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An analysis of manpower requirements for the United States Marine Corps Tiers II & III unmanned aerial systems family of systems program

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THESIS

AN ANALYSIS OF MANPOWER REQUIREMENTS FOR THE UNITED STATES MARINE CORPS TIERS II & III UNMANNED AERIAL SYSTEMS FAMILY OF SYSTEMS PROGRAM

by

Cesar E. Nader

June 2007

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13. ABSTRACT (maximum 200 words)

This research was conducted to examine the quantitative and qualitative component requirements for the Tier II and Tier III of the United States Marine Corps Unmanned Aerial Systems Program. The main objective of this research is to develop a proposed manpower structure for a composite squadron in order to improve current UAS capabilities while minimizing manpower requirements.

This was accomplished by conducting an independent assessment of manpower requirements of the different strategies being considered under the Unmanned Aerial Systems Family of Systems (UAS FoS) for the Marine Corps for the Tier II and III.

In the final analysis, the research recommends the consolidation of the Tiers II and III to form a composite UAV squadron, reduce the logistics footprint by relegating the support mission to the MWSS and the MALS, and combining operational and maintenance billets within the current VMU structure to consolidate manpower requirements and optimize UAS force structures.

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AN ANALYSIS OF MANPOWER REQUIREMENTS FOR THE UNITED STATES MARINE CORPS TIERS II & III UNMANNED AERIAL SYSTEMS FAMILY OF SYSTEMS PROGRAM

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Submitted in partial fulfillment of the
Requirements for the degree of

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LIST OF ACRONYMS AND ABBREVIATIONS

4th Marine Expeditionary Brigade (4th MEB)
Air Intelligence (AI)
Air Vehicle (AV)
Air Vehicle Mechanic (AVM)
Air Vehicle Operators (AVO)
Aircraft Armaments Incorporated (AAI Corp.)
Aircraft Support Equipment (ASE)
Anti-Submarine Warfare (ASW)
Aviation Ground Support (AGS)
Aviation Maintenance Department (AMT)
Battalion (Bn)
Command and Control (C2)
Command channel (C-band)
Commandant of the Marine Corps (CMC)
Commanding Officer (CO)
Commercial-Off-The-Shelf (COTS)
Concept Demonstrator (CD)
Defense Advanced Research Project Agency (DARPA)
Department of Defense (DoD)
Dragon Eye (DE)
Drone Anti-Submarine Helicopter (DASH)
Electronic Warfare (EW)
Electro-optical/infrared (EO/IR)
Experimental Helicopter Squadron One (EHS-1)
External Pilots (EP)
Fleet Marine Forces (FMF)
Fleet Replacement Squadron (FRS)
Forward Looking Infra-Red (FLIR)
Friendly Line of Troops (FLOT)
General Accounting Office (GAO)

Global Positioning System (GPS)

Ground Combat Element (GCE)

Ground Control Station (GCS)

High Mobility Multi-purpose Wheeled Vehicles (HMMWVs)

Imagery Analysts (IA)

Imagery intelligence (IMINT)

Improvised Explosive Devices (IED)

Initial Capabilities Document (ICD)

Intelligence, surveillance and reconnaissance (ISR)

Interim-Small Unit Remote Scouting System (I-SURSS)

Internal Pilots (IP)

Israel Aircraft Industries, Ltd. (IAI Ltd.)

Joint Task Force (JTF)

Knowledge, skills, and abilities (KSA)

Landing Force Development Center (LFDC)

Life Cycle Costs (LCC)

Line-of-sight (LOS)

Marine Air Group (MAG)

Marine Air Wing (MAW)

Marine Air-Ground Task Force (MAGTF)

Marine Aviation Logistics Squadron (MALS)

Marine Composite Unmanned Aerial Vehicle Squadron (VMUX)

Marine Corps Air Ground Combat Center (MCAGCC)

Marine Corps Air Station (MCAS)

Marine Corps Air Station (MCAS)

Marine Corps Combat Development Command (MCCDC)

Marine Corps Systems Command (MCSC)

Marine Corps Warfighting Laboratory (MCWL)

Marine Expeditionary Force (MEF)

Marine Expeditionary Unit (MEU)

Marine Forces Reserve (MARFORRES)

Marine Unmanned Aerial Vehicle squadron (VMU)

Marine Wing Support Squadrons (MWSS)
Marine Expeditionary Brigade (MEB)
Military Occupational Field (MOS)
Mission Commanders (MC)
Mobile maintenance facility (MMF)
Military Operations Other Than War (MOOTW)
Motor Gasoline (MOGAS)
Marine Aviation Weapons and Tactics Squadron 1 (MAWTS-1)
Naval Aviation Training and Operating Procedures Standardization (NATOPS)
Naval Research Laboratory (NRL)
Navy Training Systems Plan (NTSP)
Non-Developmental Items (NDI)
Nuclear, Biological and Chemical (NBC)
Operation Enduring Freedom (OEF)
Operation Iraqi Freedom (OIF)
Payload Operators (PO)
Pneumatic Launch System (PLS)
Portable Control Station (PCS)
Remote Receiving Stations (RRS)
Remotely Piloted Helicopters (RPH)
Replacement Air Group (RAG).
Rocket Assisted Take-off (RATO)
Shipboard Pioneer Arrestment and Recovery System (SPARS)
Small Unmanned Aerial Vehicle (SUAS)
Suppression of enemy air defenses (SEAD)
Surveillance, Reconnaissance and Intelligence Group (SRIG)
Table of Organization and Equipment (TO&E)
Tactical Unmanned Aerial Vehicle (TUAV)
Tactics, Techniques and Procedures (TTP)
Tracking Communication Unit (TCU)
United States Marine Corps (USMC)
Unmanned Aerial Vehicle (UAV)

Unmanned Air System Family of Systems (UAS FoS)

Unmanned Surface Vehicles (USV)

Vertical Take-off and Landing Unmanned Aircraft System (VTUAS)

Marine Unmanned Aerial Vehicle Squadron 1 (VMU-1)

Marine Unmanned Aerial Vehicle Squadron 2 (VMU-2)

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I. INTRODUCTION

The purpose of this research is to examine the quantitative and qualitative manpower requirements of the United States Marine Corps (USMC) Unmanned Aerial Vehicle (UAV) program for the implementation of a Tier II/III Unmanned Air System Family of Systems (UAS FoS) manpower structure that complements the development of new technologies in this field. The Marine Corps is composed of three UAS tiers. Tier I is currently serviced by the Dragon Eye UAV and is an organic component of the Ground Combat Element (GCE) at the Infantry Battalion (Bn) level. It also supports units at lower levels of command within an infantry Bn down to the squad level. ScanEagle is the Tier II UAS. It supports the Marine Expeditionary Unit (MEU) and is currently filled by a fee-for-service contract with Boeing Corporation. The Tier III requirement is currently filled by the RQ-2 Pioneer, which has been in service with the USMC since 1986. This UAS currently fulfils the UAS strategic role at the Marine Air-Ground Task Force (MAGTF).[1]

The primary objective of this research is to develop a proposed UAS manpower structure to support the mid-level tier of the UAS FoS within the USMC, also known as Tier II. The study will consider the required manpower structure by Military Occupational Field (MOS) to grow a Tier II UAS structure as well as the training component required to develop this force within the USMC.

A. AREA OF RESEARCH

This research will encompass an independent assessment of manpower requirements of the Tier II and Tier III structures needed to fulfill the mission of the Unmanned Aerial Systems Family of Systems (UAS FoS) for these tiers in the USMC. This will be accomplished by analyzing the Marine Unmanned Aerial Vehicle squadron (VMU) manpower structure and developing the manpower requirements to support the Tier II UAS FoS capability currently under development. The research will also include an assessment of the establishment of a training facility that will allow for more realistic

[1] MCCDC, USMC VISION. UAS Family of Systems (FoS) Document. September 2005.

and hands on training to ensure newly trained Marines are able to developed the knowledge, skills and abilities (KSA) required to effectively performed their duties. In addition, the research will review the possibility of establishing a composite VMU squadron (VMUX), where the Tier II and Tier III systems can be combined into one efficient and effective squadron that reduces manpower requirements and logistical footprint and improves mission capabilities. This study will provide an understanding of the synergy that might be created from a composite (Tier II and III) UAS squadron and the implications of the ownership and location of these squadrons in relation to their ability to support the Marine Air-Ground Task Force (MAGTF).

B. RESEARCH QUESTION

1. Primary Questions

- What notional manpower structure would best support the Tier II and Tier III mission requirements of the UAS FoS?

2. Secondary Questions

- What notional logistics support is required to maintain and operate a deployed UAS unit?

C. DISCUSSION

The USMC's UAS FoS has undergone substantial growth in the past decade. Since the inception of the RQ-2 Pioneer (Tier III) in 1986 and Dragon Eye (Tier I) in 2003, the technology has evolved from simple hand-held and easy launch systems to more complex and flexible systems that are capable of carrying combat payloads.[2] At this pace, this type of capability will allow ground forces to improve their visibility and decision making on the battlefield to achieve mission goals and objectives. Both commercial and government agencies have realized the considerable benefits of UAS technology in the battlefield, propagating their growth beyond the initial requirement to

[2] OSD. Unmanned Aircraft Systems Roadmap. 2005-2030. p. 8.

gather intelligence, scan and observe ahead of troops, and provide real-time feedback on the battle assessment during contingency operations.

One of the biggest challenges for the Marine Corps is its ability to grow and maintain these UAS units without increasing the manpower requirements to augment the ever-growing need for the capability across the Marine Corps. The increased demand for these assets in the battlefield has consumed the limited capability and available resources of the only two active-duty Marine Unmanned Aerial Vehicle squadrons (VMU). VMU-1 is located at Marine Corps Air Ground Combat Center (MCAGCC), 29 Palms, CA and VMU-2 is located at Marine Corps Air Station (MCAS), Cherry Point, NC. These two VMU squadrons have been alternating deployments to Iraq and Afghanistan in support of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). To meet the future needs of the MAGTF, the Marine Corps is looking at technological advances to adopt UAS platforms that will augment current and future Marine Corps capabilities and requirements in this field.

Until recently, the parameters and doctrine governing the UAS community in the Marine Corps were limited in scope and cost assessment. The increased demand in missions for irregular warfare and new operating conditions means that current UAS platforms must be more advanced (i.e., multi-mission, increased range, more autonomous) in order to meet MAGTF requirements. Advances in UAS technology have made it possible for the Marine Corps to be ambitious and demanding about the types of platforms they need to meet dynamic threats and UAS mission criteria.

To meet UAS demands throughout the USMC, the Marine Corps Systems Command (MCSC) is exploring new visions and capabilities to meet the UAS needs of the future. The current tier structure allows the MAGTF to divide the battlefield according to the range, endurance and capability of each asset. As stated, the Tier I role is currently filled by the Dragon Eye, but the USMC has plans to transition from this platform to the RQ-11 Raven. For the Tier III, USMC planners have established timelines for the replacement of the RQ-2 Pioneer since this platform does not meet the future concept of employment for this tier.[3] The Tier III is still being analyzed to

[3] MCCDC, USMC VISION. UAS Family of Systems (FoS) Document. September 2005.

determine capability requirements and structure. This study, which focuses on Tier II, will look for the development of a well-defined manpower structure and to replace the fee-for-service contract for the ScanEagle UAS. Based on the USMC UAS FoS vision for 2005 developed by the Marine Corps Combat Development Command (MCCDC), the requirement for any UAS is to provide each level of the MAGTF with a tactical, organic, joint interoperable, integrated, and tailored capability that gives situational awareness to the warfighter through a common Command and Control (C2) architecture across the range of military operations.[4]

The manpower requirements development process to support these capabilities must take into consideration the type of system used for each level; the training requirements needed to grow each tier; and the impact on other units associated with the maintenance and support of these systems.

D BENEFITS OF THE STUDY

This study provides the Marine Corps with a proposed template for the implementation of combined manpower structure for the Tiers II and III. It also addresses the importance of the KSAs required to support and maintain the personnel structure in these tiers. The study will also evaluate the feasibility and benefits of recommending a composite squadron for the Tier II and III to minimize the manpower requirements to support separate squadrons and maximize the concentration of capabilities and resources.

E. SCOPE

The scope includes: (1) A review of the background and history of the USMC UAS program; (2) an in-depth review of UAS platforms currently operating in the USMC and their manpower structure and support systems, as well as the planned replacements for these platforms; (3) a feasibility study for the implementation of a Tier II/III manpower structure to operate in teams or as a detachment, according to mission needs. The thesis will conclude with a recommendation for the manning and training of an organic Tier II/III UAS FoS force structure.

[4] MCCDC, USMC VISION. UAS Family of Systems (FoS) Document. September 2005

F. METHODOLOGY

The methodology used in this thesis research consisted of the following:

- Conduct a literature search of documents, doctrine, publications, and current manpower structure of UAS platforms in the military.
- Conduct a review of UAS vision, plans, and projects underway by Marine Corps Combat Development Command (MCCDC) and MCSC to develop requirements, compatibility issues, capability needs and standards across systems.
- Conduct a review of the Army's Shadow UAS project to compare and contrast capabilities and mission needs.
- Examine capabilities of the current UAS systems in operation within the Marine Corps (Pioneer and Scan Eagle) and documented the requirements of the MAGTF on these systems.
- Conduct a visit to an operational UAV Squadron, the UAS School in Pensacola, and an Army UAS facility to observe operation and discuss differences between the Army and USMC requirements, implementation and maintenance costs, and lessons learned.
- Identify all potential courses of action to implement the manpower requirements.
- Prepare a target proposal for the development of the manpower structure required for a Tier II and III of UAS FoS in the USMC to support the different levels of MAGTF.
- Evaluate and proposed the location and units where these systems could reside.

G. THESIS ORGANIZATION

CHAPTER I: INTRODUCTION. This chapter discusses the purpose and description of the thesis and the benefits of this study. It also details the methodology, scope and organization of the thesis.

CHAPTER II: BACKGROUND AND HISTORY OF THE USMC UAS PROGRAM. This chapter covers the life of the UAS program, starting with the RQ-2 Pioneer in 1986 and leading to the current status of the UAS program in the USMC. It also includes an overview of the future programs that are being tested to replace some of the aging UAS programs in the USMC.

CHAPTER III: CURRENT AND FUTURE USMC UNMANNED AERIAL SYSTEMS. This chapter focuses on UAS platforms currently operated within the USMC and their manpower structures. It discusses the mission and purpose, system description, general characteristics, capabilities, and manpower requirements of each UAS platform to include the proposed replacement platform for each tier.

CHAPTER IV: PROPOSED UNMANNED AERIAL SYSTEM MANPOWER STRUCTURE FOR A COMPOSITE SQUADRON. This chapter offers a notional manpower structure template for the Tier II/III to form a composite squadron to minimize manpower requirements and concentrate resources and capabilities to meet the future needs of Marine Corps UAS requirements.

CHAPTER V: SUMMARY, CONCLUSION AND RECOMMENDATIONS. This chapter summarizes the study and provides conclusions, including the development of strategies offered for the Tier II manpower component. It also provides recommendations for the implementation of this manpower structure as well as answering secondary questions.

II. BACKGROUND AND HISTORY OF THE USMC UAS PROGRAM

A. BACKGROUND

The introduction of UAVs in the Armed Forces took time and considerable effort to incorporate. Service traditions played a factor in the debate over who would control UAVs and what UAVs would be allowed to enter the acquisition process. Drones such as the Ryan-modified Firebee, used in Vietnam for low-altitude reconnaissance, were an easy fit to the Air Force missions of the time. High-altitude, long-endurance platforms with autonomous flight completed some successful test flights in the 1960s and 1970s, but ultimately found no long-term buyers.

Figure 1. Ryan-modified Firebee Drone

When the Navy and Marine Corps bought the Pioneer in 1985, the argument about who should own UAVs had shifted to who should be allowed to pilot them. The Air Force, in its service tradition, was reluctant to agree with the other Services that allowed enlisted personnel to be trained to perform the duties of the pilot and payload operator in a UAV. After its performance in Desert Storm, and the now famous story of how one group of Iraqi troops tried to surrender to a Navy Pioneer UAV, there was no doubt that this asset was not prejudice against who controlled the system, but how it was used to achieve mission performance.

After logging over 900 hours during operation Desert Shield and Desert Storm, the Pioneer became a legend, and the Air Force lagged so far behind in UAV operations that many of the drones had to be borrowed from the Navy.[5]

Following the success of UAVs during Desert Storm, concepts changed and the development of capabilities for UAVs took a dramatic turn for the best. The Global Positioning System and more extensive satellite communications made remote-site control and in-flight rerouting of UAV missions easier and more effective to the requirements of field commanders. Commanders also wanted more real-time reconnaissance and surveillance to enable them to better assess the battlefield. The incorporation of increased bandwidth via satellite communications opened up new possibilities.

B. EARLY UAV PROGRAMS IN THE MARINE CORPS

1. Remotely Piloted Helicopters (RPHs)

The earliest historic data of Unmanned Vehicle research and testing goes back to the 1950s with the concept of Remotely Piloted Helicopters (RPH). After being sold on the idea of helicopters, the Marine Corps became more interested in the development of this technology for other Corps specific missions. One of the disadvantages of the helicopter fleet was the workload and manpower required to equip the Marine Operating Forces with enough helicopters to meet all of its requirements. In a concept paper published in 1954, titled “A Study of Marine Corps Requirements for the Remotely Controlled Rotary Wing Aircraft,” the discussion centered on the use of (RPHs) instead of manned helicopters to meet missions requirements. This concept paper argued that the RPHs had three advantages over manned helicopters: they were more cost effective, they

[5] Air Force Magazine Online. http://www.afa.org/magazine/sept2005. Accessed March 2007.

would reduce the exposure of helicopter crews to potentially harmful situations, and they would reduce the workload of manned helicopter crews. A year later, after prototypes from Kaman Corporation were evaluated by Experimental Helicopter Squadron One (EHS-1) and the Landing Force Development Center (LFDC), the Marine Corps planned to activate three RPH squadrons beginning in fiscal year 1959 (FY-59). The squadrons never materialized because the evaluation demonstrated no advantage over a manned helicopter. The demonstration highlighted some shortfalls that the Marine Corps was unable to overcome. It showed that the RPHs were more expensive than anticipated, less reliable than their manned counterparts, and more difficult to operate than originally planned. This was the end of the RPH program.[6]

2. Bikini Drones

Unwilling to scrap all of the research and development with unmanned vehicles, the Marine Corps continued to pursue this technology with a new approach under the code name Bikini. While the RPH concept was tested and evaluated for the feasibility of a utility vehicle, the Bikini concept was evaluated for the feasibility of providing organic near real-time reconnaissance to the battalion commander in the field. The Bikini program started in 1959 and was under research and development for seven years before it was tested for its feasibility. According to the R&D specifications, this system would only require a two-man team — one to operate the vehicle and the other one to maintain it. In true Marine Corps fashion and according to doctrine, the unmanned drone and its team of two Marines would be attached to the infantry battalions and perform reconnaissance missions in support of the battlefield commander.[7]

The configuration of the drone system (the drone and all of its support requirements) was designed to fit in one jeep and one trailer. To be more efficient in the deployment and employment of the system, the trailer would double as a launcher as well as a cargo carrier. The battalion’s flamethrower compressor would recharge the

[6] Major L. R. Fuchs, USMC. “Unmanned Aircraft” Marine Corps Gazette, October l98l.

[7] Major L. P. Charon, USMC, “Front Line Photo Drone Ready for Robot Recon,” Marine Corps Gazette, August l966.

pneumatic launcher, and the air vehicle would be recovered by the operator flying the drone by cutting the engine and activating the parachute release. The drone carried a 70mm camera whose film had to be developed, like any other camera, by either the division reconnaissance battalion or by the team using a newly developed waterless film processor. An important development from the Bikini drone was the Concept of Employment that came of this project, which is remarkably similar to the standing Marine Corps Concept of Employment for the Close Range UAV published by MCCDC, in 1992.[8]

After testing, the Marine Corps purchased twenty Bikini drones, and establish their residence for further testing and evaluation with the Headquarters and Service Company, 2nd Reconnaissance Battalion, 2nd Marine Division at Camp Lejeune, NC. After only one year of testing with this unit, and over 300 flights later, the results were not positive. Of the original twenty air vehicles, only six remained. From the fourteen vehicles damaged, eleven were lost due to operator error, with the majority of the errors occurring during landing and takeoffs. Despite the proven potential for UAVs in the battlefield, Bikini was a risk that Marine Corps planners at the time were not willing to take. The system was not suitable for the time, and it would have to be shelved until further development.

3. Dash and Project Snoopy

In 1969, not too long after discarding the RPHs, the Defense Advanced Research Project Agency (DARPA) developed some advanced applications of a similar RPH called Drone Anti-Submarine Helicopter (DASH) also known as the QH-50. The DASH was originally developed to extend the range of the Navy's anti-submarine warfare (ASW) capability a safe distance from the ship.

[8] Major H. L. Scott, "Tactical Imagery Processing," Marine Corps Gazette, September l966.

