

(U//FOUO) By effectively prioritizing, integrating, and multi-tasking assets, at least one, and sometimes two, Shadow, ScanEagle, or joint UAS was available to provide some level of ISR coverage per battalion almost every day. [55]

(U//FOUO) The MARCC OIC developed a comprehensive kneeboard card that had information regarding all of the unmanned assets that were going to be airborne during a particular fly-day. This provided aircrews with improved situational awareness that was critical to safety of flight and helped reduce the chance of mid-air collisions. The kneeboard card also provided time,

location, and contact frequency information that could be used to more effectively and efficiently employ or retask UASs. It was approximately a four to five hour process to construct the kneeboard card because the work had to be done by hand. However, in addition to providing increased situational awareness for all concerned, RC (SW) ability to cross-queue ISR assets during ongoing operations was significantly enhanced. [56]

(U//FOUO) "*I think the MARCC was a game changer in terms of integrating all of the available airborne ISR platforms. I think we still have a lot that we have to learn and develop, but I think the MARCC was a step in the right direction.*"

Col Steven Hanson
I MEF (Fwd)/RC (SW) C-2

(U//FOUO) The establishment of the MARCC generated friction between the RC (SW) ACE and GCE. The ACE regarded the MARCC as a more efficient means of conducting command and control of ACE assets. However, the GCE had been accustomed to a greater degree of autonomy in employing UASs and saw the establishment of the MARCC as an impediment to responsiveness and their ability to dynamically retask UASs as desired. [57]

(U//FOUO) From the GCE perspective, they were more subject to losing UAS coverage time. Previously, UASs were simply scheduled to support a particular unit for a particular timeframe and that unit could employ the aircraft as it saw fit, or the GCE could coordinate directly between users and retask that asset if necessary. However, UAS sorties were increasingly in high demand and as RC (SW), the commander was conscious of the need to effectively allocate ISR support to all of the units within the regional command. This made it necessary to improve multi-tasking and integration of all available ISR resources. [58]

(U//FOUO) "*In many cases units got what they wanted and in many cases they did not get exactly what they asked for. But, I would say that when the product came down it was what they needed and they could still accomplish their mission*."

MajGen Andrew O'Donnell
Commanding General
3d MAW (Fwd)

(U//FOUO) The GCE was particularly concerned about the impact the MARCC would have on response times. To address this, the MARCC studied the timing in detail involved in dynamic retasking of UASs. They determined that the new process, with some exceptions, added an approximate average of five minutes to the previously "ad hoc" system of retasking UASs, while increasing situational awareness and the ability of the ACE to integrate other ISR assets into operations. [59]

(U//FOUO) The establishment of the MARCC initially created the perception within the GCE of two separate procedures for requesting UAS support – one procedure for requesting organic support and a different procedure for requesting joint support. However, the 3d MAW (Fwd) Future Operations Officer stated that the team that developed the MARCC specifically avoided creating any new procedures for the end users. [60]

(U//FOUO) The intent of the change in the staffing of requests for organic ISR was to establish a common process for requesting all ACE support. This meant ensuring that UASs were requested and tasked in the same manner as any other ACE aircraft. [61]

(U//FOUO) Regarding ISR requests that could not be filled by organic Marine assets, the MARCC would enter these in the Planning tool for Resource Integration, Synchronization, and Management (PRISM) via the Joint Worldwide Intelligence Communications System (JWICS) for consideration by the CFACC. Requests for ISR that could be filled by organic assets would be submitted by the MARCC to 3d MAW (Fwd) ATO Development as standard JTARs. What was lacking was a uniform aviation requesting process, including ISR, common to all users that was supportable on CENTRIXS, SIPRNET, and JWICS and based on requesting desired effects vice specific platforms. This would have streamlined and simplified the entire process. [62]

(U//FOUO) "*The MARCC right now is a good solution, but it's not the long-term solution. The long-term solution is a uniform, unified requesting process for everybody in the joint architecture.*"