Figure 2. QH-50 Unmanned Aerial Vehicle (AUV)

The DASH did not survive testing and field applications in its current configuration. Consequently, Project Snoopy became the first advance application of the DASH. It equipped the drone with television cameras for beach reconnaissance and naval gunfire spotting along the coast of Vietnam. Further developments included payload packages with low light level television, lasers for range finding, and armaments of .50 caliber guns, Gatling guns, or hypervelocity guns. The drone was capable of carrying payloads of up to 1,000 pounds.

Eventually, the Marine Corps got involved with DASH during operation Nite Panther. In contrast with the Navy version, the Marine DASH was equipped with a jeep configured as a Ground Control Station (GCS) in order to go ashore. The intent of the operation was to have the Marines take control of a ship-launched drone and execute clandestine reconnaissance and targeting missions while ashore. This was the first attempt at the “Hub and spoke” concept that is now practiced with the RQ-2 Pioneer and Scan Eagle UAVs. Upon completing the mission, they would hand over control of the drone back to the ship for recovery. From the trials of the DASH, 58 vehicles were lost during this time, but these losses could not be solely attributed to either enemy action or operator/malfunction error. Lower than expected performance played a major role in the outcome of the program.

The program was cancelled in 1971 due to an overwhelming number of lost systems during peacetime operations and a lower than expected performance rate as stated by the Secretary of Defense at that time, Robert McNamara. Of the 750 drones built during this period, 411 crashed within a ten-year span. In the eyes of the Defense department, DASH attrition was attributed to poor management. The system was exposed to corrosion problems, high crew turnover, improper maintenance procedures, and the crew lacked flight proficiency because of long periods without training.[9]

In contrast to the American performance record, the Japanese, who were flying similar systems, were able to achieve 1,440 flight hours with only four losses. This was four times better than the American average. The Japanese program was more disciplined, and they emphasized crew cohesion as well as a daily training program. They maintained crews together for years and followed a detailed maintenance program prescribed by the manufacturers.

The DASH program was built under a false sense of urgency, and no one realized how much money and effort would be required to make the system work well. Looking back at the program, one can assume that if more emphasis had been placed on the DASH during its development and testing, many design flaws and deficiencies could have been resolved, and its management problems could have been corrected. When Secretary McNamara cut the DASH program, the Navy decided to immediately replace the DASH with the SH-2D Seasprite helicopter, claiming that its evolving mission was too critical to rely on an unmanned drone. Despite the fact that the DASH was originally a Navy program, the Marine Corps was able to draw some very important lessons that would later become the foundation of their UAV program.

4. The Revitalization of UAVs

During the mid 1970s and early 1980s, all of the Services were revitalizing their interest in UAVs. More importantly, the Marine Corps outlined its UAV requirements in

[9] Jack Kestner, “Navy Dumps DASH after $250 Million Dollar Cost,” Ledger-Star, September 27, 197l.

the l975 Mid-range Plan. Conversely, Congress was not very supportive of the Services as they were not showing a dramatic increase in performance, efficiency, or cost. Interestingly enough, the General Accounting Office (GAO) was trying to rekindle the military's affair with UAVs because they believed UAVs could be more cost-effective than manned aircraft. In 1981, the GAO, in its report to Congress titled "DoD's Use of Remotely Piloted Vehicle Technology Offers Opportunities for Saving Lives and Dollars," claimed that the Services were reluctant to field UAVs because pilots feared a lack of job security. In its findings, the report alluded to pilot fears of being replaced by the drones and suffering the effects of reduced promotions and manpower cuts in their field. The report concluded with a strong recommendation to give UAVs adequate consideration for specific missions.[10]

C. THE MARINE CORPS' FIRST OFFICIAL UAV (RQ-2 PIONEER)

Early in 1980, the Navy began the employment of remotely piloted vehicles (RPV) on battleships like the Iowa-class, to gather imagery intelligence (IMINT) for spotters in support of naval gunfire. This process began as a requirement from the Navy to search for a system that would deliver the unique needs of the Navy and Marine Corps onboard ships. The Marine Corps adopted the Pioneer 1986 after an interim program adopted from the Navy in 1985.[11]

The historic link between Pioneer (the first USMC UAS) and the United States Marine Corps began long before the first acquisition of the asset in 1985. The Israeli invasion of Lebanon in 1982 was the catalyst that sparked the Marine Corps' interest in Pioneer when Israel launched Operation PEACE FOR GALILEE. During this time, Lebanon had been under the political control of Syria. It was a safe-haven for the PLO, and it was also occupied by a large Syrian military force. Israel was aware that, in order to mount a successful ground campaign, it had to master the skies and ensure air superiority.

10 General Accounting Office Report to Congress MASAD-8l-20, 3 "DoD's Use of Remotely Piloted Vehicle Technology Offers Opportunities For Saving Lives And Dollars." April 1981.

11 Website Israeli Weapons. http://www.israeli-weapons.com/weapons/aircraft/uav/pioneer/Pioneer.html. Accessed March 2007.

The Israelis knew that controlling Lebanon's Bekaa Valley was critical in order to break the lines of communication with Damascus. The challenge for Israel was to find a way to neutralize the Syrian Air Defense Network that defended this key terrain. In a strategy developed by the Israeli military planners, their solution to this tremendous challenge was to flood the skies above the Bekaa Valley with a fleet of unmanned aerial vehicles. The UAVs would be equipped with transponders that simulated the electronic signature of actual attack aircraft. The outcome was a complete success as the Syrian SAM sites began to engage these drones. Once the Syrian SAM positions were compromised and they had spent all of their missiles on the UAVs, Israeli attack jets rushed to the scene and engaged the SAM sites with anti-radiation missiles. In the aftermath, the Israeli Air Force did not lose a single manned aircraft during the attack and went on to achieve complete air supremacy in the skies over Lebanon.

After the disastrous suicide attack against the Marine Barracks in Beirut, which killed 241 American servicemen, the Commandant of the Marine Corps (CMC) General P. X. Kelley traveled to Israel to visit the Marine barracks. Israeli's UAVs had captured images of the CMC standing in the rubble of the destroyed Marine barracks. This video impressed the CMC so much that, upon his return to the United States, General Kelley shared that experience with then Secretary of the Navy John Lehman. Based on Israel's previous success with UAV systems, coupled with the recommendations of the CMC, Secretary Lehman was insistent on rapid procurement of an unmanned aerial vehicle system for use by the Navy and Marine Corps.

Secretary Lehman became the primary advocate behind the acquisition of the Israeli Mastiff UAV System. This was a simple, inexpensive solution to the problem of reconnaissance and target acquisition. It was Secretary Lehman who helped establish a bilateral agreement with the Israeli government to acquire the famous UAVs. Later, in January of 1984, Marines from the 2nd Marine Division, (10th Marine Artillery Regiment's Target Acquisition Battery, Detachment Alpha) secretly traveled to Israel to learn to operate and maintain the Mastiff UAV system. For a price tag of $7.5 million, the Israeli military would teach the Marine unit how to operate and maintain the Mastiff UAV system.

After extensive training and having gained real-world experience operating the Mastiff system with their Israeli's counterparts, the Marines of the 10th Marine Artillery Regiment returned to the United States, and on August 22, 1984, the detachment was transferred to Headquarters Battalion, 2nd Marine Division and was re-designated as the 1st Remotely Piloted Vehicle (RPV) Platoon. Though the newly formed unit was challenged by an unusual amount of logistical and technical difficulties, the 1st RPV Platoon successfully employed the Mastiff UAV in support of a number of Navy and Marine Corps exercises. At the time, the system was under the operational control of the Atlantic Fleet Commander.[12]

The platoon's successes with the Mastiff UAV validated the merits of unmanned aviation, and the Department of the Navy soon solicited defense contractors for an off-the-shelf UAV system more capable than the Mastiff. At the end of this process, the winner of the bid was the RQ-2 Pioneer. This UAV was also developed by the Israelis, and it was the direct descendant of the Mastiff UAV. In an effort to streamline the process and avoid the pitfalls that followed the acquisition of the Army's Aquila and Skyeye, Secretary Lehman designated the Pioneer an "interim" system intended only to fill the gap until a permanent solution could be achieved. Both of these Army UAVs concepts had been under intense scrutiny by the GAO. The Aquila had been under development for ten years — with a price tag of $2.4 billion. The Skyeye UAV was large and it was designed for heavy payloads to operate in Central and South America.

[12] Global Security.org. http://globalsecurity.org /intell/library/reports/1995/wga.htm. Accessed March 2007.

Figure 3. RQ-2A Pioneer Unmanned Aerial Vehicle (UAV)

After extensive trials and the interim period that followed, in 1991, a joint venture was formed between Aircraft Armaments Incorporated (AAI) and Israel Aircraft Industries, Ltd. (IAI Ltd.), the latter of which developed the current RQ-2B Pioneer. This new corporation was named Pioneer UAV, Inc. and its purpose was to manage the RQ-2 Pioneer program as the prime contractor to the U.S. Government. Pioneer UAV Inc. is currently located in Hunt Valley, Maryland. It maintains resident expertise in quality assurance, program management, configuration management, finance, business development, procurement, logistics support, subcontract, and contract management.

During the 1990s, the Navy and Marine Corps operated the RQ-2 Pioneer with great success. This proved particularly effective during operations Desert Shield and Desert Storm. During this decade, the Navy began to develop a more focused UAV effort towards unmanned surface vehicles (USV). This resulted in the transfer of all Pioneer UAV assets to the Marine Corps by the end of the decade.

Since then, the Marine Corps has employed the Pioneer as a means to provide near real-time reconnaissance, surveillance, and intelligence to commanders in the field. Originally, Pioneer was enlisted to fill the Tier III UAS requirement for the USMC. It is currently being employed as a Tier II asset in OIF/OEF. In the future, the Vertical

Takeoff and Landing Unmanned Aircraft System (VTUAS) will replace Pioneer to become the Marine Corps' Tier III asset. Pioneer is due to phase out by 2015.

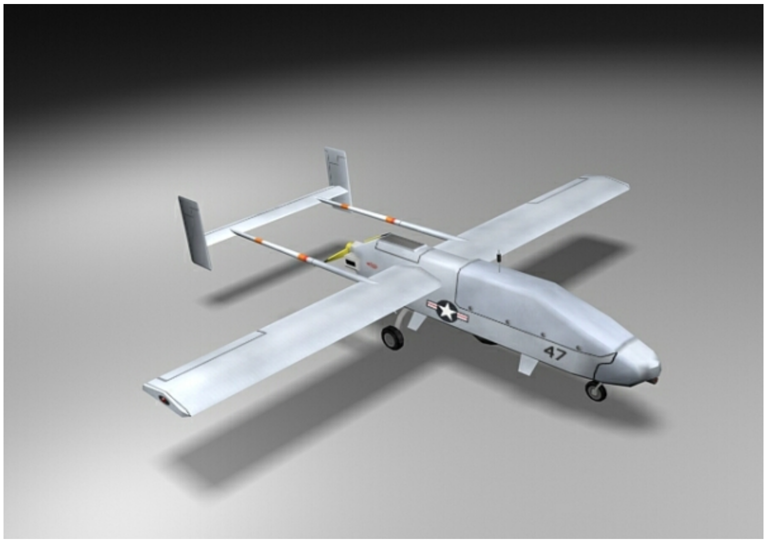

Figure 4. RQ-2B Pioneer UAV Model

D. HISTORY OF THE MARINE UNMANNED AERIAL VEHICLE SQUADRON (VMU)

The Marine Unmanned Aerial Vehicle squadron (VMU) has its roots far from its current composition and mission. As stated earlier, during January 1984, 10th Marine Artillery Regiment's Target Acquisition Battery Detachment Alpha were the first Marines to be assigned to train in the Mastiff UAV system in Israel. Upon their return in June of 1984, the unit was designated as the Remotely Piloted Vehicle (RPV) Detachment. On August 22, 1984, the detachment was reorganized, and re-designated, as the 1st Remotely Piloted Vehicle Platoon, Headquarters Battalion, 2nd Marine Division.

As part of the 13th Marine Expeditionary Unit (13^{th} MEU), the 1st RPV Platoon was embarked aboard the USS Tarawa for operations in the western Pacific. In October 1986, the 1st RPV Platoon was once again reorganized and re-designated as the 2nd RPV Company, Headquarters Battalion, 2nd Marine Division at Camp Lejeune, NC. In 1987, the Marine Corps received its first two RQ-2A Pioneer Unmanned Aerial Systems. In the following few years, the 2nd RPV Company consistently trained and deployed within the United States in support of several Marine Corps exercises.

E. SUBSEQUENT EVOLUTION OF VMU-1 & VMU-2

In February 1989, RPV units were incorporated into the Surveillance, Reconnaissance and Intelligence Group (SRIG) concept as an independent company under the Group command. In August 1990, the 2d RPV Company was reassigned to the 4th Marine Expeditionary Brigade (4th MEB) and embarked to the Middle East region in support of Operation Desert Shield. The company remained embarked with the 4th MEB until November 1990. Thereafter, the company was ordered ashore and reassigned to the 1st Surveillance, Reconnaissance and Intelligence Group, I Marine Expeditionary Force (I MEF).

During January 1991, the company deployed to Saudi Arabia in direct support of the 2nd Marine Division and later conducted missions in support of Operation Desert Storm. From February to March of 1991, direct support of Operation Desert Storm was conducted from Al Qurah. 2d RPV Company began retrograde operations and returned to Camp Lejeune on March 1991. During Operation Desert Shield/Storm, 2nd RPV Company flew a total of 69 sorties and 226 flight hours. Of these, 55 sorties and 192 flight hours were performed during combat operations. No Pioneer air vehicles were lost as a result of enemy action.

During May 1991, a detachment from 2nd RPV Company was formed to participate in Operation Provide Comfort and the Kurdish relief effort in northern Iraq. These Marines provided surveillance information during the conduct of the operation. The detachment returned to Camp Lejeune, NC, on May 31,1991. For the remainder of 1991, the company provided support to various elements of the II Marine Expeditionary Force (II MEF).

On January 1993, 2nd RPV Company was re-designated as the 2nd Unmanned Aerial Vehicle (UAV) Company and, in February 1994, the company was re-equipped with the Pioneer Option II Plus air vehicle. On January 1996, 2nd UAV Company was reorganized under Marine Aviation sponsorship and re-designated as Marine Unmanned Aerial Vehicle squadron 2 (VMU-2). Placed under Marine Aircraft Group 14, 2nd Marine Aircraft Wing, the squadron was relocated to Marine Corps Air Station Cherry

Point, NC, in May 1996. Then, in August 2000, VMU-2 was re-assigned to Marine Air Control Group 28, 2nd Marine Aircraft Wing.

Similarly, on January 1987, a new unit, 1st RPV Company, was activated at Marine Corps Air-Ground Combat Center (MCAGCC) 29 Palms, California, as part of the 7th Marine Amphibious Brigade followed by 3rd RPV Company in June 1987. On December 1989, 1st and 3rd RPV Companies were reassigned to the 1st Surveillance, Reconnaissance, and Intelligence Group. On January 1994, 1st RPV Company and 3rd RPV Company were integrated as one unit to form the 1st Unmanned Aerial Vehicle (UAV) Company. On January 1996, 1st UAV Company was re-designated Marine Unmanned Aerial Vehicle squadron 1 (VMU-1) and was reassigned to Marine Aircraft Group 13, 3rd Marine Aircraft Wing. During January 2000, VMU-1 was reassigned to Marine Air Control Group 38, 3rd Marine Aircraft Wing.[13]

VMU-1 is located at the Marine Corps Air-Ground Combat Center (MCAGCC) 29 Palms, CA. VMU-2 is located at Marine Corps Air Station (MCAS) Cherry Point, NC. VMUs operate the RQ-2 Pioneer Unmanned Aerial Vehicle (UAV) which provides Marine ground forces with information, surveillance, target acquisition and reconnaissance. They also provide artillery spotting and can assist in search and rescue operations. Since 2004, the VMU squadrons have also been operating with the ScanEagle UAV which is a fee-for service contract with Boeing Corp. Both of these systems will eventually be replaced by the Vertical Takeoff and Landing Unmanned Aircraft System (VTUAS).

The squadron has approximately 180 Marines and four Pioneer Systems with all of the logistical support required to operate as a unit. Appendix A is a copy of the table of Organization and Equipment (TO&E) of VMU-1.

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[13] Dave Funkhouser (USMC Captain), *The History of VMU-1*, January 2004.

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III. CURRENT AND FUTURE USMC UNMANNED AERIAL SYSTEMS

A. MARINE CORPS' UAS CONCEPT OF EMPLOYMENT.

The Marine Corps' Unmanned Aerial Systems Family of Systems (UAS FoS) was developed to provide each level of the Marine Air Ground Task Force (MAGTF) an organic, interoperable, integrated and tailored capability providing warfighter situational awareness through a common C2 architecture across the range of military operations.[14] The concept of employment for the three USMC UAS FoS tiers was developed to satisfy the needs of the commander at every level of operational support (battalion, regiment, MEF). A conscientious effort was made to ensure these tiers overlapped to enhance the operational capability of Unmanned Aerial Vehicle (UAV) assets at all levels. This concept of employment is meant to coincide with the level of unit they support.

The first aggregate level, called Tier I, comprises Dragon Eye UAV, but transition to the RQ-11B Raven B is expected in the near future. Its purpose is to provide short-duration reconnaissance and surveillance at the battalion and below level. This small unit UAS and its video is not available beyond the user at that level. This is what the Marines call "Over the next Hill/building reconnaissance" capability.[15]

The Marine Corps does not have a Tier II program of record (POR), but it employs the ScanEagle UAV systems under a fee-for-service agreement with Boeing Corporation to fill this Tier II capability gap. Along with ScanEagle, this tier is also supported by RQ-2 Pioneer. This tier supports the Marine Division, Regimental, Battalion and Marine Expeditionary Units (MEU).[16]

The Marine Corps' Tier III UAS is the RQ-2 Pioneer even though it is not used in its official role as a Tier III asset. Tier III provides target acquisition and designation,

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[14] MCCDC, USMC VISION. UAV Family of Systems (FoS) Document. September 2005.

[15] LtGen John G. Castellaw, DC Aviation, Fiscal Year 2007 Marine Corps tactical Air Programs, March 2006.

[16] Ibid.

reconnaissance and surveillance and radio relay to the Marine Expeditionary Force (MEF) or the Marine Expeditionary Brigade (MEB). The RQ-2 Pioneer is operated by the two active duty VMUs (VMU-1 and VMU-2). It supports tasking from subordinate units of the Marine Expeditionary Force (MEF) by providing intelligence, surveillance, reconnaissance, and target acquisition to Marine ground combat elements, including direct support to Marine Division and Regiments.[17]

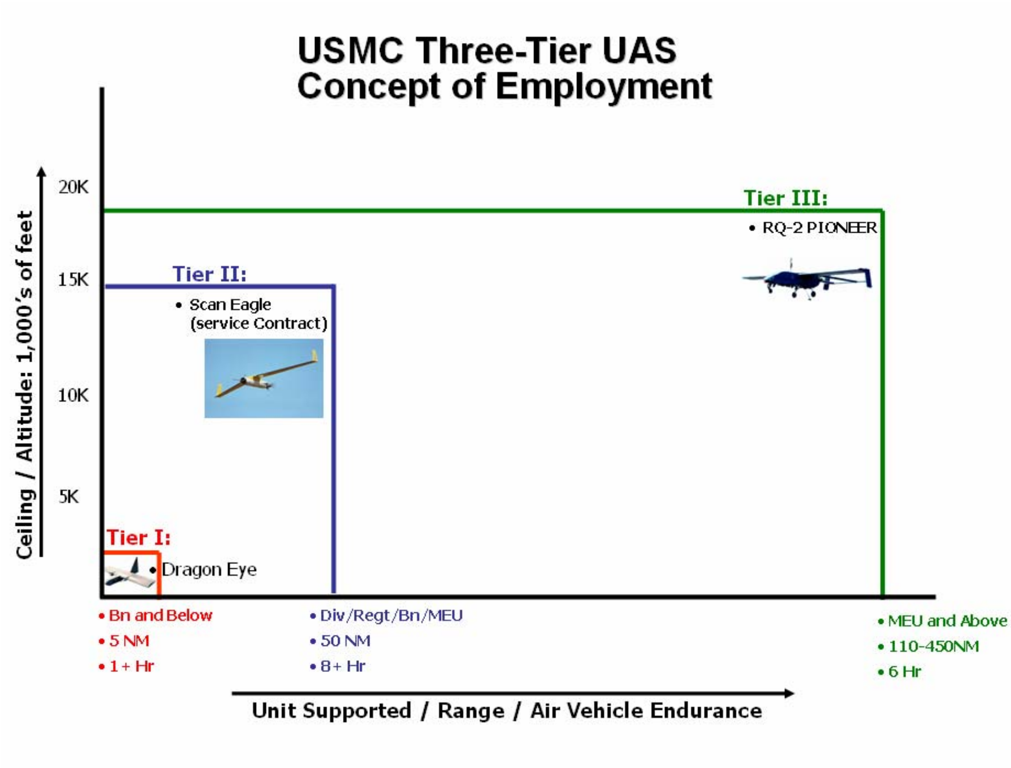

Figure 5. USMC UAS FoS Three Tier Concept

B. CURRENT MARINE CORPS UNMANNED AERIAL SYSTEMS

The Marine Corps has two fielded UAS programs of record: Dragon Eye and RQ-2 Pioneer. The Tier I UAS program, Dragon Eye, has flown 8,500 hours in support of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). The Tier III UAS program, RQ-2 Pioneer has flown over 13,900 combat hours since its inception in

[17] John G. Castellaw, DC Aviation, Fiscal Year 2007 Marine Corps tactical Air Programs, March 2006.

1986. As mentioned earlier, the Marine Corps is filling a capability gap for the Tier II UAS with a fee-for-service agreement with Boeing and has two ScanEagle UAS systems collocated with the VMU squadrons in OIF and OEF.

1. RQ-2 Pioneer Unmanned Aerial System

Developed jointly by AAI Corporation and Israel Aircraft Industries, the RQ-2 Pioneer has served with the U.S. Navy and Marine Corps since 1986. The Pioneer UAV System was originally a joint Navy and Marine Corps program. After the Navy decided to transition to other UAS programs, all Navy Pioneer systems were transferred to the Marine Corps in the late 1990s. Currently, the RQ-2 Pioneer is deployed by the MAGTF to provide real-time tactical intelligence services for the battlefield commander. The "R" is the Department of Defense designation for reconnaissance; "Q" means unmanned aircraft system. The "2" refers to it being the second of a series of purpose-built unmanned reconnaissance aircraft systems. (See Table 1)

The RQ-2 Pioneer System has been providing commanders at all levels with day and night, battlefield ISR and target acquisition capabilities in support of Marine expeditionary warfare operations. After 21 years of service, the Pioneer has undergone numerous upgrades despite its original "interim" status as a program that was intended to fill a capability gap in 1986. Over the years, Pioneer has been updated with state of the art technology to operate through 2015. Through a planned phase-out, it is expected to be replaced by a Vertical Takeoff and Landing Unmanned Aircraft System (VTUAS). Currently, the Pioneer program relies on major sub-systems from the Army's Shadow 200 UAV system (i.e., engine, payload, GCS and launcher), and the Hunter UAV system (i.e., Flight Computer and avionics package) to minimize the Life Cycle Costs (LCC).

Table 1. U.S. DoD Aerospace Vehicle Designations for the RQ-2 Pioneer

R	**Reconnaissance:** Reconnaissance craft are designed to conduct reconnaissance through photographic and electrical means.
Q	**Unmanned:** An unmanned aerial vehicle (UAV) is any aircraft without the capacity for a human pilot. Yet, not merely a missile or rocket.
2	**Edition:** Position in a series of models of the same vehicle type.

The program is also in the process of modifying its legacy Ground Control Station (GCS) into the **One System™ GCS** currently under development and procurement by the U.S. Army. This common operating system will help minimize development costs and contribute to the Marine Corps' concept of interoperability as well as a more common approach to inter-service UAS operations with the U.S. Army. This new One System™ GCS will be scalable, and it will serve as a common GCS for all future Marine Corps UAS tier systems. This early investment is expected to produce improved readiness, increase flexibility, and availability of systems to the commander in the battlefield while reducing the cost and manpower training requirements in different systems. It is also regarded as a positive step for the future of all UAS systems in the U.S. military because it will integrate UAS capabilities into a more common and interoperable environment.[18]

[18] LtGen John G. Castellaw, DC Aviation, Fiscal Year 2007 Marine Corps tactical Air Programs, March 2006.

Figure 6. One System Ground Control Station (GCS)

a. Mission and Purpose

The Pioneer UAV system performs a wide variety of reconnaissance, intelligence, and special missions. The Pioneer's primary mission is Reconnaissance and Surveillance, Battle Damage Assessment, Search and Rescue, Artillery Targeting and Acquisition, Control of Close Air Support and Psychological Operations. It also provides real-time intelligence imagery in support of maritime, amphibious, and ground battle operations.[19] Secondary missions include the development of tactics and operational concept, support rear area security, drug interdiction support and Improvised Explosive Devices (IED) identification during convoy operations.

The Pioneer UAV System is capable of operation from conventional airfields, unimproved airfields (with a smooth, Foreign Object Damage free surface), and six modified L-class ships. Alternative launch methods include pneumatic launch (Marine Corps only) ashore, and Rocket Assisted Take-off (RATO) ashore and afloat. Recovery methods include conventional and arrested landings ashore, and Shipboard Pioneer Arrestment and Recovery System (SPARS) net recoveries aboard ships.

[19] MCWP 3-42.1, Unmanned Aerial Vehicle Operations, August 2003.

b. System Description

The RQ-2 Pioneer system consists of five air vehicles, a Ground Control Station (GCS), a Tracking Communication Unit (TCU), a Portable Control Station (PCS), four Remote Receiving Stations (RRS), pneumatic or rocket assisted launcher and net or runway arrestment recovery systems. The ground control station (GCS-2000) is contained in either an S-250 shelter or an S-280 shelter. When installed aboard ship, the GCS is housed in a mobile maintenance facility (MMF). The PCS, which does not require a shelter, is housed in an S-250 shelter and can be transportable on a HMMWV for remote operations.

The Pioneer system utilizes a jam-resistant, direct sequence spread spectrum up-link command channel (C-band). The video and telemetry down-link, also at C-band, utilizes a state-of-the-art high-power solid-state amplifier and directional antennas on both the TCU and air vehicle, assuring excellent quality video for the commander in the field. An Omni-directional UHF backup link is provided for redundancy in this key subsystem. Currently the Pioneer's payload includes the gyro-stabilized high-resolution TV or FLIR payloads for day and night or reduced visibility operations.

Also available for integration and testing is a radio relay payload for VHF and UHF frequencies. Recent demonstration programs have successfully integrated meteorological sensor, radial sensor, and chemical detection payloads into the Pioneer system. Additional payloads are being scheduled for integration and testing on-board the Pioneer.[20]

[20] The Warfighter's Encyclopedia. RQ-2 Pioneer. October 2006.

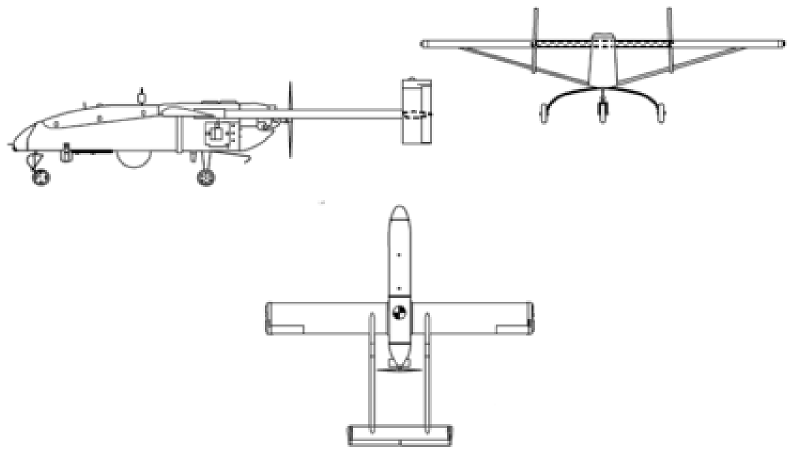

Figure 7. RQ-2 Pioneer Profile

c. General Characteristics

The RQ-2 Pioneer is a product of Pioneer UAVs Incorporated; Israel Aircraft Industries. The **RQ-2A** Power Plant is a **S**achs 2-stroke crankcase-scavenged 2-cylinder horizontally-opposed, simultaneously firing engine (26hp). **The RQ-2B** Power Plant is a UEL AR-741 Wankel engine 28.3 kW (38 hp). The RQ-2 Pioneer specifications are shown in Table 2.

Table 2. RQ-2 Pioneer Specifications Table

WEIGHT	Empty	276 lb
	Fuel Capacity	65 lb
	Sensor Payload (max)	75 lb
	Max Takeoff Wt	416 lb
DIMENSIONS	Wing Span	17 ft 1 in
	Fuselage Length	9 ft 7 in
	Fuselage Width	1 ft 4 in
	Wheel Base	5 ft 6 in
	Propeller Diameter	2 ft 5 in
	Length	13 ft 8 in
	Wing Area	30.1 sq ft
PROPULSION	Pusher-propeller driven two-stroke, twin-cylinder, rear-mounted engine. Max Power 29 hp	
PERFORMANCE	Fuel capacity 100 octane AVGAS	12.9 gallons of
	Radius	114 mi (100 nm)
	Endurance	5 hrs
	Altitude	15,000 ft
	Max Endurance	59.0 mph (65 kts)
	Loiter Speed	59.0 mph (65 kts)
	Cruise Speed	74.5 mph (85 kts)
	Maximum Speed	109.4 mph (110 kts)
	Radius of Action	
	nominal	99.4 mi (87 nm)
	maximum	114.0 mi (101 nm)

d. Capabilities

The Pioneer Unmanned Aerial Vehicle (UAV) system provides real-time intelligence and reconnaissance capability to the field commander. This highly mobile system provides high quality video imagery for artillery, battle damage assessment and reconnaissance over land or sea. Strategic or tactically vital data may be obtained cost-effectively by exploiting the UAV’s low radar cross section, low IR signature, and remote control versatility.

The Air vehicle relays video and/or telemetry information from its payload to the ground control station (GCS) and/or portable control station (PCS) in real time. More than one control station may be used to either increase the UAV's effective range or to control more than one UAV.

e. Manpower Requirements

A detailed summary of the manpower structure of the VMU to operate the RQ-2 Pioneer is shown in Appendix A. This structure is the result of decades of continuous evolution through trial and error and through some research and development from the aviation sponsor where it currently resides. After over 20 years of operating the RQ-2 Pioneer and with the current operating tempo, the VMUs are faced with the challenge of meeting a 21st century mission with an outdated and underdeveloped manpower structure. Their ability to meet mission is remarkable and worthy of praise, but this does not mean that they are capable of maintaining this record for the long term. It is imperative that the VMU of the future develops a scalable, flexible and knowledgeable manpower structure to ensure its survivability through 2030 and beyond.

2. ScanEagle™ Unmanned Aerial System

ScanEagle is a low-cost, long-endurance UAV built by Boeing and Insitu. ScanEagle is a descendant of another Insitu UAV, SeaScan, which was conceived of as a remote sensor for collecting weather data as well as helping commercial fishermen locate and track schools of tuna. ScanEagle emerged as the result of a strategic alliance between Boeing and Insitu. The resulting technology has been successful as a portable Unmanned Aerial System (UAS) for autonomous surveillance in the battlefield, and has been deployed since August 2004 in the Iraq War.

Figure 8. ScanEagle on the Pneumatic Launch System (PLS)

a. Mission and Purpose

ScanEagle is not a POR and therefore does not have a specified mission that can be researched from military documents. Its role, similar to Pioneer, is to perform Reconnaissance and Surveillance, Battle Damage Assessment, Search and Rescue, Artillery Targeting and Acquisition, Control of Close Air Support and Psychological Operations as directed by military commanders.

b. System Description

ScanEagle is not a program of record but fills an identified capability gap, and is filling the Tier II role in the Marine Corps' three tier UAS FoS concept of employment. The Marine Corps is developing requirements for a UAS to support regimental and Marine Expeditionary Unit operations. This Tier II UAS will be smaller in size than the Tier III Pioneer but bigger than the Tier I UAS, the Dragon Eye.

c. *General Characteristics*

Payload	13.2 lb / 6 kg
Endurance	15 hours
Service Ceiling	16400 ft / 5000 m
Max Level Speed	70 knots / 36 m/s
Cruise Speed	49 knots / 25 m/s
Wing Span	10.2 ft / 3.1 m
Fuselage Diameter	7.0 in / 0.2 m
Length	3.9 ft / 1.2 m
Camera Range	100+ km
Max Takeoff Weight	37.9 lb / 18 kg

d. *Capabilities*

ScanEagle carries an inertially stabilized electro-optical and/or infrared camera on a lightweight inertially stabilized turret system integrated with a communications range over 100 km, and flight endurance of 20+ hours. ScanEagle has a 10-foot wingspan and can fly up to 75 knots. The block D aircraft features a higher resolution camera, a custom-designed Mode C **transponder** and a new video system.[21]

ScanEagle needs no airfield to deploy; it is launched and recovered using Insitu's patented **SuperWedge** launcher and **SkyHook** retrieval system which uses a rope hanging from a 50-foot pole. Not requiring a runway and being crosswind independent makes the ScanEagle UAV an ideal solution for both sea and land-based operations.

21 Wikipedia.com. http://en.wikipedia.org/wiki/Scan_Eagle. Accessed April 2007.

e. Manpower Structure

Since ScanEagle is not a POR and it is a fee-for-service contract, no military manpower requirements structure currently exists. The system is operated and maintained by Insitu and Boeing Corporation. The Marine Corps is currently researching the development of this manpower structure. This thesis is part of the research and Chapter IV proposes a manpower structure to satisfy the immediate requirement to fill this gap.

3. Dragon Eye Unmanned Aerial System (Micro UAS)

In 2003, the Marine Corps adopted the Dragon Eye UAV, the smallest functioning unmanned aerial vehicle, in an effort to minimize friendly casualties and maximize pre-movement surveillance. The Dragon Eye UAV is specifically designed to follow a predetermined mission into questionable areas to deliver a bird's eye view of its surroundings with two, near-real-time video cameras.

Initial experimentation occurred during the Kernel Blitz Experiment with 3rd Battalion, 5th Marines in June 2001, providing operating forces an early opportunity to gain familiarization with the small UAV concept; develop tactics, techniques and procedures; and identify potential doctrine, organization and training issues.

The Dragon Eye (DE) Interim-Small Unit Remote Scouting System (I-SURSS) was developed by the Marine Corps Warfighting Laboratory in Quantico, VA., as a small, fully autonomous, back-able, hand launched UAV to provide the Marine Corps an "over-the-next-hill, or building" tactical reconnaissance and surveillance capability. Dragon Eye began fielding in June 2004, after a successful 10-system demonstration with the 1st Marine Division serving in Iraq. Currently, over 40 percent of the Dragon Eye inventory (171 air vehicles and 57 Ground Control Stations are serving in OIF and OEF. As of January 2005, the Dragon Eye had been in production for three years, with the Marine Corps having fielded it in two. The Dragon Eye system was also expected to be soon utilized at a company level.

Figure 9. Dragon Eye Unmanned Aerial Vehicle System

a. Mission and Purpose

Dragon Eye's primary mission is reconnaissance and surveillance for small unit commanders, across the battlefield functions, with an organic capability to see over the next hill/building, or conduct route reconnaissance, battle damage assessment, and unit force protection. The autopilot must provide fully autonomous operation, GPS navigation, air vehicle stability for imagery, preprogrammed search patterns, in-flight waypoint updates, and interface protocol with the GCS software and payload sensors.

The Dragon Eye aircraft is used primarily for scouting urban areas, and is especially useful in urban assaults. Its camera, when used with a trained Marine, spots the enemy without alerting them to the UAV's presence. Launched using a store-bought bungee cord, it is easy to get aloft and becomes useful quickly. It also uses a break-apart system to increase durability — parts of the plane break apart instead of shattering and can be reattached later or replaced with new parts.

b. System Description

A Dragon Eye system consists of two air vehicles, four cameras, two replacement noses and one ground control station. The Dragon Eye UAV is battery-operated and capable of fully autonomous flight. Made of lightweight material, it is designed to disassemble into five separate pieces and is intended to be carried in an individual Marine's pack. Dragon Eye is made of lightweight Styrofoam-like materials. Dragon Eye has a 45-inch wingspan once assembled and weighs about five pounds. Missions are programmed via a wireless modem that is integrated into a twelve-pound ground control station. After being hand- or bungee cord-launched, Dragon Eye flies to pre-assigned GPS waypoints and has the ability to be reprogrammed in flight. Its sensors include full motion color, low light and infrared cameras, each capable of transmitting video line-of-sight to a range of ten kilometers.

This UAV can reach speeds of 35 miles-per-hour, altitudes of 1,000 feet, distances of 10 kilometers, and has a battery endurance of one hour. Dragon Eye's twin electric engines run quietly on battery power. It is flown autonomously at an altitude of 150m'. The total weight of the Dragon Eye is five pounds including the one-pound payload (camera and equipment). The mission is programmed on the control station and transmitted to the UAV via wireless modem. After launch by a bungee cord or by hand, it climbs to the cruise altitude and sweeps through the pre-assigned waypoints, navigating via GPS. The fuselage-mounted, side-looking sensor consists of a low-light black and white (b/w) camera capable of transmitting live video to the ground station from a distance of 10 km via line-of-sight video data-link. Operator's training requires less than one week to complete the course of instruction and learn to execute its capabilities.

The aircraft is programmed via a seven-pound, rugged-sized handheld computer that is capable of flight planning, flight monitoring, and storage of air vehicle transmitted video. The aircraft's flight profile is GPS waypoint guided, each waypoint allowing for various linear, and orbiting search patterns and altitudes. Missions are programmed via a wireless modem that is integrated into a small, lightweight ground control station. After bungee launch, Dragon Eye flies to pre-assigned GPS waypoints but the aircraft's flight profile has the ability to be reprogrammed in flight.

The operator uses a wearable ground control station with a computer processor and a map display that is located on the forearm or vest attachment. Clicking on the moving map display tells the UAV how high and where to fly, including desired return time. A video stream comes back to a monitor contained in the wearable ground station. Lithium batteries allow for 60 minutes of flight time at a speed of about 45 mph. It has about a 10-kilometer range, and could, theoretically, be passed from one Marine to the next to extend this range if batteries are replaced.

The GCS is a computerized system that controls and operates the aircraft from the ground by means of a touch screen. A laptop computer with wireless satellite connections sends signals to the aircraft. The operator views video through goggles connected to the GCS. There are three interchangeable nose cameras including one for low-light situations such as dusk and dawn, one for regular daylight and an infrared nose used for night launches. One camera is mounted inside the nose of the plane and a second is located on the left side. While the nose camera can move any direction, the left camera can only point in the direction of flight or straight forward, but delivers an eight-digit grid at the center point of the video. Its small size and aerodynamic design make it a hard target for adversaries.

c. General Characteristics

The propeller-driven Dragon Eye comes packed with a video camera. It is assembled and launched by a two-man team in approximately 10 minutes though possibly less than five minutes, and comes complete with a portable control station. Dragon Eye weighs approximately six pounds fully assembled and has a wingspan of three feet. Its maximum endurance rate is approximately 60 minutes, but 45 minutes is nominal. Dragon Eye's operating altitude is between 300 and 500 feet above ground level, with a video link range in excess of five kilometers.

LENGTH:	0.9 M (3 FT)
Wingspan:	1.1m (3.75 ft)
Ceiling:	90 to 150 m (300-500 ft)
Weight:	2.3 kg (5.1 lb)
Cruising speed:	65 km/h (40 mph)
Battery Endurance:	1 hour
Range:	5 km (3.1 mi)
Transmission Range:	10 km (6.2 mi)
GCS	6 kg

d. Capabilities

Dragon Eye possesses real-time high resolution day color and low light black/white imaging. It has two electric motors that provide extremely low noise signature and its small wingspan makes it hard to detect. Its sensors include full motion color, low light, and in the future other sensors such as infrared cameras in interchangeable payload noses. The system is capable of transmitting sensor and air vehicle telemetry data line-of-sight (LOS) to a range of ten kilometers. Dragon Eye flies up to speeds of 35 mph. The system is based on an evolutionary acquisition strategy which plans performance improvements in future block upgrades. The autopilot must weigh less than four ounces.

e. Manpower Requirements

Proper operation of the system takes a two-man team: one to assemble the aircraft and one to get the ground control station up and running. Both are capable of operating the vehicle and perform the required maintenance to keep the UAV in action. Since this is an organic asset to the infantry battalion, commanders usually assign Marines on the basis of availability and skills that resemble the operations of these small assets. There is no specific pre-requisite to how Marines are selected to fill this manpower billet, yet once they are selected; their knowledge, skills, and abilities (KSA) are developed through extensive and consistent hands on training and operational experience.

C. FUTURE MARINE CORPS UNMANNED AERIAL SYSTEMS

1. RQ-7 Shadow 200 Unmanned Aerial System

Unlike the Pioneer, this UAV system is launched from a rail. It is recovered with the aid of arresting gear similar to jets on an aircraft carrier. Currently, this system is operated by the U.S. Army, but the Marine Corps is planning to transition from the RQ-2 Pioneer to the Shadow 200 by 2015. The Army's Unmanned Aircraft Systems Training Battalion at Fort Huachuca, AZ trains soldiers and civilians in the operation and maintenance of the Shadow UAV. Concurrently, the Marine Corps is researching efforts to develop its training in coordination with the Army at Fort Huachuca. The MCWL is performing tests and operational developments with a concept demonstrator to facilitate the transition.[22]

The RQ-7 Shadow is the result of the U.S. Army's continuous search for an effective battlefield UAV after the cancellation **of the RQ-6 Outrider UAS.** The Army requirement specified a UAV that used a gasoline engine, could carry an electro-optic/infrared imaging sensor turret, and had a minimum range of 31 miles (50 kilometers) with four hour endurance on station.[23] The Shadow 200 offered at least twice that range, powered by a 38 hp (28.5 kW) rotary engine. The Army also mandated that the UAS be capable of landing in an area the size of a soccer field.