LtCol John Barranco
VMU-1 Commanding Officer

(U//FOUO) As the ground scheme of maneuver evolved, establishing and supporting UAS "hubs" and "spokes" in proximity to ground forces posed a significant challenge to 3d MAW (Fwd) planners. Concurrent with supporting expanding GCE operations, ACE UAS assets were expected to support the regional command as a whole. This created conflicts at times between establishing hubs or spokes closer to the GCE main effort while balancing the ACE's ability to also support other RC (SW) elements distributed throughout the AO. [63]

(U//FOUO) As the process for tasking and retasking UASs evolved following the establishment of the MARCC in September 2010, authority to retask organic UAS assets from supporting one unit to another within the same RCT was eventually delegated to the RCTs. [64]

(U//FOUO) "*What the regiments wanted was to be delegated the authority for retasking UASs between the different battalions within their regiment. According to the 1st Battalion, 8th Marines (1/8) air officer that has happened*."

LtCol John Barranco
VMU-1 Commanding Officer

(U//FOUO) Retasking of organic UASs from one RC (SW) major subordinate command (MSC) to another occurred at the MAW level via the TACC. For instance, requests for retasking from GCE battalions across RCTs were routed via the requesting RCT to the MARDIV, who would forward them to the MARCC. The MARCC would review the assets available, prioritize the request against any other units currently receiving support from the asset being requested, and pass that information to the TACC. The TACC senior watch officer (SWO), on behalf of the ACE commander, was the final decision maker. The MARCC would receive an average of four to five retask requests per day out of 15 pre-scheduled missions. [65]

(U//FOUO) The RC (SW) timeline for processing requests to retask organic UASs began counting when the request was received. However, it was understood that the clock for the end-user in a kinetic situation could have started counting the moment he first took fire, so the overall objective was to process these requests as fast as possible. [66]

(U//FOUO) Joint UASs could be retasked but that authority wasn't resident inside RC (SW). Predator and Reaper UASs were tasked via IJC and IJC ISRD was the retasking authority. If RC (SW) units being supported by joint UASs knew in advance they would need to request retasking (for instance, if circumstances had changed in the 72 - 96 hours since the original request was

submitted), RC (SW) would prepare the JTAR in advance of the applicable ATO being posted. Not as responsive as retasking organic assets, it could take between 15 minutes and an hour to process a request through higher headquarters. [67]

(U//FOUO) By the fall of 2010 RC (SW) was able to establish a concept of operations (CONOP) with IJC for retasking joint ISR assets within their AO. This included a detailed process matrix that helped streamline and facilitate retasking between units within the MARDIV. The GCE would forward a request and RC (SW) would finalize coordination with IJC and the CFACC. [68]

(U//FOUO) "*We worked around* [joint ISR] *dynamic retasking constraints by writing overarching CONOPs for everything that we were doing. For example, we would have an entire winter campaign, so we would receive ISR for the winter campaign and we could use it anywhere that CONOPs had and we were able to use it quite widely.*"

Col Barry Fitzpatrick
I MEF (Fwd)/RC (SW) C-3

(U//FOUO) The MARCC referred to ISR targeting and support of fires as "packages" that could involve cross-queuing multiple platforms in order to prosecute a target. [69]

(U//FOUO) The main targeting challenge presented to RC (SW) decision makers in executing fires, including those targets identified via UAS, was timeliness. The enemy in RC (SW) was usually not stationary and may present himself for only a few minutes. Without an armed UAS on station, all concerned had to work quickly to coordinate a manned air attack or employ indirect ground fires. To address this and improve time-to-kill the MARCC practiced a hunter-killer concept designed to integrate and maximize the capabilities of each asset in the kill-chain by coordinating in time and space to bring these systems to bear on the target. [70]

(U//FOUO) The stand-off distance mandated between UASs and target grid coordinates affected the timeliness of fires supported by UASs. Accounting for this stand-off could cause delays in clearing fires. [71]

(U//FOUO) UASs were a key component in the fires decision matrix by helping decision makers clear fires and determine what munitions to employ while also verifying information being relayed from ground commanders on the scene. [72]

(U//FOUO) "*I don't remember a single instance where I was in the COC approving anything* [fires] *and we didn't have some kind of video feed*."