In the recent past, MCCDC and MCSC have been examining plans to compare and select a more compatible UAV system that meets the requirements of their tiers II and III requirements. The Shadow UAV has proven to be more cost effective and flexible

[22] David A. Funkhouser, (Capt USMC). MCWL Concept Demonstrator Tier II. Personal email interview. February 2007.

[23] Wikipedia.com. http://en.wikipedia.org/wiki/RQ-7_Shadow. Accessed on February 2007.

than the current Pioneer. At half the cost and with similar capabilities than the Pioneer, the transition was one that made sense for all entities involved.

Figure 10. RQ-7 Shadow 200 Unmanned Aerial System

a. Mission and Purpose

This Tactical Unmanned Aerial Vehicle (TUAV) system is designed as a ground maneuver asset. It is the commander's primary day/night reconnaissance, surveillance, target acquisition, and battle damage assessment system.

b. System Description

The RQ-7 Shadow system includes four aircraft, two ground stations, a launch trailer, and support vehicles for equipment and personnel. The Shadow 200 is a small, lightweight, tactical UAS. The system comprises four air vehicles, modular mission payloads, ground control stations, launch and recovery equipment, and communications equipment. It will carry enough supplies and spares for an initial 72 hours of operation. It will be transported by means of two high mobility multi-purpose wheeled vehicles (HMMWVs) with shelters, and two additional HMMWVs with trailers as troop carriers.[24]

[24] Global Security.org. http://www.globalsecurity.org/intell/systems/shadow.htm. Accessed April 2007.

c. *General Characteristics*

While a single UAS system includes three Shadow 200 air vehicles, a forth air vehicle is included as part of the issued equipment of the maintenance section. The air vehicle is constructed of composite materials, with a wingspan of 12.3 feet, and length of 11.2 feet. Power is provided by a commercial 38-horsepower rotary engine that uses motor gasoline (MOGAS). The payload has two commercially available electro-optic and infrared cameras for command and control and imagery dissemination, communication equipment and an onboard global positioning system (GPS) to provide navigation information.[25]

Payload	POP-200/300 27 kg (60 lb)
Length	3.4 m (11.2 ft)
Wingspan	3.9 m (12.8 ft)
Height	1 m
Weight	375 lb (154 kg) fueled and oiled
Fuel capacity	44 L of 87 octane gasoline, also capable of 100LL Avgas (with few modifications)
Power plant	Wankel UAV Engines 741
Speed	normal operating range 60 to 110 knots (110 to 200 km/h)
Ceiling	15,000 ft (4,600 m) MSL
Maximum endurance	4 hours (6 hours for RQ-7B)
Range	50 km (27 nautical miles) with a single GCS and up to 125 km with a pair of GCSs

[25] OSD. Unmanned Aircraft Systems Roadmap. 2005-2030. p. 8.

d. Capabilities

The Shadow 200 can provide up to four hours of air time endurance with a maximum range of 125 kilometers (limited by data link capability). It typically operates between 8,000 to 10,000 feet above ground level during the day and 6,000 to 8,000 feet at night. The air vehicle uses a pneumatic launcher and is recovered by a tactical automatic landing system without pilot intervention on the runway. Landing is performed automatically in day or night using a portable tracking system, an airborne transponder and arresting cable system. Its liquid nitrogen cooled gimbal and digitally stabilized electro-optical/infrared (EO/IR) camera relays video in real time via a C-band LOS data link to the ground control station (GCS). The Shadow 200 can be launched over a distance of 10 meters, and in crosswinds as strong as 20 knots. The entire Shadow unit is transportable by means of three C-130 aircraft.

e. Manpower Requirements

The U.S. Army's Shadow 200 systems uses two-man teams at the ground control system, an air vehicle operator who flies the UAV and a mission payload operator who controls the camera and other sensors.[26] This manpower requirement is based on the Army's UAS concept of employment and it is currently being studied by the MCWL at Quantico, Virginia. The Marine Corps will most likely adapt from the Army's lessons learned and develop its own manpower requirements from this basic structure. The intent is to reduce the manpower requirements and minimize the need for further development by simply adopting the system in its current status.

2. RQ-11 Raven Unmanned Aerial System

Weighing in at four and a half pounds with a five-foot wingspan and stretching a mere 38 inches in length, the RQ-11 Raven is one of the smallest UAVs currently used by the U.S. Army. Yet, its aerial reconnaissance value has quickly earned the respect of small unit commanders in Iraq and has filled a niche at the battalion level where larger

[26] Harding S. UAV University. Soldiers, 58 (2) 4-9. 2003.

UAVs were unavailable. Though not as large or capable as some tactical UAVs, the RQ-11 Raven provides units with a substantial live-coverage capability previously available only at higher levels of command.

The RQ-11 Raven is used by the US Army, USSOCOM, and recently, the Marine Corps. As of early 2007, over 5,000 airframes have been shipped, making it the most prolific UAV system in the world today. Additionally, U.S. allies have also begun acquiring it, e.g., Australia, Italy, and Denmark, with more countries expected over the next few years.

Figure 11. RQ-11 Raven Unmanned Aerial System

What makes this UAS more attractive to the USMC than its cousin the Dragon Eye, is that it is lighter, more maneuverable, has more air endurance, and though a foot longer than Dragon Eye - with a six inch longer wing span, its range is more than five nautical miles.

a. Mission and Purpose

Like Dragon Eye, the RQ-11 Raven's primary mission, once incorporated into the USMC's UAS FoS, will be reconnaissance and surveillance for small unit commanders, across the battlefield functions, with an organic capability to see over the next hill/building, or conduct route reconnaissance, battle damage assessment, and unit force protection.

b. System Description

The RQ-11 Raven is propeller driven and back-packable. The operation of the RQ-11 Raven system is effectively identical to the Pointer UAS, making transition to the new smaller system particularly easy. The RQ-11 Raven UAV weighs about 1.9 kg (4.2 lb), has a flight endurance of 80 minutes and an effective operational radius of about 10 km (6.2 miles). Flying speed is 45-95 km/h (28-60 mph) at typical operating altitude between 30 m and 300 m (100-1000 ft). The RQ-11 Raven can be either remotely controlled from the ground station or fly completely autonomous missions using GPS waypoint navigation.

c. General Characteristics

Wing Span	4 ft 3 in
Length	3 ft 7 in
Height	
Weight	4.2 lb
Engine	Aveox 27/26/7-AV electric motor
Maximum speed	
Cruising speed	60 mph
Range	6.2 miles
Service Ceiling	15000 ft
Flight Time	60-80 Minutes
No. in Inventory	~ 1300
Payloads	Interchangeable: optical, infrared, and IR cameras

d. Capabilities

The RQ-11 Raven provides a number of capabilities to the small unit commander, namely, a real-time, up-to-date, over the horizon view of any trouble spots. It also allows units to conduct intelligence, surveillance, and reconnaissance (ISR) of danger zones. The Raven has about 45 to 60 minutes of flight time on a battery. The UAS is equipped with spare batteries and a charger that plugs into a HMMWV. This allows the operator to land it, replace the battery and get it back in the air within minutes.

The Raven has three different cameras that attach to the nose of the plane, an electrical optical camera that sends data either through a nose camera or a side camera, an infrared camera in the nose, and a side-mounted IR camera. With a moderate operational range, the Raven provides up-to-the minute intelligence over the target area. Day and night, live video capabilities let the Raven greatly assist with the overall situation awareness picture. The Raven can fly automatically, navigating using GPS technology and programmable routes and target areas, or be remotely flown by the operator when necessary.

The RQ-11 Raven can land itself by auto-pilot to a near-hover speed until it drops to the ground. This means there is no requirement for a landing gear or carefully prepared landing strips. Since it is launched and recovered in this manner, it does not require elaborate support or maintenance facilities.

e. Manpower Structure

Its automated features and GPS technology make this UAS simple to operate, requiring no especially skilled operators or in-depth flight training. Proper operation of the system takes a two-man team - one to assemble the aircraft and one to get the ground control station up and running. The Marine Corps is expected to adopt the same manpower structure since the Dragon Eye and RQ-11 Raven are virtually similar to operate.

D. LONG-RANGE MARINE CORPS UAS PROGRAM

1. Tier III Developments

Currently, the Marine Corps does not have a true Tier III asset that meets the capability requirements stipulated in their future UAS FoS plans. The intent is to replace the RQ-2 Pioneer with a Vertical Take-off and Landing Unmanned Aircraft System

(VTUAS). This system will provide responsive, real-time reconnaissance, surveillance, intelligence, targeting, and weapons employment capability that is organic to the MAGTF and the Joint Task Force (JTF) commanders.[27]

It will have the key attributes necessary to support (EMW), including vertical takeoff and landing from all air capable ships/austere land bases, the speed to be responsive and tactically agile, and the survivability required to effectively operate in denied access environments. In search for a replacement for its aging RQ-2 Pioneer system, the Marine Corps is interested in finding a capable and versatile VTUAS platform to transition its Tier III asset starting in 2015.

The control and ownership of this asset will rest with the Marine Expeditionary Force (MEF) and Joint Task Force (JTF) level commands. The development of this VTAUS system is the primary focus of capability teams at (MCSC, MCCDC and MCWL respectively). Though there is no official documentation to corroborate what asset will become the first VTUAS. Bell Helicopter's Eagle Eye tilt rotor UAS, which is the U.S. Coast Guard's planned procurement program, seems to meet the capability requirements concept for the Marine Corps for the Tier III UAS FoS Strategy articulated by MCCDC.[28]

[27] John G. Castellaw, DC Aviation, Fiscal Year 2007 marine Corps tactical Air Programs, March 2006.

[28] J. Mullin, Lt Col (USMC), UAS Material Capability Officer, MCCDC. USMC UAS FoS Vision Brief. November 2005. Slides 12, 14.

Figure 12. Eagle Eye Unmanned Aerial System
Source: From AHS international

2. Tier II Developments

The Marine Corps is currently testing a Tier II UAS asset to replace the ScanEagle fee-for-service contract with Boeing Corp. The Marine Corps Warfighting Laboratory (MCWL) at Quantico, VA, will use a proposed UAS as a Concept Demonstrator (CD) — a single system with a GCS and multiple vehicles – to serve as the test-bed to develop operating concepts and tactics, techniques and procedure, as a means to flesh out performance requirements for the future Tier II UAS.[29] The Shadow 200 is being evaluated to fulfill this role. In the testing, the CD must be capable of operational speeds of 40-60 knots, up to 10 hours of flight endurance, and operations at altitudes up to 15,000 feet, but with a typical mission altitude of 1,500–3,000 feet.[30]

[29] David A. Funkhouser, (Capt USMC). MCWL Concept Demonstrator Tier II. Personal email interview. February 2007.

[30] J. Mullin, Lt Col (USMC), UAS Material Capability Officer, MCCDC. USMC UAS FoS Vision Brief. November 2005. Slide 16.

3. Tier I Developments

The Marine Corps' micro UAS field is primed for a new wave of technology advances that will improve the Tier I. it includes one of the latest developments in the military UAS arena — the proliferation of small, hand-launched, fixed wing UAVs. Currently, the Marine Corps' Dragon Eye has been effective in its mission for the low-level unit commander, providing aerial observation over the next hill/building, ahead of convoys or a few blocks away in cities without endangering troops.

In the future, as the air ways become increasingly clogged with UAS, this micro UAS technology will become the norm for higher operational support. Consequently, the MCWL is experimenting with a "flying wing" micro-UAS called The Wasp. Developed by the same company who created Dragon Eye and the RQ-11 Raven, it is being funded by the Defense Advanced Research Projects Agency (DARPA) and supported by the Naval Research Laboratory (NRL).[31]

Figure 13. The Wasp Unmanned Aerial Vehicle (Micro UAV)
Source: www.Military.com

[31] G. Elhers, Maj (USMC), Navy League website, www.navyleague.org/sea_power/jul06-18.php. Accessed April 2007.

Launched with a flick of the wrist, the Wasp weighs six ounces and has a 13-inch wingspan. It carries tiny forward- and side-looking color daylight video cameras. It flew for an hour and 47 minutes during initial tests in 2002, and could eventually become a Sub-Tier I UAV for Marine squads and platoons.

E. CHAPTER SUMMARY

The Marine Corps UAS FoS program has come a long way from its origins on 1986. Since the first UAS (RQ-2 Pioneer) was flown by U.S. Marines, the technology of these systems has advanced tremendously. While the systems have become more autonomous and more flexible to meet the warfighter's needs, the manpower requirements have been adapting to catch up to the capabilities developed for each system. These manpower requirements should become part of the program of record so as to be more realistic in the assessment of future program developments in this field.

This chapter highlights the evolution and level of sophistication the Marine Corps has achieved as a "Force in Readiness". Throughout the Marine Corps's history with UAS platforms, there has been substantial development in capabilities but little progress in the development of a systematic and realistic manpower structure to plan for and support mission needs and growing technological requirements, including schools and promotion criteria. This chapter illuminates a shortfall in the prospect for advanced research in the manpower requirements that are needed to develop a functional, capable and scalable force to operate and maintain these systems. This research produces a template for the development of a manpower structure based on where the program has been and where it is going towards 2030.

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IV. PROPOSED UNMANNED AERIAL SYSTEMS (TIER II/III) MANPOWER STRUCTURE

A. THE CHALLENGE OF DEVELOPING A MANPOWER STRUCTURE

The Marine Corps UAS community has two active duty VMUs. The unit's T/O identifies the current USMC UAS manpower structures. The evolution and development of their early manpower structures are an outgrowth of the requirements for the RQ-2 Pioneer. The T/O&E for one of these squadrons is shown in Appendix A.

Since 1986, when the first Pioneer was flown, the Marine Corps has been analyzing its manpower requirements to fulfill the growing demand for UAS capabilities in the battlefield. Currently, neither VMU-1 nor VMU-2 has enough qualified personnel to meet the ever growing demand for UAS assets. The mission requirements for these two VMUs have grown exponentially with the ongoing operations in Iraq and Afghanistan.

The pervasive conflict that emerges in many MOS fields, including the UAS community when a capability is developed without the proper steps in the acquisition process, is that the manpower billets are filled using originally established requirements. In 1986, the original intent of the RQ-2 Pioneer was to fill a capability gap as an "interim" program. Now, 21 years later, the VMU has evolved to become the model for the manpower structure for future UAS in the Marine Corps.

In a report by the Government Accounting Organization (GAO) published in March of 2004, the committee cites the importance of integrating the capability with the force structure:

> DoD's approach to planning for developing and fielding UAVs does not provide reasonable assurance that its investment in UAVs will facilitate their integration into the force structure efficiently, although DoD has taken certain positive steps to improve the UAV program's management.[32]

[32] Force Structure: Improved Strategic Planning Can Enhance DOD's Unmanned Aerial Vehicles Efforts. General Accounting Office Report GAO 04-342. March 2004.

The evident challenge in the development of a robust, flexible and scalable UAS manpower structure is to break the adaptation cycle. The DoD's Unmanned Aerial Systems Roadmap 2005–2030 or other defense planning documents discuss a comprehensive strategic plan to ensure that the services and DoD agencies focus on the integration of the systems with the manpower requirements. The future manpower structure for the UAS program must be developed in accordance with the requirements stated in the Concept of Operations and employment for the Marine Corps Vision for the UAS program.[33] The traditional approach to manpower development is to choose a system that meets the stated capability requirement or to replace an aging system with a new system. Among the choices of systems available, Marine Corps planners determine which new specific vehicle/system most closely meets the requirements at the lowest cost, while providing maximum stated capabilities.

Marine Corps planners consistently strive to optimize resources to meet capability requirements, by looking at Commercial-Off-The-Shelf (COTS) alternatives and Non-Developmental Items (NDI) to save time and money. Unfortunately, this is not always the best approach. If COTS or NDI alternatives cannot meet the requirements, then other approaches, consistent with the acquisition process, are selected, which include the research and development of a completely new system. This is a more costly and time consuming approach. It is also an approach that can kill a program if funding must be diverted mid-stream for other critical programs. Once a system is selected, the process of operational development and testing begins and a set of Tactics, Techniques and Procedures (TTP) are developed through a Concept Demonstrator (CD) prior to the full acquisition and fielding on the new system.

In theory, the Initial Capabilities Document (ICD) which reviews all these aspects of acquisition should highlight the importance of the manpower concept of operations (ConOps) as a key factor in the development of any system. Many times, the process of manning is a secondary issue or an after-thought that becomes more relevant once the capability has been selected or developed, rather than integrated as part of the original concept design. In practice, it is important to state that Marine Corps planners estimate

[33] J. Mullin, Lt Col (USMC), UAS Material Capability Officer, MCCDC, USMC VISION. UAV Family of Systems (FoS) Document. September 2005.

risks and determine priorities based on mission needs and other relevant factors to the acquisition process, but the integration of all agencies is not always possible. For this reason, sometimes, the manpower ConOps is not considered in the original set of priorities but as an Appendix to the capability development. If this were accomplished in a more integrated process, the Manpower Concept of Operations would be considered a top priority, and the manpower requirements would be determined based on this concept of operations. Manpower drivers must be integrated into the development of capability and resources to produce a system that meets the needs of the Marine Corps and will not cause a force shaping dilemma in the Total Force Structure for manpower planners.

This chapter will analyze this integrated development process so that future UAS manpower requirements may be considered in the initial development of the capability. The goal is to create a Marine Composite Unmanned Aerial Vehicle Squadron (VMUX) to merge the Tier II and III capabilities into one robust, flexible and scalable UAS unit. This would provide each level of the MAGTF an organic, interoperable, integrated and tailored capability that gives situational awareness to the warfighter through a common C2 architecture across a range of military operations.[34]

B. CURRENT VMU ORGANIZATIONAL STRUCTURE

1. VMU Manpower Structure

The VMU is the only officially developed manpower structure in the USMC UAS community. It has been developed over the years through the growing pains and experiences from the original concept of employment back in 1986 with the 10th Marine Artillery Regiment’s Target Acquisition Battery, Detachment Alpha. Since then, the VMU has been adapting to the growing need of field commanders for this unique and limited asset. The squadron is organized much like any other manned squadrons in the Marine Corps with the following departments:[35]

[34] J. Mullin, Lt Col (USMC), UAS Material Capability Officer, MCCDC, USMC VISION. UAV Family of Systems (FoS) Document. September 2005.

[35] Marine Unmanned Vehicle Squadron (VMU) Organizational Structure Presentation. MAWTS-1, UAS Division. March 2007. Slide 16.

a) HQ Section. This is the Command and control section of the unit and it is where the Commanding Officer (CO) and his cell reside. It is the CO who promulgates and delegates the authority for the conduct and execution of all functions of the VMU.

b) Administration Department (S-1). Like every Marine Corps unit, the VMU has an Administration Department that handles day-to-day administrative functions such as record keeping, correspondence, legal matters, and other relevant personnel functions.

c) Intelligence Department (S-2). The VMU has a robust intelligence department which includes several Air Intelligence (AI) Officers, Intelligence Analysts (IA), and Imagery Analysts (IA), who process the intelligence collected by the UAS and coordinate intelligence collection with other intelligence units and agencies.

d) Operations Department (S-3). The operations department is staffed with several officers from aviation or aviation command and control backgrounds who serve as UAV Mission Commanders (MC); as well as enlisted Marines who serve as UAV external pilots (EP), internal pilots (IP), and payload operators (PO).

e) Logistics Department (S-4). This department operates and maintains the squadron's rolling stock and support equipment. It also manages the squadron's supply and accounting systems and it is responsible for the effective and efficient operation of the unit's armory.

f) Communications Department (S-6). The communications department operates and maintains the squadron's vast array of communications and data equipment used to communicate with the supported unit and aviation command and control agencies throughout the Battlespace.

g) Aviation Maintenance Department (AMT). The Aviation Maintenance Department not only maintains the squadron's stable of UAVs, but also maintains all of the UAV system's associated equipment such as the Ground Control Station (GCS), Portable Control Station (PCS), Pneumatic Launch Vehicle (PLV), Rocket-Assisted Take-Off (RATO) equipment, and UAV recovery equipment.

h) Department of Safety and Standardization (DOSS). Just like all manned-aviation squadrons in the Navy and Marine Corps, the VMU has a Department of Safety and Standardization that is responsible for managing the squadron's overall safety effort and ensuring that the squadron operates in accordance with the Naval Aviation Training and Operating Procedures Standardization (NATOPS) program.

i) Medical Department. This small department is charged with proving all the medical support for the unit. It is comprised of a flight surgeon and three corpsmen.

The focus of this research concentrates on the development of the manpower requirements currently imbedded in the S-3 and Aviation Maintenance Department **(**AMT) departments. These departments contain all of the MOS billets required to operate and maintain the UAS platforms. Following the development of a robust, flexible and scalable manpower structure, this research will analyze how an integrated approach to optimize the operational, maintenance and logistical support structures would maximize the capabilities of the system and improve manpower assignment of billets in each VMUX.