LtCol Mark Dietz
RCT-7 Executive Officer

(U//FOUO) The ability to observe and designate (with Shadow and joint UAS laser target designators) for precision-guided air delivered and ground delivered munitions quietly and accurately made UASs valuable fire support assets. This also required mastering fire support control measures associated with employing joint UAS weapons systems because the most consistent link to distant Predator and Reaper operators was via MiRC and other digital communications that did not facilitate an in-depth question and answer exchange in a timely manner. [73]

(U//FOUO) RC (SW) UASs were fully integrated with fires in part because of the accuracy of their ground position location sensors and ability to generate grid coordinates for use in targeting. [74]

(U//FOUO) The GCE determined the armed Predator and Reaper (Figure 6) UASs to be invaluable in conducting COIN operations. The extensive loiter time combined with the ability to immediately strike confirmed, often fleeting targets was a powerful tool. [75]

(U//FOUO) Figure 6. MQ-9 Reaper

(U//FOUO) In employing armed UASs it was important from a command and control perspective to have a clear handoff to a JTAC or targeteer for prosecution of the target and, post-engagement, returning that UAS to continue providing ISR support. [76]

(U//FOUO) When armed UASs were not available to RC (SW) forces, one of the purposes of the MARCC was to assist with integrating manned armed platforms with ISR assets in order to strike targets more immediately. [77]

(U//FOUO) RC (SW) established a staff cell called the Incident Assessment Team (IAT) whose purpose included responding to the scene of alleged civilian casualties to counter or address charges of civilian casualties caused by coalition forces. [78]

(U//FOUO) "*Not that everybody needs perfect information all the time, but these assets gave the ground commander the ability to fight full throttle without tripping the ROE. As a result, with ROEs similar to what we had in Afghanistan, having UASs with that higher-end capability allowed the commanders to operate without any hindrance*."

BGen Joseph Osterman
Commanding General
1st Marine Division (Fwd)

(Material is omitted from the preceding section due to classification. See classified report: "UAS Integrated Operations ISO RC (SW)".)

Training

(U//FOUO) UAS technologies and capabilities continue to be developed and fielded. These include communications relays and laser target designators. Training and education of UAS users, including unit air officers, intelligence officers, FACs, JTACs, and JFOs, regarding new capabilities and how best to employ UASs and integrate them with other ISR systems is vital. In order to support this, sufficient UAS and other ISR assets must be made available during pre-deployment training. This will become increasingly important particularly as USMC UAS offensive air support capabilities evolve, including employment of armed UASs. [79]

(U//FOUO) For the past 2.5 years, Marine Aviation Weapons and Tactics Squadron ONE (MAWTS-1) has had RQ-7B Shadow UASs provided by the VMUs to support some of the Weapons and Tactics Instructor (WTI) training evolutions. MAWTS-1 also uses a Center for Interdisciplinary Remotely Piloted Aircraft Systems (CIRPAS) Surrogate Unmanned Aircraft (a Cessna aircraft with a MQ-1A Predator payload) to simulate UASs in training outside restricted airspace. [80]

(U//FOUO) "*The Marine Corps lacks a dedicated unmanned aircraft schoolhouse for mission commanders or for its enlisted students. Instead, these personnel piggy-back off of U. S. Army programs that are insufficient to meet all Marine Corps requirements.*"

Maj Christopher Coble
MAWTS-1 UAS Division Head

(U//FOUO) Raven and Wasp man-portable UASs were employed to varying degrees of effectiveness by RC (SW) forces. A primary reason for this inconsistency was a lack of sufficient operator training during PTP. [81]

(U//FOUO) It continues to be difficult to schedule airspace for UAS training operations at less remote locations in the continental United States (CONUS) due to air traffic regulations and airspace crowding. For example, in order to fly UASs at Camp Pendleton, it is necessary to construct UAS-only airspace that excludes all manned aircraft. [82] In addition to airspace, ensuring adequate control frequency availability and deconfliction must also be arranged for and can be equally challenging. [83]

(U//FOUO) There was a lack of equipment for training in conducting FMV dissemination organic to the VMU. During deployment, systems such as Intelligence, Surveillance, Reconnaissance Internet Services (ISRIS) and DVB-RCS were being employed, much of it supported by contractors. However, in CONUS, the VMUs were "*disseminating video with a $10 RadioShack dazzle video capture card*" and the VMUs did not have experience with the ISRIS, DVB-RCS, and other systems prior to deploying. [84]

Logistics and Equipment

(U//FOUO) In attempting to coordinate ISR coverage, logistics elements were most successful in routing requests air officer to air officer via MiRC from LCE battalion to the GCE battalion and leveraging that working relationship vice requesting support through the MLG COC to RC (SW) Collections. [85]

(U//FOUO) The RQ-7B Shadow UAS employed by the Marine Corps is a U. S. Army program of record. Because it is an Army program the Shadow has VHF but no UHF retransmission

capability. UHF is the primary means of communication between key elements of the MACCS, airborne Marine Corps aviation assets, and Marine JTACs and FACs. Developing a UHF retransmission capability for an indigenous USMC UAS was regarded as a primary need. [86] [MCCLL Note: HQMC APX and NAVAIR PMA-263 are working to resolve this issue and UHF capability will be included in future UASs]

(U//FOUO) VMU-1 established a "hot weather schedule" during the summer months due to temperatures that could reach as high as 135 degrees Fahrenheit on the runway. This extreme heat could cause the Shadow's wings to swell and vent fuel. However, the ScanEagle did not have this significant a problem with the heat and has longer endurance, so, the VMU scheduled ScanEagle sorties earlier in the day but still sufficient to cover the hottest time of day and Shadow sorties in the morning or evening. This enabled the VMU to maintain coverage throughout the fly-day. VMU-1 also erected a LAMS-A in order to keep aircraft and personnel out of the heat. [87]

(U//FOUO) Hyper-spectral imaging (HSI) sensors and precision radars could be incorporated in a UAS and RC (SW) submitted an UUNS in June 2010 requesting development and integration of a hyper-spectral imaging sensor payload for the RQ-7B Shadow. [88]

(U//FOUO) The Shadow UASs deployed with one launcher per set of four aircraft (Figure 7). This was potentially an area of concern and could be mitigated by deploying two launchers per set. [89] [MCCLL Note: This circumstance was also noted in a 2009 MCCLL report on Shadow operations in Iraq and brought to the attention of the program office COMNAVAIR PMA-263. However, collection interviews did not indicate any issues regarding failure of Shadow launchers in RC (SW).]

(U//FOUO) Figure 7. RQ-7B Shadow UAS and Launcher

(U//FOUO) USMC units were dependent on joint assets for armed UAS missions and competed with every other unit in OEF to schedule armed UAS sorties. Developing an indigenous armed USMC UAS was regarded as a priority by RC (SW) end-users. [90]

(U//FOUO) In July, 2010, a contract was awarded to Boeing subsidiary Insitu, Inc. for development and production of the STUAS. STUAS will be used by the U. S. Navy and Marine Corps to provide persistent maritime and land-based tactical RSTA data collection and dissemination. Unlike the current ScanEagle and Shadow UASs, among other upgrades, STUAS will have a UHF retransmission capability and the modularity to carry "plug-and-play" mission payloads such as hyper-spectral imaging sensors, synthetic aperture radar sensors, and potentially small precision-guided

munitions (PGM) among others. [MCCLL Note: STUAS is currently being tested. USMC plans to buy two systems in summer 2011 for early operational capability. These systems will be based at Marine Corps Base 29 Palms, with an expected initial operational capability (IOC) in 4th quarter, FY 2013.] [91]