C. CONCEPTS FOR THE DEVELOPMENT OF THE MANPOWER REQUIREMENTS FOR THE VMUX

1. Concept of Operations

The creation of a new, composite VMU (VMUX) will be a radical departure of current doctrinal practices within the USMC in the UAS Community. This new UAS unit will continue to be operated, predominantly, by enlisted Marines, and a hand full of officers assigned as Mission Commanders (MC). This will require the development of a training plan that will develop Marines from each Tier to be selected to move up to higher tiers after certification and completion of specific requirements. The ConOps should enable the VMUX units to deploy in detachments of capability sets to support field commanders at different levels of the MAGTF. These units will be required to operate afloat and ashore in a variety of missions that range from MOOTW to combat operations in every corner of the globe. These systems will be combined to form capability sets to support protracted operations or to deploy ahead of the Friendly Line of Troops (FLOT) to provide intelligence, target acquisition, reconnaissance, surveillance, and other missions as required by the MAGTF and JTF commanders.

According to USMC authorities, the systems must be capable of providing at least 12 hours of continuous on-station support at a range of up to 110 nautical miles (NM) within a 24-hour period. The capability for 24-hours of continuous on-station support can be scaled when the systems are deployed in sets of two or more to support different MAGTF elements (e.g. MEF, MEB, and MEU). The GCS will be replaced with the new One System™ GCS. This system is scalable, and will serve as a common GCS for all future Marine Corps UAS tier systems to allow UAS personnel to perform detailed route and payload planning and mission execution. The VMUX units will not only be required to perform missions afloat and ashore but also be able to conduct ship-to-ship, split ship-to-shore and split shore operations with the use of the PCS and Remote Receiving Station (RRS). Their enhanced capabilities will allow VMUX detachments to locate and identify major enemy forces, moving vehicles, and weapons that are firing on ground and air units, and other targets of interest as determined by the controlling activity.

In addition, the VMUX will conduct counter-mobility operations, provide security for rear area forces, and perform other such air operations as assigned by the MAGTF Commander. In accordance with the Navy Training Systems Plan (NTSP) for the Vertical Takeoff and Landing Tactical Unmanned Aerial Systems (VTUAS), there will be three concepts of employment in support of the MEU:

> The first has AVs launched, recovered, and maintained aboard the Amphibious Transport Dock (LPD) with MMP operators residing onboard the Amphibious Ready Group (ARG) command ships. The second concept is also launched from the LPD with operations handed off to a HMMWV-mounted GCS ashore. This method of operation may require that detachment personnel be split between three locations: the ARG command ship, the LPD, and the shore component. The third option is limited operations ashore. This has the bulk of the detachment moving ashore to support operations, leaving a liaison aboard the ARG command ship for mission coordination. In this option, it may be necessary to split the maintenance personnel between the shore site and the LPD.[36]

The composition of each VMUX detachment should be flexible and light for embarkation and conform to the expeditionary nature of the USMC. The VMUX

[36] NAVAIR. Navy Training System Plan for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle. N-75-NTSP-A-50-0004/D. June 2001. p. 8.

detachment should be capable of rapidly integrating with elements of the MAGTF on short notice and deploy on board amphibious ships or military aircrafts with all of its assets. Therefore, it is imperative that deployment work-ups and short notice embarkation training are incorporated in the squadron's training plan and Standard Operating Procedures (SOP). This supports rapid mobilization and integration of the unit with the MAGTF.

All VMUX UAS must be capable of operating in conventional and unconventional combat operations. This includes the ability to withstand the harsh conditions of severe weather, Nuclear, Biological and Chemical (NBC) threats, and attacks by air defense missile systems, small arms fires, electronic warfare (EW) systems, and the encounter of other manned or unmanned enemy aircraft.

2. Manning Concept of Operations

The manning of the VMUX will be similar to the current structure in that it will have a mix of officers and enlisted Marines that will be combined to form a more cohesive and flexible unit when deployed as a detachment. The manning ConOps is divided into operations and maintenance.

a. Operations

The operations department (S-3) will provide the officers to serve as MC and enlisted personnel to fill the other operational billets. The only modification to the current operational structure of a typical VMU is that the duties of the external pilot (EP), which is part of the operations department, may be combined with the duties of the Air Vehicle Mechanic (AVM) in the maintenance department. This consolidates two manpower requirements into one billet with a well developed set of skills. Currently, the NTSP for the RQ-2 Pioneer requires that EPs must first meet the required training as IP through formal school qualifications.[37] This is the first departure from the traditional organizational structure. The operations team will include Mission Commanders (MC)

[37] NAVAIR. Navy Training System Plan for the RQ-2 Pioneer. N-78-NTSP-A-50-8622D/A. August 2004. p. I-23.

and Air Vehicle Operators (AVO). In accordance with NATOPS, all AVOs will be OPNAV Instruction 3710.7 Series qualified, with qualification and certification as Mission Commander or AVO managed by the individual's parent unit.

The Marine Corps has already established a good set of UAS related MOS billets in accordance with the current VMU manpower structure. The specific titles and MOS designators developed in the RQ-2 Pioneer NTSP will serve as the foundation for the development of the manpower requirements for the VMUX and are shown in Table 4-1.[38] This research does not focused on specific MOS categories used to develop new UAS related MOS billets but rather, establish a foundation for the development of a new, more robust, flexible and scalable manpower structure.

Table 3. UAV Related Operational MOS Billets

MOS	TITLE
7314	UAV operator (IP)
7316*	UAV External Pilot / UAV Mechanic (EP)
7315	UAV Mission Commander (MC)
0231	Intelligence Analyst (IA)
0241	Imagery Analyst (IA)

*NOTE: Additional MOS as a UAV Mechanic (6214)

The Marine Corps is currently reviewing the manpower structure that supports Tier II and Tier III programs. The critical focus of the two programs is the Tier II since it is the only level of support not managed by military personnel but by a fee-for-service contract with Boeing Corporation. The goal of the research to form a composite squadron is based on the study of the UAS program in the USMC, interviews, and

[38] NAVAIR. Navy Training System Plan for the RQ-2 Pioneer. N-78-NTSP-A-50-8622D/A. August 2004. p. I-25.

recommendations from members of VMU-1, MWATS-1, MCWL, MCSC and MCCDC who are involved in the development of capabilities and requirements for the tiers II and III of the UAS FoS.

b. Maintenance

The maintenance manpower requirements were derived from the analysis of the manpower ConOps and the concept of employment as previously described. The maintenance concept of operations is similar to that currently employed in the VMUs. Maintenance will be performed by Marine Corps personnel with skills resident within the maintenance fields prescribed in the NTSP for the RQ-2 Pioneer (N-78-NTSP-A-50-8622D/A) and adapted for future systems that will replace Pioneer and other UAS platforms.

Currently, four MOS billets are involved in the maintenance of UAV assets. The UAV mechanic (6214) is directly involved with the engine and structural maintenance of the Air Vehicle (AV). The Avionics Technician (6314) is responsible for the all electronic components of the AV including the payloads (i.e. IR cameras). The other two MOS billets are indirectly involved in the maintenance process. The Aircraft Support Equipment (ASE) Mechanic (6072) and the Aircraft Ordnance Technician (6531) are respectively responsible for handling the aircraft support equipment (i.e. Hydraulic system, Pneumatic system) and the ordnance of the AV. The UAV maintenance related billets established by Navy and Marine Corps planners are shown in Table 4. These MOSs were established in the RQ-2 Pioneer NTSP and serve as the foundation for the development of future skills sets for the replacement of the Pioneer and other UAS assets.[39]

[39] NAVAIR. Navy Training System Plan for the RQ-2 Pioneer. N-78-NTSP-A-50-8622D/A. August 2004. p. I-22.

Table 4. UAV Related Maintenance MOS Billets

MOS	TITLE
6214*	UAV Mechanic / UAV External Pilot (AVM)
6072	Aircraft Support Equipment Mechanic (AVSE)
6314	UAV Avionics Technician (AVT)
6531	Aircraft Ordnance Technician (AVORD)

*NOTE: Additional MOS as a UAV External Pilot/UAV Mechanic (**7316**)

3. Training Concept of Operations

An important goal of the training program for UAS personnel is to provide the Marine Corps with qualified Mission Commanders, AV Operators, and maintenance personnel for the effective and safe employment of UAV systems. The knowledge, skills and abilities required to grow these professionals is the program foundation. The proper development and implementation of adequate and relevant training will ensure the designated personnel who serve in these billets possess the necessary knowledge and skills to support UAS operations throughout the spectrum of combat scenarios. As with other major programs, the development of the training courses should be done with the participation of the contractor. They will develop and conduct familiarization training for all billets until the activation of a training facility. The courses should focus on initial training requirements for the MC, IP, PO, and the maintenance technicians (AVT, AVORD, and AVM). Military instructors should be developed to take over the operations of the training facilities after they have completed a tour in a VMU designated UAV billet.

The training facility should be co-located with one of the operating VMUs at MCAGCC 29-Palms, CA or MCAS Cherry Point, NC. This training facility will run like any other flight school that has its own Fleet Replacement Squadron (FRS) or Replacement Air Group (RAG). This creates the proper environment for students to learn the knowledge and skills required to operate in the operating forces. This realistic environment will serve to develop their abilities to complement the training and adapt to the culture of the VMU community.

The training hardware such as the GCS and PCS should have an enhanced version of the fleet Full Mission Capable Training Device and software. This system should have a set of mission scenarios that will enhance training with a realistic approach and allow students to conduct emergency procedures and mission scenarios that will build on the knowledge and skills to develop the unique abilities required for these billets. The maintenance training should include preventive/corrective maintenance and Troubleshooting workshops to create a realistic environment for operational readiness. There should be a seamless transition from school to operating forces in order to maximize the learning experience and minimize the learning curve when the students are transferred to their respective VMU.

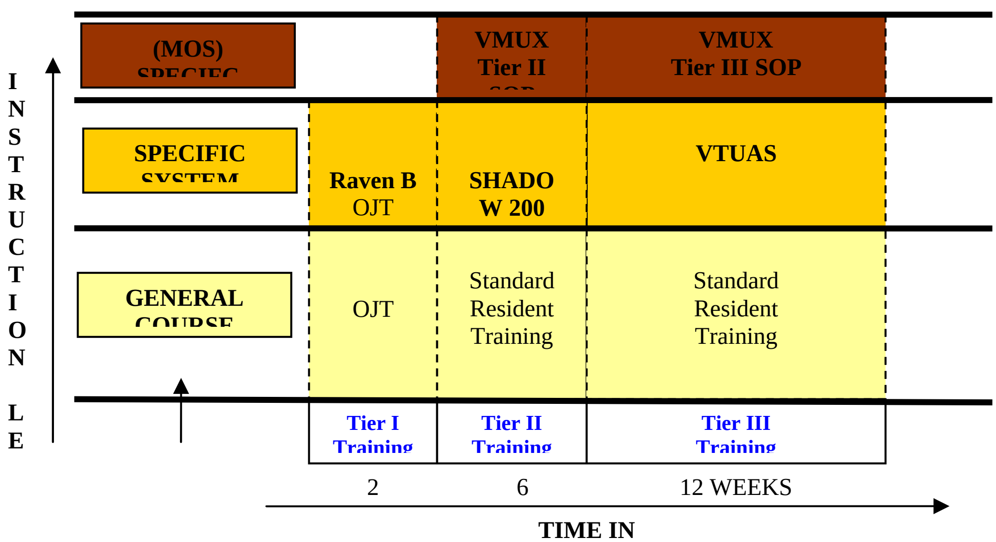

Figure 14. Proposed Training Evolution From One Tier to the next

As a contingency plan, the FRS/RAG could support real world operations as required. This will require that the school house be set up with operational structure and composition of an active duty VMU. From time to time, the VMU's could augment their manpower structure and UAS platforms with a detachment from the school house to support missions that may require an augmented force. The UAS training facility would provide a vital training environment that could minimize mishaps, enhance individual skills and hone specific abilities inherent in all UAS members.

D. FUTURE COMPOSITE-VMU (VMUX) MANPOWER STRUCTURE

1. System Requirements

The establishment of a composite squadron is not a new idea. What is new is the integration of the concept of employment developed by the Marine Corps and the manning proposed by this research. The intent is to combine the System's ConOps, Concept of Employment and the Manpower ConOps to produce an integrated solution to the conflict between capability requirements and manpower shortages. The VMUX is the culmination of a year of research and experimentation as well as the optimization of resources to meet the capability requirements of the future of the Marine Corps UAS program.

The first point of departure would be the addition of a third VMU so there may be a VMUX assigned to each of the Marine Air Wing (MAW) components. Additionally, there will be two more VMUX units in reserve. One will be assigned to the Marine Corps Reserve Forces and the other will be an inactive unit within the training facility that will be run as an operating unit with the intent to create a realistic environment for the students. The latter will only be activated under special circumstances that warrant their deployment and by direction of the highest levels of command within the MAW. A proposed composition of three VMUX detachments is shown in Appendix B.

The proposed VMUX will be capable of conducting operations across the spectrum of combat operations. Each detachment will have 4 UAS platforms and the capability to break down into smaller sections to provide split operations (hub and spoke). Each VMUX will have the following capabilities:

a) 12 combined UAS platforms (6 Tier II and 6 Tier III).

b) 3 Ground Control Stations (GCS).

c) 6 Portable Control Stations (PCS).

d) Combined coverage of approximately 715 Km by 265Km when operating as a single unit located in the same area.

e) Capable of conducting split ship-to-shore or split shore (Hub and spoke) operations on three separate fronts with extended range capabilities.

f) Independent maintenance and rolling assets that facilitates the embarkation and movement of the unit when deployed with the MAGTF.

g) 16 to 24 hours of continuous on-station support for sustained and surge operations.

The VMUX will not be required to maintain a logistical footprint of vehicles and other support assets to operate efficiently. This task will be delegated to the Marine Wing Support Squadrons (MWSS) within the MAW. Currently, the MWSS is the Aviation Ground Support (AGS) element of the MAW for all manned aviation squadrons. The abundance of rolling stock (trucks and engineer equipment), medical support and maintenance capability inherent in the MWSS will be sufficient to support the VMUX and provide the required manpower and equipment support to conduct operations. The Marine Aviation Logistics Squadron (MALS) will provide the technical support to facilitate the reduction of squadron manpower requirements. Altogether, the analysis for the modifications to the manpower structure and the re-allocation of logistical responsibilities will enhance the ability of the VMUX to effectively perform its mission as it enters a new age of integration in the Marine Corps to operate in a joint environment.

2. Manpower Requirements

a. Operational Manpower Requirements

The required number of AV operators is driven by the Concept of Employment. The recommended number of members in each detachment is specified in Table 5. This table was created from a notional organizational structured derived from the current VMU composition. The numbers depicted in the table reflect the quantities of personnel of each specialty assign to a specific station. For example, the number of MC in a PCS is zero since there is no need to have a MC at a PCS. However, there are two IPs and two POs assigned to each PCS. The numbers add up to complete a squadron size element as the aggregation of stations goes from one PCS to two PCS and so on all the way up to the entire composition of three detachments per squadron. The intent is to complement each station with the right manpower capability to provide up to 24 hours of continuous on-station operational support.

Table 5. Operational Manpower Requirements for the VMUX

	MC	IP	EP*	PO	IA	TOTALS
PCS-1	0	2	2	2	0	6
PCS-2	0	2	2	2	0	6
GCS (x1)	2	2	2	2	4	10
DET (x3)	2	6	6	6	4	24
SQDN	**6**	**18**	**18**	**18**	**16**	**72**

***NOTE:** The external Pilot duties will be consolidated with the duties of the Maintenance Personnel

Each Squadron will be composed of three detachments. Each Detachment will have one GCS and two PCS. Each station (GCS or PCS) will have two full crews to operate the four platforms that will be part of the detachment. The only exception to the crew composition is that neither PCS will have a MC or IA in their organic composition. These two billets will reside in the GCS and can be distributed as needed during operations. Each PCS has six Marines. The GCS will have a total of ten Marines which includes the two MC, two PO, two IP and four IA (two Intelligence Analysts and two Imagery Analysts). That means that there will be 24 Marines in each detachment that will operate four UAS platforms. Each detachment will contain two Tier II (Shadow 200) and two Tier III (VTUAS) platforms. Each squadron will be comprised of three detachments. This gives a VMUX the ability to configure their assets and personnel to meet a wide range of missions. Each squadron will have 72 Marines that will operate 12 UAS platforms (six Tier II and six Tier III).

The numbers selected for this notional manpower structure is driven by the operational scenarios and system composition that are currently planned for the future of the UAS FoS in accordance with the USMC Vision.[40] The endurance requirement specified in the Concept of Operations above for 12 hours of continuous on-station support, at 110NM requires approximately a 16-hour operating cycle. Each PCS will have two crews that can maintain an 8-hour watch, 6 hours of on-station time per AV and 2 hours of overlap for transition from one AV to another. The GCS also has two full crews to include an extra MC for contingency and back up and two extra IA for deployment with the PCs if needed. This allows the GCS to operate for a 16-hour or 24-hour operating cycle depending on how the detachment is configured (i.e. split or combined operations).

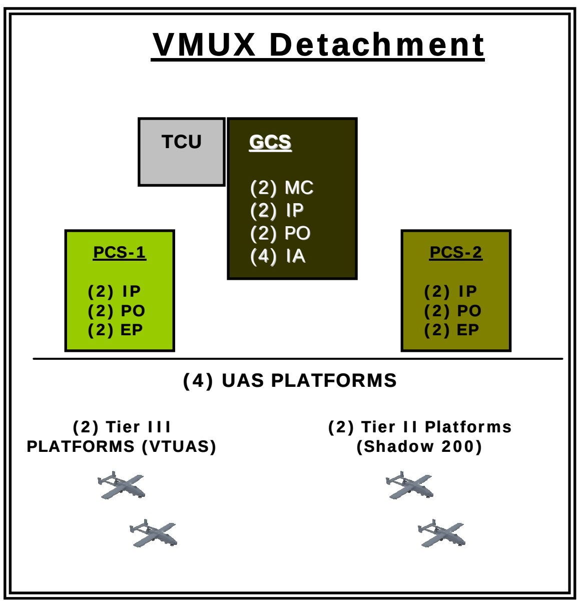

Figure 15. Notional Depiction of a VMUX Detachment

40 Marine Unmanned Vehicle Squadron (VMU) Organizational Structure Presentation. MAWTS-1, UAS Division. March 2007. Slide 5.

Flight safety and crew rest requirements have been incorporated in the assessment of the number of crews per station. This ensures that qualified operators (MCs and AV operators) are assigned for each watch station during normal operating hours. During surge operations, the detachment/squadron can be configured to support 24/7 operations for an extended period of time. The exact time period for surge operations should determined by the CO of each VMU considering the mission, environment and other relevant factors affecting the effectiveness of the crew and safety of flight operations.

b. Maintenance Manpower Requirements

The required number of maintenance personnel is driven by the Concept of Employment and the Manning Concept of Operations. The recommended number of members in each station/detachment/squadron is specified in Table 4-4. This table was created from a notional organizational structured derived from the current VMU composition. The numbers depicted in the table reflect the quantities of personnel of each specialty assign to a specific station.

Table 6. Maintenance Manpower Requirements for the VMUX

	PC	**AVM***	**AVT**	**TOTALS**
PCS-1	0	0	0	0
PCS-2	0	0	0	0
GCS (x1)	1	4	4	9
DET (x3)	1	4	4	9
SQDN	3	12	12	27

***NOTE:** The Maintenance Personnel duties will be consolidated with the duties of the external Pilot.

The maintenance cell of the VMUX detachment will be structured around the operational cell to support all four UAS platforms. This allows the detachment to operate remotely, autonomously and independent from the squadron's main body. It also allows the detachment to operate in concert with other detachments which may be co-located in the same operating area by pooling resources to enhancing their capabilities. Each Detachment will have 11 maintenance Marines from the required MOS billets. All maintenance personnel will be co-located with the Detachment's GCS to provide maximum flexibility and economy of force. With this flexible force, the detachment's MC can detach members of the maintenance cell to support a PCS when conducting split operations.

The numbers selected for this notional maintenance manpower structure is driven by the operational scenarios and system composition that are currently planned for the future of the UAS FoS in accordance with the USMC Vision.[41] The maintenance personnel will be capable of conducting preventive and corrective maintenance for all UAS platforms. The preventive maintenance will consist of pre-flight and post-flight inspections and routine services as prescribed by NATOPS. These include but are not limited to takeoff and landing inspections, acceptance inspections and initial buildup, and corrosion control and preservation. The corrective maintenance will involve all minor structural repairs as well as fault isolation and access, removal, and repair or replacement of failed components to the lowest level replaceable assembly.[42]

3. Other Manpower Requirements

One of the proposed changes to optimize VMUX manning levels is to reduce the logistics footprint by requesting logistics support to the MWSS and Ordnance and avionics support to the MALS. This will decrease the number of manpower billets inherent in the VMUX and utilize existing resources that already support other units within the MAW.

There are five MOS billets that will be required to support the VMUX from the MWSS and the MALS. These MOS billets, along with the rolling stock and GSE

[41] Marine Unmanned Vehicle Squadron (VMU) Organizational Structure Presentation. MAWTS-1, UAS Division. March 2007. Slide 5.