(U//FOUO) When operated effectively, the Raven UAS was useful because it could be employed by the end-user at the tactical level and involved little to no integration with higher headquarters other than coordinating with the battlespace owner for launch. [92]

(U//FOUO) Global broadcast systems (GBS) are data-supply systems that transmit information from broadcast facilities to receivers via communications satellite relays. These were used by RC (SW) units to receive and disseminate Predator and Reaper UAS video signals. GBS units were high-demand, low-density items and multiple operators would tie-in to a single system. This required close coordination to manage firewalls and other system security measures. [93]

(U//FOUO) The VMU-1 executive officer observed during a WTI course that MAWTS-1 demonstrated a new video data archiving system hosted on a blade server. This system had several terabytes of storage capacity and included the ability to archive and retrieve data according to geographic location, time/date, and other user-defined metadata. [MCCLL Note: A blade server is a stripped-down server computer with a modular design optimized to minimize the use of physical space and energy. This type of capability could enhance the expeditionary characteristics of UAS support infrastructure and is currently being tested.] [94]

(U//FOUO) Personnel working on the flight line did not have a wireless intercommunication system (ICS). Instead, they were required to be hardwired to their systems in order to communicate with one another, dragging cables across the tarmac as they performed their work.[95]

(U//FOUO) The Marine Corps is currently deploying and testing variants of a cargo delivery-capable UAS. The intent is to reduce the number of logistics support ground convoys while ensuring timely resupply to distributed outposts. However, there are no confirmed plans to purchase these aircraft or establish the cargo UAS as a program of record. Reasons for this include questions regarding the requirement to fund and maintain this capability post-OEF. [96]

(Material is omitted from the preceding section due to classification. See classified report: "UAS Integrated Operations ISO RC (SW)".)

Manning / Personnel

(U//FOUO) The fact that there is no primary MOS designator for UAS officers degraded the ability of the VMUs to retain corporate knowledge and experience within the UAS community. Instead, officers were assigned to VMUs for 18 – 24 month tours of duty, a substantial portion of which was spent in training, and usually never returned to the UAS community after transferring out. [97]

(U//FOUO) In addition to requiring facilities suitable for the launch, recovery, and maintenance of UASs, a significant limiting factor in the MAW's ability to establish hubs and spokes and provide more UAS coverage was a lack of trained UAS mission commanders, deployed maintenance personnel, and MOS 0231 intelligence specialist and 0241 imagery analysis specialist Marines. These manning limitations also negatively impacted the contractor-supported ScanEagle as requests were often made by the battalions to increase contract flight hours.

However, the key constraint was not flight time, but staffing additional mission commanders, analysts, and contract maintenance personnel and operators, plus resolving any basing restrictions subject to their contract. [98] In RC (SW), these ScanEagle mission commander and analyst billets were "taken out of hide" from units across the MAW (Fwd), but primarily from the Marine air control squadrons (MACS) and Marine air support squadrons (MASS) of the MACG. [99]

(U//FOUO) "*With the ScanEagles, it wasn't a factor of how much money we could get to have Boeing fly more ScanEagle hours; it was the mission commanders and the analysts.*"

MajGen Andrew O'Donnell
Commanding General
3d MAW (Fwd)

(U//FOUO) RC (SW) UAS manpower challenges were exacerbated by the OEF force cap. For instance, VMU-1 deployed with 135 personnel. However, they originally requested to deploy 157. [100]

(U//FOUO) Due to the highly technical nature of the UASs and their equipment, it was important to have specialty contractors and field service representatives (FSR) available to support the maintenance programs. [101]

(U//FOUO) The MARCC assistant officer-in-charge (OIC) noted the value of having the MARCC OIC continue to be an aviator in order to provide the aviation planning, operations, and command and control perspective. [102]