[42] NAVAIR. Navy Training System Plan for the RQ-2 Pioneer. N-78-NTSP-A-50-8622D/A. August 2004. p. I-23.

required to support the VMUX will be outsourced in the same manner as every other Marine Aircraft Group (MAG) unit. Table 7 is a list of MOS designators and title of all the supported billet requirements.[43]

Table 7. UAV Outsourcing MOS Designators

MOS	TITLE
3531	Motor Vehicle Operator (MVO)
3521	Organizational Automotive Mechanic (MVM)
1141	Electrician (EL)
0651	Data Network Specialist (COMM)
6072	Aircraft Support Equipment (SE)/hydraulic/Pneumatic/Structures Mechanic (AVSE)
6531	Aircraft Ordnance Technician (AVORD)

All of the motor transport, utilities and communications support will come from the MWSS. The Aviation technicians and ordnance technicians will come from the MALS. This requirement to request support to the MWSS and the MALS currently exists in the Marine Air Group (MAG) that operate with manned aircrafts. Consequently, the change within the MAW community, where UAS units reside, is cultural and not structural.

Table 8. UAV Outsourcing Manpower Requirements

	MVO	MVM	EL	COMM	AVSE	AVORD	TOTALS
PCS-1	0	0	0	0	0	0	0
PCS-2	0	0	0	0	0	0	0
GCS (x1)	0	0	0	0	0	0	0
DET (x3)	6	2	2	2	1	1	14
SQDN	18	6	6	6	3	3	42

43 USMC.mil. (MOS List). http://www.uspharmd.com/usmc/cgi-bin/mos.cgi. Accessed May 2007.

4. Method of Employment

The results of the newly configured VMUX will provide an enhanced capability with more flexible manpower structure and a reduced logistical footprint. This will allow the MAGTF commander to employ these assets more effectively. Currently, the VMU is designated to deploy as an entire unit. The VMUX will not only be able to deploy as separate detachments, but may even scale its force down to capabilities modules within a detachment to support smaller operations during peacetime and other non-combat contingencies.

The MAGTF commander would be able to tailor the VMUX force to deploy them more effectively to meet a wide variety of missions. More importantly, the newly proposed manpower structure will minimize the manpower billets required to operate and manage the VMUX. The integration tiers II and III, into one composite squadron, would create savings that would offset the cost of alternatively providing more GCS and PCS for each VMUX.

Finally, the functions and capabilities of the VMUX will be ahead of current efforts by other services to meet DoD's requirement to develop and establish joint standards, transformational capabilities and control cost. DoD's goals to develop a joint unmanned combat aircraft system capable of performing suppression of enemy air defenses (SEAD), Intelligence, surveillance and reconnaissance (ISR), in a high threat environment will be facilitated by the template of integrated capabilities that will be inherent in the Marine Corps' VMUX.[44]

a. Sustained Operational Requirements

With the implementation of the newly proposed VMUX, the Marine Corps would exceed the capability requirements established by the concept of employment planned for the VTUAS.[45] The VTAUS NTSP requires that a single system be capable

[44] Office of the Secretary of Defense (OSD). Unmanned Aircraft Systems Roadmap 2005–2030. Exec Summary.

[45] NAVAIR. Navy Training System Plan for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle. N-75-NTSP-A-50-0004/D. June 2001. p. 7.

of providing 12 hours of continuous on-station support and provide coverage for 110NM within a 24-hour period. It is also expected that the VTUAS be capable of providing 24-hour coverage when two or more systems are assigned to one MAGTF element.

During sustained operations, a VMUX detachment could position one GCS and one PCS in the same location to provide a back up system support. The other PCS could be deployed to extend the radius of the systems and allow for coverage of over 200Km. Figure 16 shows how this capability will be employed in one random scenario.

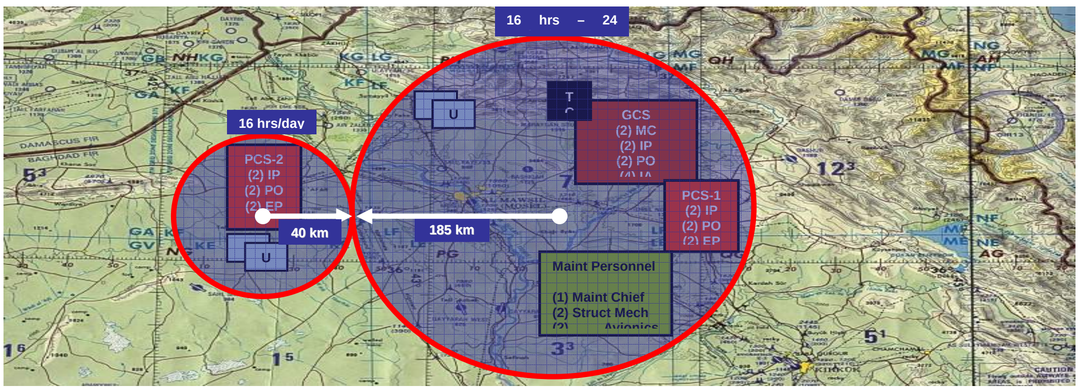

Figure 16. Sustained Operations Using One VMUX Detachment

The above described capability would be considered standard for every VMUX detachment. Furthermore, the reach and endurance of the VMUX squadron would be extended when detachments are combined. This unique composition would support more missions from multiple units, located in different areas.

b. Surge Operational Requirements

One of the most pervasive problems currently affecting the VMUs is their inability to operate independently without moving their massive logistical footprint. Once a VMU is on station, it must augment its capabilities with additional UAV systems from the other squadron in order to meet mission requirements. This presents a critical gap in capability when the mission requires a surge in operations. The current structure of the VMU is augmented by ScanEagle civilian staff. The staff is not part of the squadron's T/O&E, but is required to fulfill assigned MAGTF missions. The potential for mishaps and crew risk is increased when the requirements for more on station assets is in surge operations. The same concept of employment planned for the VTUAS, requires that one system be capable of providing 24-hour coverage when two or more systems are assigned to one MAGTF element.[46]

The VMUX must be capable of managing the surge requirements for any mission with just one detachment. It must fill the capability gap and fulfill the MAGTF commander's mission requirements without increasing the mishaps risk of, hazards or crew safety. More importantly, it must be able to scale its force to provide 24 hours of continuous on station support by employing all four platforms and its three control stations (GCS and two PCS) in a hub and spoke configuration. This means that each detachment within the VMUX must be able to provide 24/7 continuous on-station support to maintain a surge level of for a limited period of time. Figure 17 is a graphic depiction of how the VMUX detachment will conduct surge operations.

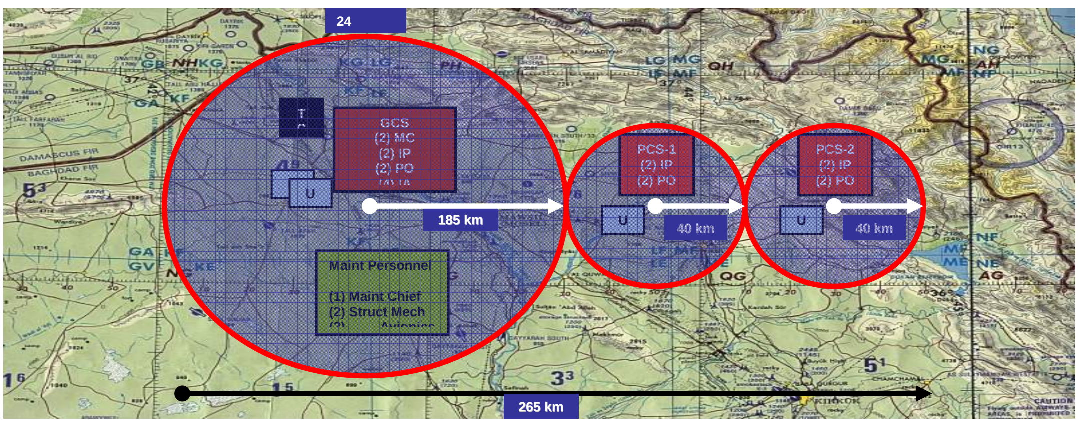

Figure 17. Surge Operations of One Vmux Detachment

When operating as one unit, the combined capabilities of a VMUX, would provide an extended surge capability for an indefinite period of time. This is the result of an integrated approach to the concept of parallel development of capabilities with

[46] NAVAIR. Navy Training System Plan for the Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle. N-75-NTSP-A-50-0004/D. June 2001. p. 7.

manpower requirements in one comprehensive process consistent with desired goals. The examples provided for the sustained and surge operational configuration are notional concepts of the range of capability The key aspect of this entire process is that this recommendation, minimizes manpower requirements and logistical footprint, improves current system capabilities, and provides a robust, flexible and scalable force to execute a wide range of missions with any size MAGTF.

E. CHALLENGES TO IMPLEMENTATION

1. A New Perspective (Joint Ops)

As DoD's requirements for the development of increased joint capability are pushed to each of the services, there's a concerted effort to strike a balance between standardization and service specific mission requirements. The transformation that is ongoing throughout DoD makes it more critical that our UAS FoS meets this challenge with a new perspective. While there are some important aspects to consider when developing a new and innovative approach, the opportunity to explore new perspectives to existing problems must be inherent in our culture. This is the idea behind the creation of the Marine Corps Warfighting Laboratory (MCWL).

Consequently, the recommendations contained in this research are a departure from standard concepts and a new perspective on how we develop capabilities and manpower requirements in concert. The VMUX can become a functional operating unit in the Marine Corps but it needs to be supported by the advocates and agencies that are charged with fostering this type of innovative approach. The possibility that the entire process may have flaws is reasonable, but the template on which this recommendation is based has a great potential to become a reality in this decade.

2. Cost

The Marine Corps budget is small in comparison with the other services. Marine Financial planners constantly work the budget figures to allocate resources effectively and make critical decisions about which of the many budget requirements for capabilities development to fund. Many programs are victims of this ranking process which makes it difficult to promote a capability that is a shift from what currently exists in the inventory. It is difficult to absorb the financial cost of a concept that requires the creation of a composite squadron with 12 UAS platforms, but this cost could be countered by arguing that the recommendations provided reduce the manpower requirement of each VMUX by about 10% from 180 Marines to about 160. Additionally, the squadron rolling stock would be reduced and the logistical and maintenance requirements to manage those assets will also be reduced. Moreover, the communications, medical and other support requirements will become null as the squadron becomes more lean and specialized to carry out its main mission and functions. The generated savings from this consolidation would streamline the process and bring about greater cost reduction. Therefore, the notion that this will cost more than is worth is debatable and would require a detail cost and benefit analysis to assess the actual outcome of the costs associated with the modification and restructuring of the UAS community.

3. Obstacles

The most challenging obstacle that this type of new perspective faces within the Marine culture is that of acceptance and further development. Advocates for this community have done extensive research and development on current and future approaches to the UAS FoS capabilities requirements for 2030. It will be difficult to win the hearts and minds of those who are charged with developing similar approaches.

Another consideration is further research funding. This research was achieved without the support and funding of any Marine Corps organization, despite the overwhelming amount of requests sent to all branches of the research community for assistance and support. It is difficult to find the needed assistance and financial support when there are so many competing interests that have priorities in a time of war.

Finally, any research must be validated and examined to verify its accuracy and feasibility of application. This may be one of many research reports that must wait its turn to be discovered. This notion of waiting might just be the greatest detriment in our ability to find the most optimal solution. There are never enough manpower resources to meet the needs of every requirement which is the primary reason for this research.

F. CHAPTER SUMMARY

This chapter qualitatively analyzes the feasibility of a proposed solution to the manpower issues that surround Tier II and III of the UAS FoS. It highlights the inherent challenges to the development of a manpower structure and how DoD's push for a joint unmanned Aerial vehicle validates the need for the consolidation and restructure of our current UAS force. The chapter briefly outlines the organizational structure of the current VMUs. The concept of operations, concept of employment and the manning concept of ops are examined to develop future force structure requirements.

The concepts are used to develop a notional manpower structure for a composite VMU squadron that includes tiers II and III assets notionally called VMUX. Finally, the chapter briefly highlights some of the challenges that impede the implementation of these notional force structure changes. Though this research took about a year to develop, it well may be the next template of for unmanned vehicle units. Manpower is a costly asset and the efficient use of our manpower assets will always be a benefit to the entire force. The objective of this chapter is to serve as a starting point for the development of new perspectives for further research into more efficient ways to provide manpower savings.

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

This research is the first known academic study analyzing and recommending operational manning requirements for the Unmanned Aerial Systems Family of Systems (UAS FoS) for the USMC. It began with an assessment of the status of manpower structures in the current UAS community, and qualitatively assessed the manpower requirements and logistical impact of the different strategies being considered for the Marine Corps' Tier II and III of the UAS FoS.

The objective and goal was to analyze and recommend a manpower structure to support the tiers II &II of UAS FoS development. The research examined the following: the current composition of the Marine Unmanned Aerial Vehicle Squadron (VMU); the recommended location and structure of the Marine UAS training facility to develop the knowledge, skills and abilities required in the UAS community; and costs and benefits of a new squadron structure combining (Tier II & III) the VMU squadron versus two separate squadrons.

The study uncovered key aspects of the considerable challenge facing the UAS FoS in the Marine Corps and the need for a robust, flexible and scalable manpower structure to improve and hasten adaptation to emerging new technology in this warfare arena. The origins and background of UAS development and the history of the UAS program in the USMC are described for context purposes. The research illuminated pitfalls contributing to the imbalance in capabilities and manpower requirements and offers developmental recommendations

The efforts of early planners to incorporate UAV technology into the USMC appeared detached from how the technology would flow within the acquisition process. For example, the RQ-2 Pioneer interim program became a funded program despite shortfalls in the capability development process. Even with shortfalls, this asset has been deemed successful in terms of filling a needed capability gap. Conversely, an insufficient program development process adversely impacted the manning of the squadrons created to fulfill the UAS missions of the Marine Corps.

In sum, a re-structuring of the manpower force in the UAS community is needed, and a new perspective for Tier II and III UAS manning is offered, i.e., a composite squadron for two tiers of UAV systems to optimize manpower requirements and to reduce the logistics footprint of the current VMUU. Cost savings would likely result from combining the training, operations and management of separate UAS squadrons.

Chapter IV describes the recommendation for the re-structuring of the current VMU into a composite VMU (VMUX). The methodology used to develop this manpower structure included a review of doctrinal publications and documents related to UAS operations, both within the Marine Corps, across the Services and at the DoD level. Input and expert opinion was also incorporated in the study from VMU-1, the MCWL, MCCDC, MWATS-1 and industry experts from the private sector.

The analysis of this research envisions an increased capability with a robust, flexible and scalable force that can be adapted to meet UAS needs into the future. The initial intent to form separate squadrons evolved into the documented and innovative approach to merge the assets from the two top tiers of the UAS FoS program. To summarize, a composite squadron would likely generate both savings and expanded capability of the current VMU, as well as decreased manning requirements.

B. CONCLUSIONS AND RECOMMENDATIONS

1. Primary Research Questions

a. What Notional Manpower Structure Would Best Support the Tier II & Tier III of the UAS Fos?

Conclusion:

- An analysis of the current manpower structure of the Tier II UAS concluded that the for the fee-for-service contract currently in place with Boeing Corporation needs to be replaced by active duty personnel. It became apparent early in the research that the creation of a separate, additional squadron for the Tier II assets was challenging both from a capability as well as a manning perspective. The research challenge is to find a way to incorporate the Tier II assets, with USMC manpower and force structure required to replace the fee-for-service contract with ScanEagle, while maintaining the same levels of support to the current UAS missions.

Recommendation:

- Combine Tier II and III assets and personnel under one marine Unmanned Aerial Vehicle squadron to form a composite VMU squadron (VMUX). This is comparable with the current concept of operations of the VMU squadrons with ScanEagle civilian personnel who work side-by-side with their military counterparts. The merger of two Tier III assets (VTUAS) and two Tier II assets (Shadow 200) would create economies of scale and increase capabilities to the field commander.

- Combine the EP and AVM duties so the maintenance section becomes responsible for all external AV operations (takeoff and landing). This will reduce the manpower requirement of one key billet and place more responsibility on the department responsible for handling the safe and effective operation of the AV prior and after the launch. There is considerable concern about how this may impact the operations and performance of the unit, as well as the safety and regulations of current NATOPS, but it is worth analyzing the feasibility of this proposal to validate the recommendation.

- Relinquish all logistics, transport and avionics requirements to other units such as the MWSS and MALS to minimize the squadron’s organic footprint and allow for more flexible and effective deployments and operations. This will allow the VMU to focus on its core competencies and mission rather than managing AGS assets. All other manned squadrons in the Marine Corps use the MWSS and MALS to coordinate their ground logistics, transport, air logistics and avionics needs. The VMU should not continue to be the sole proprietor of assets that do not directly contribute to mission accomplishment.

- Grow the UAS community to a total of five Unmanned Aerial Vehicle squadrons. Increase the current active duty squadrons from two to three so each MAW has an independent UAS capability. Grow to additional squadrons in reserve. One of these squadrons will be assigned to Marine Forces Reserve (MARFORRES) and the other one will be a Fleet Replacement Squadron (FRS/RAG) used at the training facility to enhance the training of students in a realistic environment and serve as a contingency squadron..

- Re-structure each squadron so they are broken down into three independent and autonomous detachments capable of deploying and operating as one organic asset in support of a MATFG element. Each detachment will have two Tier II assets and two Tier III assets with associated operations and maintenance personnel. Each detachment would be augmented by the MWSS and the MALS depending on mission requirements.

2. Secondary Research Questions

a. What Notional Logistics Support is Required to Maintain and Operate a Deployed UAS Unit?

Conclusion:

- The current VMU configuration does not provide the flexibility to deploy sections or detachments of a squadron. It can only deploy as a whole to a single location, where it may be tasked to conduct split operations with limited capabilities to operate 24 hours a day. This reduces its effectiveness and overburdens the two VMU's in the USMC operating forces.

Recommendation:

- Transfer logistical requirements to the MWSS, and all avionics and ordnance requirements to the MALS. This will likely make the proposed VMUX more responsive, flexible and light, with a smaller logistics footprint.
- Reduce the manpower footprint by transferring all logistics responsibilities to the MWSS and the MALS. Additionally, this will result in manpower efficiencies requirements in other squadron areas such as administration, ground vehicle maintenance and communications. These changes will cause the VMUX to focus on core competencies and primary missions. These recommendations incorporated at each level of the Marine Air Ground Task Force (MAGTF) will increase the organic, interoperable,

integrated and tailored capabilities provided to the warfighter's situational awareness through a common C2 architecture across the range of military operations.[47]

C. AREAS FOR FURTHER RESEARCH AND STUDY

There are six recommendations for further research to advance the concept of the composite VMU (VMUX).

- Conduct a cost and benefit analysis of reducing the logistics manpower and equipment associated with supporting VMU UAS operations and outsource those billets and equipment to the MWSS and MALS units in the MAW.
- Conduct a feasibility KSA analysis to determine the realistic probability that the EP and the AVM duties and responsibilities can be combined in one manpower billet to reduce the manning requirements of the VMUX operating and maintenance force.
- Conduct a Cost and Benefits Analysis to determine if the composite squadron can operate more effectively and efficiently than as a separate, tier specific unit. The emphasis should be on the manpower cost of each alternative.
- Conduct a research study on the development of a training facility at the MCAGCC in 29 Palms independent of other Services training facilities and configured to resemble the organizational structure of a typical active duty VMUX.
- Conduct a study of the cost of adding a third VMUX squadron to the active forces and another squadron to the reserve forces.
- Identify the KSA's required to grow a robust UAS force that can be scaled from one tier to the next as it moves from Tier I to Tier II to Tier III.

[47] MCCDC, USMC VISION. UAV Family of Systems (FoS) Document. September 2005.

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APPENDIX A.

Source: Published Publication Date: Nov 18, 2006	United States Marine Corps Total Force Structure Management System Unit TO&E Report VMU-1 MACG-38 3D MAW BOX 788281 TWENTYNINE PALMS , CA 922788281 Country: 06 UIC: M01480	Report Fiscal Year: Manning Precedence Level: Military Unit Level Code: Unit Descriptor Code: Unit Type Code:	2007 95 SQ D PRPAA

Mission Statement:

**8890 17 MAY 1996

TABLE OF ORGANIZATION MARINE UNMANNED AERIAL VEHICLE

SQUADRON (VMU)

NUMBER...........8890 MARINE AIRCRAFT GROUP

MARINE AIRCRAFT WING

FLEET MARINE FORCE

1. PROMULGATION STATEMENT. THIS TABLE OF ORGANIZATION PRESCRIBES THE ORGANIZATIONAL STRUCTURE, BILLET AUTHORIZATION, PERSONNEL STRENGTH, AND INDIVIDUAL WEAPONS FOR THE MARINE UNMANNED AERIAL VEHICLE SQUADRON (VMU), MARINE AIRCRAFT WING.

2. ORGANIZATION

HEADQUARTERS SECTION

SAFETY SECTION

PERSONNEL SECTION

INTELLIGENCE SECTION

OPERATIONS SECTION

Mission Statement:

LOGISTICS AND GROUND MAINTENANCE SECTION

MEDICAL SECTION

COMMUNICATIONS SECTION

AVIATION MAINTENANCE SECTION

MARINE AVIATION LOGISTICS SQUADRON AUGMENT SECTION

3. MISSION AND TASKS

A. MISSION. OPERATE AND MAINTAIN AN UNMANNED AERIAL VEHICLE (UAV) SYSTEM TO PROVIDE UNMANNED AERIAL RECONNAISSANCE SUPPORT TO THE MARINE AIR GROUND TASK FORCE (MAGTF).