Recommendations

1. (U//FOUO) Ensure expeditious fielding of USMC UAS upgrades, including UHF retransmission capability, hyper-spectral imaging sensor, and capacity for armed attack. (**T**raining, **M**aterial)

2. (U//FOUO) Continue to evaluate the advantages and potential drawbacks of maintaining the MARCC as a staff component. (**D**octrine, **O**rganization)

3. (U//FOUO) Further develop and refine procedures for requesting and dynamically retasking organic and joint UAS support that are responsive, efficient, and commonly understood across the MAGTF. (**D**octrine, **T**raining)

4. (U//FOUO) Provide sufficient UASs and manned aircraft with video downlink capability during unit PTP in order to validate/update doctrine and adequately prepare air officers, intelligence officers, FACs, JTACs, and JFOs for employing these resources in combat. (**D**octrine, **T**raining, **M**aterial)

5. (U//FOUO) Determine the optimum location of VMU squadrons within the ACE. Determine whether to leave them in the MACG or place them in existing fixed-wing or rotary-wing MAGs, or establish UAS-specific MAGs. (**O**rganization)

6. (U//FOUO) Educate Marines throughout the chain-of-command regarding UAS capabilities, TTPs, and integration with other ISR systems. (**D**octrine, **T**raining, **L**eadership and Education)

7. (U//FOUO) Deploy sufficient 0231 intelligence specialist and 0241 imagery analysis specialist Marines to provide analysis and dissemination of data provided by UAS capabilities in

support of units conducting distributed operations throughout RC (SW). (**O**rganization, **P**ersonnel)

Summary

(U) Lessons and observations from this collection will be distributed to appropriate advocates, proponents, and operating forces in the interests of improving how Marine forces are organized, trained, equipped, and provided to combatant commanders.

(U//FOUO) The collection team leader for this effort was Mr. Jeff Miglionico, LtCol, USMC (Ret), MCCLL Program Analyst (PA) to 3d MAW. Other team members included:

- Mr. Bradley Lee, MGySgt, USMC (Ret), MCCLL PA to 1st MARDIV
- Mr. Craig Bevan, LtCol, USMC (Ret), MCCLL PA to MAGTF-TC
- Mr. Hank Donigan, Col, USMC (Ret), MCCLL PA to I MEF
- Mr. Rob Clark, Col, USMC (Ret), MCCLL PA to 1st MLG
- Mr. Steven Thompson, Col, USMC (Ret), MCCLL PA to II MEF

(U//FOUO) Content of this report was developed by MCCLL senior analyst, Mr. Dan Bornarth, LCdr, USN (Ret).

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[16] Reed, LtCol Marvin, USMC, RC (SW) Air Officer. Interview with Mr. Jeff Miglionico, MCCLL, May 12, 2011. Cited hereafter as Reed, Miglionico interview. Bufkin, LtCol William, USMC, 3d MAW (Fwd) Deputy G-3. Interview with Mr. Jeff Miglionico, MCCLL, April 28, 2011. Cited hereafter as Bufkin, Miglionico interview. Bolden, David, Reyna, Blakemore, Miglionico interviews.

[17] Barranco, Miglionico interview.

[18] Osterman, Lee interview.

[19] Barranco, Funkhouser, Miglionico interviews.

[20] Hanson, Col Steven, USMC, I MEF (Fwd)/RC (SW) C-2. Interview with Mr. Hank Donigan, MCCLL, June 1, 2011. Cited hereafter as Hanson, Donigan interview. David, Funkhouser, Miglionico interviews.

[21] Sibley, Thompson interview.

[22] Bohn, LtCol David, USMC, 3d MAW (Fwd) Senior Watch Officer. Interview with Mr. Jeff Miglionico, MCCLL, April 28, 2011. Cited hereafter as Bohn, Miglionico interview.

[23] David, Alvarez, Bohn, Bufkin, Miglionico interviews. Sibley, Thompson interview.

[24] Bartkowski, Capt Neil, USMC, 1st MLG Assistant G-2. Interview with Mr. Robert D. Clark, MCCLL, May 17, 2011. Cited hereafter as Bartkowski, Clark interview.

[25] Green, Maj Lawrence, USMC, MAWTS-1 UAS Division. Interview with Mr. Jeff Miglionico, MCCLL, May 4, 2011. Cited hereafter as Green, Miglionico interview.

[26] Fallon, Dallas, Thompson interviews. Bufkin, Miglionico interview.

[27] Dietz, LtCol Mark, USMC, RCT-7 Executive Officer. Interview with Mr. Craig Bevan, MCCLL, June 13, 2011. Cited hereafter as Dietz, Bevan interview.

[28] Connell, Maj Craig, USMC, 1st MLG Air Officer. Interview with Mr. Robert D. Clark, MCCLL, May 12, 2011. Cited hereafter as Connell, Clark interview. Bartkowski, Clark interview.

[29] Rodriguez, Maj Rodney, USMC, VMU-2 S-3. Interview with Mr. Steve Thompson, MCCLL, April 27, 2011. Cited hereafter as Rodriguez, Thompson interview. Dallas, Sibley, Thompson interviews.

[30] Maj Rodney Rodriguez draft report review, August 22, 2011. Cited hereafter as Rodriguez review.

[31] Phone conversation between Maj Lawrence Green, MAWTS-1 UAS Division and Mr. Dan Bornarth, MCCLL, August 3, 2011. Cited hereafter as Green, Bornarth PHONCON. Rodriguez review.

[32] Gardner, Lee interview. Hanson, Fitzpatrick, Donigan interviews. David, Miglionico interview.

[33] Bartkowski, Clark interview.

[34] Osterman, Lee interview.

[35] Lapi, GySgt Joseph, USMC, MAWTS-1 UAS Division Chief. Interview with Mr. Jeff Miglionico, MCCLL, May 4, 2011. Cited hereafter as Lapi, Miglionico interview. Lathrop, Thompson interview. Bufkin, Miglionico interview.

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[37] Monroe, Miglionico interview.

[38] Mills, Donigan interview.

[39] O'Donnell, MajGen Andrew, USMC, 3d MAW (Fwd) Commanding General. Interview with Mr. Jeff Miglionico, MCCLL, May 6, 2011. Cited hereafter as O'Donnell, Miglionico interview. Mills, Donigan interview. Osterman, Lee interview.

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[41] Hanson, Donigan interview.

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[43] Reed, Miglionico interview. Burton, Dallas, Thompson interviews.

[44] Stimpson, Thompson interview. Fitzpatrick, Donigan interview.

[45] Bechtold, Maj Robert, USMC, RCT-1 S-2. Interview with Mr. Steve Thompson, MCCLL, May 3, 2011. Cited hereafter as Bechtold, Thompson interview. Fallon, Thompson interview. Hauser, Lee interview.

[46] Fallon, Bechtold, Sibley, Thompson interviews.

[47] Burton, Thompson interview.

[48] Mills, Fitzpatrick, Hanson, Donigan interviews. Stimpson, Thompson interview. Bohn, Miglionico interview.

[49] Mills, Hanson, Donigan interviews.

[50] Mills, Hanson, Donigan interviews. Reed, Miglionico interview.

[51] O'Donnell, Blakemore, Miglionico interviews. Burton, Thompson interview.

[52] David, Miglionico interview. Sibley, Dallas, Thompson interviews.

[53] Bolden, Miglionico interview. Dallas, Thompson interview.

[54] Monroe, Miglionico interview. Dallas, Thompson interview.

[55] Osterman, Lee interview.

[56] Monroe, Bolden, David, Miglionico interviews.

[57] Osterman, Gardner, Hauser, Lee interviews.

[58] Bolden, David, Miglionico interviews.

[59] David, Miglionico interview.

[60] Gardner, Lee interview.

[61] Bolden, Miglionico interview.

[62] Barranco, Bolden, Miglionico interviews. Lathrop, Thompson interview.

[63] Gardner, Lee interview. Bolden, Bufkin, Miglionico interviews. Fitzpatrick, Donigan interview.

[64] Barranco, Templeton, Funkhouser, Miglionico interviews. Lathrop, Fallon, Thompson interviews.

[65] Dallas, Sibley, Bechtold, Thompson interviews. Fitzpatrick, Donigan interview. Bolden, Bohn, Blakemore, Miglionico interviews.

[66] Lathrop, Thompson interview.

[67] Mills, Donigan interview. Reed, Bohn, Reyna, Miglionico interviews.

[68] Gardner, Lee interview. Hanson, Fitzpatrick, Donigan interviews.

[69] Bolden, Miglionico interview.

[70] Fallon, Thompson interview. Bolden, Miglionico interview.

[71] Tucker, Capt Emma, USMC, 3d MAW (Fwd) DASC OIC. Interview with Mr. Jeff Miglionico, MCCLL, April 27, 2011. Cited hereafter as Tucker, Miglionico interview. Barranco, Miglionico interview.

[72] Mills, Donigan interview. Osterman, Lee interview.

[73] Osterman, Lee interview. Bolden, Miglionico interview.

[74] Monroe, Funkhouser, Miglionico interviews.

[75] Osterman, Gardner, Lee interviews.

[76] Sibley, Thompson interview.

[77] Hanson, Donigan interview.

[78] Osterman, Lee interview. Fitzpatrick, Donigan interview. Lathrop, Thompson interview.

[79] Coble, Maj Christopher, USMC, MAWTS-1 UAS Division Head. Interview with Mr. Jeff Miglionico, MCCLL, May 4, 2011. Cited hereafter as Coble, Miglionico interview. Osterman, Lee interview. Fitzpatrick, Donigan interview. Lathrop, Stimpson, Fallon, Thompson interviews. Barranco, Miglionico interview.

[80] Coble, Miglionico interview.

[81] Bechtold, Thompson interview. Bartkowski, Clark interview.

[82] Coble, Blakemore, Miglionico interviews.

[83] Davis, Col Jeffrey, USMC, MACG-38 Commanding Officer. Draft report review, September 13, 2011. Cited hereafter as Davis review.

[84] Rodriguez, Thompson interview.

[85] Bartkowski, Clark interview.

[86] Lathrop, Thompson interview. Funkhouser, Miglionico interview. Green, Bornarth PHONCON.

[87] Barranco, Funkhouser, Miglionico interviews.

[88] Osterman, Lee interview. Fitzpatrick, Hanson, Donigan interviews. Funkhouser, Miglionico interview. Green, Bornarth PHONCON.

[89] Funkhouser, Miglionico interview.

[90] Reed, Blakemore, Miglionico interviews.

[91] STUAS Document. Amos email.

[92] Connell, Clark interview. David, Miglionico interview.

[93] Johnson, 1stLt Trevor, USMC, 3d MAW (Fwd) ASLT OIC. Interview with Mr. Jeff Miglionico, MCCLL, April 27, 2011. Cited hereafter as Johnson, Miglionico interview. Bartkowski, Clark interview.

[94] Funkhouser, Miglionico interview. Green, Bornarth PHONCON.

[95] Funkhouser, Miglionico interview.

[96] Monroe, Miglionico interview.

[97] Lathrop, Thompson interview.

[98] O'Donnell, David, Bolden, Reed, Alvarez, Miglionico interviews. Osterman, Lee interview. Hanson, Donigan interview. Stimpson, Dallas, Thompson interviews.

[99] Davis review.

[100] Alvarez, Miglionico interview.

[101] Hanson, Donigan interview.

[102] Dallas, Thompson interview.