B. TASKS

(1) CONDUCT RECONNAISSANCE, SURVEILLANCE AND TARGET ACQUISITION.

(A) PERFORM AIRBORNE SURVEILLANCE OF DESIGNATED TARGET AREAS, MAGTF AREAS OF INTEREST/INFLUENCE, AND OTHER AREAS AS DIRECTED.

(B) PERFORM AIRBORNE SURVEILLANCE FOR SEARCH AND RESCUE AND FOR TACTICAL RECOVERY OF AIRCRAFT AND PERSONNEL.

(C) PERFORM RECONNAISANCE OF HELICOPTER APPROACH AND RETIREMENT LANES IN SUPPORT OF VERTICAL ASSAULTS.

(2) PROVIDE REAL-TIME TARGET INFORMATION TO THE DASC AND FSCC TO FACILITATE ADJUSTING FIRE MISSIONS AND CLOSE AIR SUPPORT.

(3) PROVIDE INFORMATION TO ASSIST ADJUSTING INDIRECT FIRE WEAPONS AND TO SUPPORT AND FACILITATE DEEP AIR SUPPORT AND AIR INTERDICTION.

(4) COLLECT BATTLE DAMAGE ASSESSMENT (BDA).

(5) SUPPORT REAR AREA SECURITY.

(6) PROVIDE REMOTE RECEIVE CAPABILITY AND LIAISON TO DESIGNATED UNITS.

(7) CONDUCT INDIVIDUAL AND UNIT TRAINING TO PREPARE FOR TACTICAL EMPLOYMENT AND COMBAT OPERATIONS.

4. CONCEPT OF ORGANIZATION. THE VMU SQUADRON IS ORGANIC TO THE MARINE AIRCRAFT WING (MAW) AND IS STRUCTURED TO OPERATE AS A SUBORDINATE UNIT OF ONE OF THE MARINE AIRCRAFT GROUPS (MAG). THE VMU SQUADRON IS ORGANIZED INTO VARIOUS SECTIO THAT GIVE IT THE CAPABILITY TO OPERATE AND MAINTAIN ONE UAV SYSTEM AND ASSOCIATE SUPPORT EQUIPMENT. THE MALS AUGMENT SECTION IS DESIGNED TO NORMALLY FUNCTION AS PART OF A MARINE AVIATION LOGISTICS SQUADRON TO PROVIDE INTERMEDIATE LEVEL AVIATION MAINTENANCE AND SUPPLY SUPPORT.

5. CONCEPT OF EMPLOYMENT. THE VMU SQUADRON CAN SUPPORT ANY SIZE MAGTF. NORMAL EMPLOYMENT WOULD BE AS AN INTEGRAL UNIT OF AN AVIATION COMBAT ELEMENT IN SUPPORT OF MAGTF OPERATIONS. THE SQUADRON IS CAPABLE OF LIMITED INDEPENDENT OPERATIONS.

6. ADMINISTRATION CAPABILITIES. THE SQUADRON IS CAPABLE OF SELF ADMINISTRATION

Mission Statement:

7. LOGISTICS CAPABILITIES

A. MAINTENANCE. THE SQUADRON WILL BE CAPABLE OF CONDUCTING 1ST AND 2ND ECHELON MAINTENANCE ON ASSIGNED MARINE CORPS GROUND EQUIPMENT INCLUDING TRANSPORT, ENGINEERING AND COMMUNICATIONS EQUIPMENT, AND INFANTRY WEAPONS. THE CSSD WILL PERFORM 3RD AND 4TH ECHELON MAINTENANCE ON GROUND EQUIPMENT. THE SQUADRON WILL BE CAPABLE OF PERFORMING ORGANIZATIONAL LEVEL MAINTENANCE ON AVIATION EQUIPMENT TO INCLUDE UAV'S AND UAV SYSTEMS. THE MALS WILL PERFORM LIMITED, SPECIALIZED INTERMEDIATE LEVEL MAINTENANCE ON AVIATION EQUIPMENT.

B. SUPPLY. NONE. SUPPLY SUPPORT WILL BE PROVIDED BY THE MARINE AIRCRAFT GROUP (MARINE CORPS EQUIPMENT) AND THE MARINE AVIATION LOGISTICS SQUADRON (AVATION SUPPLY).

C. TRANSPORTATION. THE SQUADRON WILL BE CAPABLE OF PROVIDING SUFFICIENT MOTOR TRANSPORTATION TO DISPLACE THE OPERATIONAL CAPABILITY OF ONE UAV SYSTEM. ADDITIONAL TRANSPORTATION SUPPORT IS REQUIRED TO DISPLACE ALL EQUIPMENT OF THE VMU SQUADRON SIMULTANEOUSLY.

D. MEDICAL. CAPABLE OF PROVIDING ROUTINE AND EMERGENCY MEDICAL SUPPORT.

E. DINING. NONE. FOOD SERVICE SUPPORT IS PROVIDE BY THE MARINE WING SUPPORT SQUADRON.

8. SUPERSESSION. THIS TABLE OF ORGANIZATION SUPERSEDES TABLES OF ORGANIZATION 4701D, 4711D, AND 4711 OF 10 JUL 1992.

Mission Statement:

C. E. MUNDY, JR

GENERAL, U.S. MARINE CORPS

COMMANDANT OF THE MARINE CORPS

Billet Organization

M01480 - VMU-1 MACG-38 3D MAW

Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	BRN	TYP	STA	Billet MNPWR CD	Res Typ CD	SC	WPN	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/CA	MCC CD	FTN
	C	M0148000001	HEADQUARTERS SECTION																									
	E	M0148000002	COMMANDING OFFICER	LTCOL	7506 7315N	7202	M	N	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000003	EXECUTIVE OFFICER	MAJ	7202 7315N	7202	M	A	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000004	SERGEANT MAJOR	SGTMAJ	9999	9999	M	E	A	A		U	P			1									1	A-M415	1J1	
Section															2	1	0	0	0	0	0	0	0	0				
	C	M0148000005	AVN SAFETY/STAND																									
	E	M0148000006	DIR SAFETY/STAND	CAPT	7506	0000	M	N	X	A		S	P									1				A-M415	1J1	
	E	M0148000007	AVN SAFETY OFF	CAPT	7506 7596N 7315N	0000	M	N	A	A		S	P		1										0	A-M415	1J1	
	E	M0148000008	NATOPS OFFICER	CAPT	7506	0000	M	N	X	A		S	P									1				A-M415	1J1	
	E	M0148000009	GROUND SAFETY OFFICER	CAPT	7506	0000	M	N	X	A		S	P									1				A-M415	1J1	
	E	M0148000010	NATOPS CLERK	SGT	7041	7041	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000011	GRD SAFETY NCO	SGT	7316	7314	M	E	X	A		U	M										1			A-M415	1J1	
Section															1	1	0	0	0	0	0	3	1	0				
	C	M0148000012	S-1																									
MT	E	M0148000239	PERSONNEL OFF	CWO2	0170	0170	M	O	A	A		U	P		1										1	A-M415	015	
	E	M0148000013	ADMIN CHIEF	GYSGT	0193	0193	M	E	A	A		U	P			1									1	A-M415	1J1	
MT	E	M0148000240	UD CLERK	CPL	0121	0121	M	E	A	A		U	M			1									1	A-M415	015	
	E	M0148000014	ADMIN CLERK/DRIVER	CPL	0151	0151	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000015	ADMIN CLERK/DRIVER	LCPL	0151	0151	M	E	A	A		U	M			1									1	A-M415	1J1	
MT	E	M0148000241	PERS CLERK/DRIVER	CPL	0121	0121	M	E	A	A		U	M			1									1	A-M415	015	
	E	M0148000016	CAREER PLAN OFF	CAPT	7506	0000	M	N	X	A		S	P									1				A-M415	1J1	

Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
	E	M0148000017	CAREER PLANNER	SGT	8421	8421	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000018	LEGAL OFF	CAPT	7506	0000	M	N	X	A		S	P									1				A-M415	1J1	
	E	M0148000019	LEGAL CLERK	CPL	0151	0151	M	E	X	A		U	M										1			A-M415	1J1	
	E	M0148000020	CMCC OFF	CAPT	7506	0000	M	N	X	A		S	P									1				A-M415	1J1	
	E	M0148000021	CMCC CLERK	LCPL	0151	0151	M	E	X	A		U	M										1			A-M415	1J1	
Section															1	6	0	0	0	0	0	3	2	0				
	C	M0148000022	S-2 SECTION																									
	E	M0148000023	S-2 OFFICER	CAPT	0277	0202	M	O	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000024	S-2A COLLECTIONS OFFICER	1STLT	0207	0207	M	O	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000025	S-2 CHIEF	SSGT	0231	0231	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000026	INTEL ANALYST	CPL	0231	0231	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000027	INTEL ANALYST	CPL	0231	0231	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000028	INTEL ANALYST	CPL	0231	0231	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000029	IMAGERY CHIEF	GYSGT	0241	0241	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000030	ASST IMAGERY CHIEF	SSGT	0241	0241	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000031	IMAGERY ANALYST	SGT	0241	0241	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000032	IMAGERY ANALYST	SGT	0241	0241	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000033	IMAGERY ANALYST	SGT	0241	0241	M	E	A	A		U	M			1									1	A-M415	1J1	
Section															2	9	0	0	0	0	0	0	0	0				
	C	M0148000034	S-3 SECTION																									
	E	M0148000035	S-3 OFFICER	MAJ	7506 7315N	0000	M	N	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000036	ASST S-3 OFFICER	CAPT	7315	7210	M	A	X	A		S	P									1				A-M415	1J1	
	E	M0148000037	S-3/WTI CHIEF	GYSGT	7041	7041	M	E	A	A		U	P			1									1	A-M415	1J1	

Billet Organization

M01480 - VMU-1 MACG-38 3D MAW

Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
	E	M0148000038	TRAINING OFFICER	CAPT	7315	7210	M	A	X	A		S	P									1				A-M415	1J1	
	E	M0148000039	GMS TRNG NCO	CPL	8711		M	E	A	A		U	M			1									1	A-M415	1J1	
	D	M0148000040	MISSION CONTROL																									
	E	M0148000041	MISSION COMMANDER	CAPT	7506 7315N	0000	M	N	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000042	MISSION COMMANDER	CAPT	7506 7315N	0000	M	N	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000043	MISSION COMMANDER	CAPT	7506 7315N	0000	M	N	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000044	MISSION COMMANDER	CAPT	7210 7315N	7210	M	A	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000045	MISSION COMMANDER	CAPT	7210 7315N	7210	M	A	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000046	EXTERNAL OPERATOR	MSGT	7316	7314	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000047	EXTERNAL OPERATOR	GYSGT	7316	7314	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000048	EXTERNAL OPERATOR	GYSGT	7316	7314	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000049	EXTERNAL OPERATOR	SGT	7316	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000050	EXTERNAL OPERATOR	SGT	7316	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000051	INTERNAL OPERATOR	SSGT	7314	7314	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000052	INTERNAL OPERATOR	SSGT	7314	7314	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000053	INTERNAL OPERATOR	SGT	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000242	INTERNAL OPERATOR	SGT	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000243	INTERNAL OPERATOR	SGT	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	

Billet Organization

M01480 - VMU-1 MACG-38 3D MAW

Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	BRN	TYP	STA	Billet MNPWR CD	Res Typ CD	SC	WPN	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
	E	M0148000054	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000055	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000056	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000057	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000058	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000059	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000060	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000061	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000062	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000063	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000244	INTERNAL OPERATOR	CPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000064	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									0	A-M415	1J1	
	E	M0148000065	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									0	A-M415	1J1	
	E	M0148000066	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000067	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000068	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000069	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000070	INTERNAL	LCPL	7314	7314	M	E	A	A		U	M			1									1	A-M415	1J1	

Billet Organization

M01480 - VMU-1 MACG-38 3D MAW

Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
			OPERATOR																									
	E	M0148000071	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000072	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000073	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000074	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000075	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000076	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000077	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000078	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000079	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000080	INTERNAL OPERATOR	LCPL	7314	7314	M	E	A	A		U	M			1									1	A- M415	1J1	
Section															6	40	0	0	0	0	0	2	0	0				
	C	M0148000084	S-4 SECTION																									
	E	M0148000085	S-4 OFFICER	CAPT	0402	0402	M	O	A	A		S	P		1										1	A- M415	1J1	
	E	M0148000086	LOGISTICS CHIEF	SSGT	0431	0431	M	E	A	A		U	P			1									1	A- M415	1J1	
	E	M0148000087	LOGISTICS CHIEF	SSGT	0431	0431	M	E	A	A		U	P			1									1	A- M415	1J1	
	E	M0148000088	EMBARKATION NCO	SGT	0431	0431	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000089	MOTOR T CHIEF	GYSGT	3537	3537	M	E	A	A		U	P			1									1	A- M415	1J1	
	E	M0148000090	LOG/MIMMS CLERK	CPL	0411	0411	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000091	LOG/MIMMS CLERK	CPL	0411	0411	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000092		SGT	3043	3043	M	E	A	A		U	M			1									1	A-	1J1	

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Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
			SUPPLY CHIEF																							M415		
	E	M0148000093	SUPPLY CLERK	CPL	3043	3043	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000094	DRIVER	SGT	3531	3531	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000095	DRIVER	SGT	3531	3531	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000096	ELECTRICIAN	LCPL	1141	1141	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000097	ELECTRICIAN	LCPL	1141	1141	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000098	ARMORER	LCPL	2111	2111	M	E	A	A		U	P			1									1	A-M415	1J1	
Section															1	13	0	0	0	0	0	0	0	0				
	C	M0148000099	MEDICAL SECTION																									
	E	M0148000100	FLIGHT SURGEON	LT	2102		N	O	M	A		S	P									1				A-M415	1J1	
	E	M0148000101	CORPSMAN	HM1	8404	8404	N	E	A	A		U	P						1							A-M415	1J1	
	E	M0148000102	CORPSMAN	HM3	8404	8404	N	E	A	A		U	P						1							A-M415	1J1	
	E	M0148000103	CORPSMAN	HM3	8404	8404	N	E	A	A		U	P						1							A-M415	1J1	
Section															0	0	0	0	3	0	0	1	0	0				
	C	M0148000104	S-6 SECTION																									
	E	M0148000105	RADIO CHIEF	GYSGT	0629	0629	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000106	INFORMATION SYSTEMS SPEC	LCPL	0651	0651	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000107	INFORMATION SYSTEMS SPEC	LCPL	0651	0651	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000108	FIELD RADIO OPER	CPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000109	FIELD RADIO OPER	LCPL	0621	0621	M	E	A	A		U	M			1									0	A-M415	1J1	
Section															0	5	0	0	0	0	0	0	0	0				
	C	M0148000110	MAINTENANCE DEPT																									
	E	M0148000111	MAINT OFF	MAJ	6002	6002	M	A	A	A		S	P		1										1	A-M415	1J1	
	E	M0148000112	ASST MAINTENANCE	CWO3	6302	6302	M	A	A	A		U	P		1										1	A-M415	1J1	

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Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
			OFFICER																									
	E	M0148000113	ACFT MAINT CHIEF	MSGT	6019	6019	M	E	A	A		U	P			1									1	A-M415	1J1	
	D	M0148000114	MAINT ADMIN																									
	E	M0148000115	NALC ADMIN/ANALYST - NCOIC	SSGT	6049	6046	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000116	MAINT ADMIN SPEC	CPL	6046	6046	M	E	A	A		U	M			1									1	A-M415	1J1	
	D	M0148000117	MAINT/MAT CONT																									
	E	M0148000118	MAINT/MAT CONT OFF	CWO3	6004	6004	M	A	X	A		U	P									1				A-M415	1J1	
	D	M0148000119	MAINT CONT																									
	E	M0148000120	MAINT CONT CHIEF	GYSGT	6012	6214	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000121	M/C A/F	SGT	6012	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000122	M/C AVIONICS	SGT	6012	6314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000123	MAINT ADMIN SPEC - M/C	CPL	6046	6046	M	E	A	A		U	M			1									1	A-M415	1J1	
	D	M0148000124	IMRL																									
	E	M0148000125	IMRL MANAGER	SGT	6042	6042	M	E	A	A		U	M			1									1	A-M415	1J1	
	D	M0148000126	TOOL CONT																									
	E	M0148000127	NCOIC	CPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000128	TOOL CONT CLK	LCPL	6214	6214	M	E	A	A		U	M			1									0	A-M415	1J1	
	D	M0148000129	Q/A																									
	E	M0148000130	Q/A OFF	CAPT	7315		M	A	X	A		S	P									1				A-M415	1J1	
	E	M0148000131	NCOIC	GYSGT	6314	6314	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000132	Q/A - A/F	SGT	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000133	AVORD TECH Q/A	SGT	6531	6531	M	E	X	A		U	M										1			A-M415	1J1	

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Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
	E	M0148000134	Q/A - AVI	SGT	6314	6314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000135	Q/A - ENG	SGT	6214	6214	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000136	NALC ADMIN/ANALYST	SGT	6049	6046	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000137	MAINT ADMIN SPEC - TPL	CPL	6046	6046	M	E	A	A		U	M			1									1	A- M415	1J1	
	D	M0148000138	PHASE MAINT																									
	E	M0148000139	NCOIC	SSGT	6214	6214	M	E	A	A		U	P			1									1	A- M415	1J1	
	D	M0148000140	C/C																									
	E	M0148000141	NCOIC	SSGT	6214	6214	M	E	A	A		U	P			1									1	A- M415	1J1	
	E	M0148000142	C/C - A/F	CPL	6214	6214	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000143	C/C - MECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000144	C/C - AVI	SGT	6314	6314	M	E	A	A		U	M			1									1	A- M415	1J1	
	D	M0148000145	ORDNANCE																									
	E	M0148000146	ORD OFF	CWO3	6502	6502	M	A	X	A		U	P									1				A- M415	1J1	
	E	M0148000147	ORD CHF	SGT	6531	6531	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000148	ORD TECH	CPL	6531	6531	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000149	ORD TECH	LCPL	6531	6531	M	E	A	A		U	M			1									1	A- M415	1J1	
	D	M0148000150	AVIONICS																									
	E	M0148000151	ELEC MAINT TECH	SSGT	6314	6314	M	E	A	A		U	P			1									1	A- M415	1J1	
	E	M0148000152	ELEC MAINT TECH	CPL	6314	6314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000153	ELEC MAINT TECH	CPL	6314	6314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000154	ELEC MAINT TECH	CPL	6314	6314	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000245	ELEC MAINT TECH	CPL	6314	6314	M	E	A	A		U	M			1									1	A- M415	1J1	

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Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	BRN	TYP	STA	Billet MNPWR CD	Res Typ CD	SC	WPN	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/CA	MCC CD	FTN
	E	M0148000246	ELEC MAINT TECH	CPL	6314	6314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000155	ELEC MAINT TECH	LCPL	6314	6314	M	E	A	A		U	M			1									0	A-M415	1J1	
	E	M0148000156	ELEC MAINT TECH	LCPL	6314	6314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000157	ELEC MAINT TECH	LCPL	6314	6314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000158	ELEC MAINT TECH	LCPL	6314	6314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000159	ELEC MAINT TECH	LCPL	6314	6314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000160	ELEC MAINT TECH	LCPL	6314	6314	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000161	ELEC MAINT TECH	LCPL	6314	6314	M	E	A	A		U	M			1									1	A-M415	1J1	
	D	M0148000164	LINE/GSE																									
	E	M0148000165	MECH MAINT TECH	CPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000166	MECH MAINT TECH	CPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000167	MECH MAINT TECH	CPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000247	MECH MAINT TECH	CPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000168	MECH MAINT TECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000169	MECH MAINT TECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000170	MECH MAINT TECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000171	MECH MAINT TECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000172	MECH MAINT TECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A-M415	1J1	

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Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
	E	M0148000173	MECH MAINT TECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000174	MECH MAINT TECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000175	MECH MAINT TECH	LCPL	6214	6214	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000177	GSE/HYD/PNEU/ STRU TECH	CPL	6072	6072	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000178	GSE/HYD/PNEU/ STRU MECH	LCPL	6072	6072	M	E	A	A		U	M			1									1	A- M415	1J1	
Section															2	51	0	0	0	0	0	3	1	0				
	C	M0148000194	GROUND MAINTENANCE DEPT																									
	E	M0148000195	MAINT CHIEF	SSGT	3529	3529	M	E	A	A		U	P			1									1	A- M415	1J1	
	E	M0148000196	AUTO MECH	SGT	3521	3521	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000197	AUTO MECH	CPL	3521	3521	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000198	AUTO MECH	CPL	3521	3521	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000199	AUTO MECH	CPL	3521	3521	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000200	AUTO MECH	LCPL	3521	3521	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000201	AUTO MECH	LCPL	3521	3521	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000202	AUTO MECH	LCPL	3521	3521	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000203	UTILITIES NCO	CPL	1142	1142	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000204	ELEC EQUIP REPAIRMAN	LCPL	1142	1142	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000205	ELEC EQUIP REPAIRMAN	LCPL	1142	1142	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000206	ELECTRICIAN	LCPL	1141	1141	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000207	ELECTRICIAN	LCPL	1141	1141	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000208	ELECTRICIAN	LCPL	1141	1141	M	E	A	A		U	M			1									1	A- M415	1J1	
	E	M0148000209	MIMMS CLK	LCPL	0411	0411	M	E	A	A		U	M			1									1	A- M415	1J1	

Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
	E	M0148000210	SUP ADMIN/OPERS CLK	CPL	3043	3043	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000213	ENG EQUIP OPR	CPL	1345	1345	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000214	MT OPERATOR	CPL	3531	3531	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000215	MT OPERATOR	LCPL	3531	3531	M	E	A	A		U	M			1									1	A-M415	1J1	
Section															0	19	0	0	0	0	0	0	0	0				
	C	M0148000216	COMMUNICATION DEPT																									
	E	M0148000217	RADIO CHIEF	SSGT	0629	0629	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000218	FIELD RADIO OPERATOR	SGT	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000219	FIELD RADIO OPERATOR	SGT	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000220	FIELD RADIO OPERATOR	CPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000221	FIELD RADIO OPERATOR	CPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000222	FIELD RADIO OPERATOR	SGT	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000223	FIELD RADIO OPERATOR	SGT	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000224	FIELD RADIO OPERATOR	LCPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000225	FIELD RADIO OPERATOR	LCPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000226	FIELD RADIO OPERATOR	LCPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000227	FIELD RADIO OPERATOR	LCPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000228	FIELD RADIO OPERATOR	LCPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000229	FIELD RADIO OPERATOR	LCPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	

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Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	B R N	T Y P	S T A	Billet MNPWR CD	Res Typ CD	S C	W P N	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
	E	M0148000230	FIELD RADIO OPERATOR	CPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000231	FIELD RADIO OPERATOR	CPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000232	FIELD RADIO OPERATOR	CPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000233	FIELD RADIO OPERATOR	CPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000234	FIELD RADIO OPERATOR	CPL	0621	0621	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000235	FIELD WIREMAN	LCPL	0612	0612	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000236	FIELD WIREMAN	CPL	0612	0612	M	E	A	A		U	M			1									1	A-M415	1J1	
	E	M0148000237	COMM/ELECT MAINT CHIEF	SSGT	2862	2862	M	E	A	A		U	P			1									1	A-M415	1J1	
	E	M0148000238	PERS CLERK	LCPL	0121	0121	M	E	A	A		U	M			1									1	A-M415	1J1	
Section															0	22	0	0	0	0	0	0	0	0				
	C	M0148000179	MALS AUGMENT																									
	D	M0148000180	SUPPLY																									
MT	E	M0148000181	AVN SUPPLY SPEC	SGT	6672	6672	M	E	A	A		U	M			1									1	A-M415	1JC	
MT	E	M0148000182	AVN SUPPLY SPEC	CPL	6672	6672	M	E	A	A		U	M			1									1	A-M415	1JC	
MT	E	M0148000183	AVN SUPPLY SPEC	LCPL	6672	6672	M	E	A	A		U	M			1									1	A-M415	1JC	
	D	M0148000184	AVIONICS																									
MT	E	M0148000185	A/C FLIR/EO TECH	CPL	6466	6466	M	E	A	A		U	M			1									1	A-M415	1JC	
MT	E	M0148000186	A/C FLIR/EO TECH	LCPL	6466	6466	M	E	A	A		U	M			1									1	A-M415	1JC	
MT	E	M0148000187	MICRO-MIN RPR TECH	SGT	6423	6423	M	E	A	A		U	M			1									1	A-M415	1JC	
MT	E	M0148000188	PME/ATE CAL REPAIR TECH	CPL	6492	6492	M	E	A	A		U	M			1									1	A-M415	1JC	
MT	E	M0148000189	NAV SYS TECH	CPL	6413	6413	M	E	A	A		U	M			1									1	A-M415	1JC	

Billet Organization

M01480 - VMU-1 MACG-38 3D MAW

Mapped Billet	Rec CD	BIC	Billet Description	Alpha Grade	BMOS	PMOS	BRN	TYP	STA	Billet MNPWR CD	Res Typ CD	SC	WPN	Billet CRD	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Other Officer Charge	Other Enlisted Charge	Reserve Officer	Reserve Enlisted	Non-Charge Officer	Non-Charge Enlisted	Non-Charge Civil	ASR CD	IH/ CA	MCC CD	FTN
MT	E	M0148000190	ELECT SYS TECH	CPL	6432	6432	M	E	A	A		U	M			1									1	A-M415	1JC	
	D	M0148000191	GSE																									
MT	E	M0148000192	GSE ELECT/REFRIG MECH	SGT	6073	6073	M	E	A	A		U	M			1									1	A-M415	1JC	
MT	E	M0148000193	GSE ELECT/REFRIG MECH	LCPL	6073	6073	M	E	A	A		U	M			1									1	A-M415	1JC	
Section															0	11	0	0	0	0	0	0	0	0				
Summary															15	178	0	0	3	0	0	12	4	0				

Billet Summary

M01480 - VMU-1 MACG-38 3D MAW

Chargeable:	Officer	Enlisted	Reserve:	Officer	Enlisted	Non Chargeable:	Officer	Enlisted
Marine:	15	178	AR:			Collat Duty:	11	4
Navy:		3	IMA:			Contingency:		
Army:			SMCR:			FAP Cat 1:		
Air Force:			IRR:			FAP Cat 2:		
Coast Guard:						FAP Cat 3:		
Civilian:						Navy Med Aug:	1	
NAFI Civilian:								

Recap by MOS

M01480 - VMU-1 MACG-38 3D MAW

			Billet Type Code	BMOS	SES5	O10 E9 SES4	O9 E8 SES3	O8 E7 SES2	O7 E6 SES1	O6 E5 C15	O5 E4 C14	O4 E3 C13	O3 E2 C12	O2 E1 C11	O1 C10	W5 C9	W4 C8	W3 C7	W2 C6	W1 C5	C4	C3	C2	C1	Total
1 CHARGEABLE	1 MARINE	1 OFFICER	O	0170															1						1
				0207										1											1
				0277									1												1
				0402									1												1
			O		0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	4
		1 OFFICER			0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	4
		2 AVIATOR	N	7506							1	1	4												6
			N		0	0	0	0	0	0	1	1	4	0	0	0	0	0	0	0	0	0	0	0	6
		2 AVIATOR			0	0	0	0	0	0	1	1	4	0	0	0	0	0	0	0	0	0	0	0	6
		3 AVIATION GROUND OFFICER	A	6002								1													1
				6302														1							1
				7202								1													1
				7210									2												2
			A		0	0	0	0	0	0	0	2	2	0	0	0	0	1	0	0	0	0	0	0	5
		3 AVIATION GROUND OFFICER			0	0	0	0	0	0	0	2	2	0	0	0	0	1	0	0	0	0	0	0	5
		5 ENLSTED	E	0121							2	1													3
				0151							1	1													2
				0193				1																	1
				0231					1		3														4
				0241				1	1	3															5
				0411							2	1													3
				0431					2	1															3
				0612							1	1													2
				0621						4	8	7													19
				0629				1	1																2
				0651								2													2
				1141								5													5
				1142							1	2													3
				1345							1														1

Recap by MOS

M01480 - VMU-1 MACG-38 3D MAW

			Billet Type Code	BMOS	SES5	O10 E9 SES4	O9 E8 SES3	O8 E7 SES2	O7 E6 SES1	O6 E5 C15	O5 E4 C14	O4 E3 C13	O3 E2 C12	O2 E1 C11	O1 C10	W5 C9	W4 C8	W3 C7	W2 C6	W1 C5	C4	C3	C2	C1	Total
1 CHARGEABLE	1 MARINE	5 ENLSTED	E	2111								1													1
				2862					1																1
				3043						1	2														3
				3521						1	3	3													7
				3529					1																1
				3531						2	1	1													4
				3537				1																	1
				6012				1		2															3
				6019			1																		1
				6042						1															1
				6046							3														3
				6049					1	1															2
				6072							1	1													2
				6073						1		1													2
				6214					2	2	6	10													20
				6314				1	1	2	5	7													16
				6413							1														1
				6423						1															1
				6432							1														1
				6466							1	1													2
				6492							1														1
				6531						1	1	1													3
				6672						1	1	1													3
				7041				1		1															2
				7314					2	3	11	17													33
				7316			1	2		2															5
				8421						1															1
				8711							1														1
				9999		1																			1
			E		**0**	**1**	**2**	**9**	**13**	**31**	**58**	**64**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**178**

Recap by MOS

M01480 - VMU-1 MACG-38 3D MAW

			Billet Type Code	BMOS	SES5	O10 E9 SES4	O9 E8 SES3	O8 E7 SES2	O7 E6 SES1	O6 E5 C15	O5 E4 C14	O4 E3 C13	O3 E2 C12	O2 E1 C11	O1 C10	W5 C9	W4 C8	W3 C7	W2 C6	W1 C5	C4	C3	C2	C1	Total
1 CHARGEABLE	1 MARINE	5 ENLSTED			**0**	**1**	**2**	**9**	**13**	**31**	**58**	**64**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**178**
	2 NAVY	5 ENLSTED	E	8404					1		2														3
			E		**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
		5 ENLSTED			**0**	**0**	**0**	**0**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
3 COLLATERAL DUTY	1 MARINE	2 AVIATOR	N	7506									6												6
			N		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**
		2 AVIATOR			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**
		3 AVIATION GROUND OFFICER	A	6004														1							1
				6502														1							1
				7315									3												3
			A		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**5**
		3 AVIATION GROUND OFFICER			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**5**
		5 ENLSTED	E	0151							1	1													2
				6531						1															1
				7316						1															1
			E		**0**	**0**	**0**	**0**	**0**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**
		5 ENLSTED			**0**	**0**	**0**	**0**	**0**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**
9 NAVY MEDICAL AUGMENT	2 NAVY	1 OFFICER	O	2102									1												1
			O		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
		1 OFFICER			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

Recap by MCC

M01480 - VMU-1 MACG-38 3D MAW

MCC	Marine Officer Charge	Marine Enlisted Charge	Civil Charge	Marine Reserve Officer	Marine Reserve Enlisted	Other Officer	Other Enlisted	Non-chargeable Officer	Non-chargeable Enlisted	Non-chargeable Civilian
015	1	2								
1J1	14	165					3	12	4	
1JC		11								
Summary	**15**	**178**	**0**	**0**	**0**	**0**	**3**	**12**	**4**	**0**

Billet Footnotes

M01480 - VMU-1 MACG-38 3D MAW

BIC	Footnote Description

Section I

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
A00817G	Replacement	RADIAC SET - A3245734 - TAMCN ALREADY EXIST ERROR FOR M11706(11) & M28311(7) 9/1/06 ARMY IS THE PICA - DEMIL: D SLC: CIIC: 7 CONTRACT NBR:	P			O		10	10				10							
A01167G	Replacement	SURVEY INTRUMENT, AZIMUTH - M111	P	EA	N	O		1					1	1						
- A20777GC	A01167G - Consists Of	RADIO SET, VEHICULAR - AN/VRC91D		EA	N	O		1		1			1							
- D00337K	A01167G - Consists Of	TRUCK, UTILITY: EXPANDED CAPACITY, ENHANCED, ARMORED (2-DOOR) - M1152A1 - CONTRACT NO. DAAE-07-01-C-S-001 DEMILIZATION CODE: A SHELF LIFE CODE: Z CONTROLLED INVENTORY ITEM (CIIC): U	P	EA	R	O		10	10				10							
A01187G		RADIO SET, INTEGRATED INTRA-SQUAD - - 5/4/06 - NEW TOECR REQUIRED TO UPDATE AAO ENTERED BY AAO COORD	P					0					0							
A01267G		MULTI-BAND FREQUENCY, VEHICLE MOUNTED RADIO SYSTEM - AN/VRC-103(V)2 - CONTRACT OR MIPR #:	P	EA	N	O		2	2				2							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		DMIL: C CIIC: 9 SLC: CG, MCLC LTR 4410 CODE 572-3 OF 26 APR 06																		
A02547G		COMBAT OPS CENTER, SET III - AN/TSQXXX(V)3 - CURRENTLY BEING FIELDED IN FY04		EA	N	O		0					0							
A02557G		COMBAT OPS CENTER, SET IV - AN/TSQXXX(V)4 - CURRENTLY IN PRODUCTION FY04		EA	N	O		1	1				1							
A02987G		OPTICAL READER, DATA ENTRY - PDT7240		EA	N	O		2		2			2							
A02997G		PRINTER, PORTABLE - PT400		EA	N	O		1		1			1							
A03007G		PRINTER, BARCODE, DESK TOP - Z4000		EA	N	O		1		1			1							
A06467G		JAMMER, COMM, DRONE, EXPENDABLE (EXDRONE) -	P	EA	N	O		60					60	60						
A06477G		TRAINER, EXDRONE -	P		N	O		10					10	10						
A08747G		WORKSTATION, INTEL (IW) - - DEMIL: P CIIC: Y	P	EA	N	O		1					1	1						
A09327G		INTELLIGENCE/ OPERATIONS WORKSTATION - AN/UYQ88		EA	N	O		1		1			1							
A12607G		NAVIGATION SET, SATELLITE SIGNALS - AN/PSN-13(A) - PDIWG 20060428, CHANGED PREFERRED, CONTRACT		EA	N	O		3		3			3							

Equipment Organization

M01480 - VMU-1 MACG-38 3D MAW

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		OR MIPR #: DMIL: D CIIC: Y SLC: CG, MCLC LTR 4410 CODE 572-3 OF 3 MAY 06																		
A12757G		ENTRY DEVICE, PROGRAM - MU848A/PSC2A		EA	N	O		2		2			2							
A16307G		RADIAC SET - AN/PDR56H - TO BE REPLACED BY THE AN/PDR-77		EA	N	O		3		3			3							
A19357G		RADIO SET - AN/MRC138B(V)		EA	R	O		8		8			8							
- D11587KA	A19357G - Consists Of	TRK, UTIL, CARGO/TRP CARR, 1 1/4T, W/EQP, HMMWV - M998		EA	N	O		8		8			8							
A19577G		RADIO SET - AN/MRC145A		EA	R	O		6		6			6							
- A20787GR	A19577G - Consists Of	RADIO SET, VEHICULAR - AN/VRC92D		EA	N	O		6		6			6							
- D11587KE	A19577G - Consists Of	TRK, UTIL, CARGO/TRP CARR, 1 1/4T, W/EQP, HMMWV - M998		EA	N	O		6		6			6							
A20437G		RADIO SET, MULTIBAND (URBAN) - AN/PRC148V2C		EA	R	O		16		16			16							
A20657G		RADIO SET - AN/PRC104B(V)		EA	R	O		10		9			10	1						
A20697G	Replacement	RADIO SET, UHF - AN/PRC113(V)3 - RECORD REVIEWED 1/20/04		EA	R	O		7		7			7							
A20707G		RADIO SET, MANPACK - AN/PRC119A		EA	R	O		10		10			10							

Equipment Organization

M01480 - VMU-1 MACG-38 3D MAW

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
A20747G		RADIO SET, VEHICULAR - AN/VRC88D		EA	R	O		5		5			5							
A21647G		RADIO SET, VEHICULAR - AN/VRC83(V)2		EA	N	O		2		2			2							
A21677G		RADIO SET, VEHICULAR - AN/VRC88A		EA	R	O		8		5			8	3						
A22947G		SHELTER, NONEXPANDABLE - S-715/T		EA	N	O		4					4	4						
A23362B		SHELTER, 20FT, EMI, MAINT COMPLEX - 82A5048A000		EA	N	O		1		1			1							
A23382B		SHELTER, 10FT, RIGID, MAINT COMPLEX - 87A036A0000		EA	N	O		1		1			1							
A25457G		TACTICAL DATA SYSTEM, FIRE SUPPORT, TRANSIT - AN/GYK47(V)7		EA	N	O		2					2	2						
A25467G		COMPUTER, RUGGEDIZED, ULTRAPORT, LAPTOP - RUPL-FY02		EA	N	O		1					1	1						
A25467GA		COMPUTER, LAPTOP, RUGGED - PANASONIC C27		EA	N	O		1					1	1						
A25557G	Replacement	ADVANCED FIELD ARTY TACTICAL DATA SYSTEM - AN/GYK60		EA	R	O		2					2	2						
A32517G		UNMANNED AERIAL VEHICLE-SHORT RANGE -	P	EA	N	O		1					1	1						
A70027G		ANALYZER, SPECTRUM HAND HELD - FSH6-NTG/ K-6 - REQUEST USMC BE USER OF NSN AND ID NUMBER 11230C BE		EA				5	5				5							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		USED DEMIL CODE: A CIIC: Y NIMSC: 3																		
A70057G		ANLYZER, SPECTRUM - FSP-38 - DMIL: A CIIC: Y NIMSC: 3		EA	N	O		5		5			5							
A70217G		COUNTER, ELECTRONIC, DIGITAL READOUT - PM 6690/AN - NIMSC:3 DMIL: A CIIC:U ASSIGN MC AS USER CATALOGING COMPLETED.		EA	N	O		4		4			4							
A70357G	Replacement	CALIBRATOR, FREQUENCY - 585B			N	O		3		3			3							
A70367G	Replacement	GENERATOR, FUNCTION, ELEC TEST - 33120A-E01		EA	N	O		4		4			4							
A70527G	Replacement	GENERATOR, SIGNAL - 8643A		EA	N	O		4		4			4							
A70557G		MONITOR UNIT, RADIO FREQUENCY - 4410A520		EA	N	O		5		5			5							
A70597G		OHMMETER (EARTH GROUND RESISTANCE TESTER) - R1LC		EA	N	O		2		2			2							
A70607G		OSCILLOSCOPE - TDS-5054B - DEMIL CODE: A CIIC: Y		EA	N	O		7		7			7							
A70617G		OSCILLOSCOPE - FLK199C		EA	N	O		7		7			7							
A70807G		TEST SET, RADIO VHF - MCA7080-06 - CONTRACT OR MIPR #:		EA	N	O		3		3			3							

Equipment Organization

M01480 - VMU-1 MACG-38 3D MAW

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		DMIL: B CIIC: U SLC: CG, MCLC LTR 4410 CODE 572-3 OF 23 MAY 06																		
A70827G		TEST SET, RADIO - TS4317/GRM		EA	N	O		4		4			4							
A77007G	Replacement	ANALYZER-CHARGER, BATTERY - PP8333/U - CAR IS REQUIRED TO BE SUBMITTED TO LOGCOM (MBMATCOMDATAMAN) 12/5/05 PROVIDED ADDITIONAL INFO AS REQUESTED.		EA	N	O		0					0							
A77057G	Replacement	POWER SUPPLY, 18 - 30 VDC - PP8474/G		EA	N	O		8		8			8							
A77067G		POWER SUPPLY, 0-40 VDC - PP8436/P		EA	N	O		10		10			10							
A79002E		TOOL KIT, MAINT, ELECTRONIC - MK2569/P		EA	N	O		7		7			7							
A79067G		TOOL KIT, ELECTRONIC SYS (MINI-SOLDER KIT) - TK-8641 - CAR IS ATTACHED	P	EA	N	O		1					1	1						
A79557G		KIT, MAINT, EQUIPMENT, ELECTRONIC - MK-2663/U(V2) - THIS IS THE MOUNTED PACE KIT WITHOUT EMBARK BOXES. REQUEST NSN. ALSO REQUEST ID 09458B BE ASSIGNMENT.		EA	N	O		2		2			2							

Equipment Organization

M01480 - VMU-1 MACG-38 3D MAW

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
A80237G		TRANSFER DEVICE, DATA (DTD) - AN/CYZ10(V)3		EA	N	O		13		13			13							
A80257G		TRANSFER DEVICE, ELECTRONIC - TSEC/KYK13		EA	N	O		6		6			6							
A80267G		CONTROL DEVICE, NET - TSEC/KYX15A		EA	N	O		6		6			6							
A80507G		CASE, BATTERY - TSEC/ZAIJ	P	EA	N	O		25		25			25							
A81007G		CONTROL GROUP, RADIO - OK648/U - LAP21-91 NOT OFFICIALLY STAFFED/AFM 031147Z APR 95		EA	R	O		6		6			6							
A91002B		COMPUTER, GP, LAPTOP - GPLT2SPINFY03		EA	N	O		7		7			7							
A93002B		MCHS, COMPUTER, GP WORKSTATION - GPWSPFY03		EA	N	O		84		84			84							
B00057B		AIR CONDITIONER, MCS VERTICAL, 60HZ, 36K BTU - 817005		EA	N	O		1		1			1							
B00087B	Replacement	AIR CONDITIONER, 5T, 60K - GL543ZAADWYX01 - WSC UPDATED ON 4/3/06	P	EA	N	O		0					0							
B00127B	Replacement	AIR CONDITIONER, VERTICAL, 60/400HZ, 18K BTU - F18T-NON MP1		EA	R	O		1		1			1							
B00137B		AIR CONDITIONER, MIL-STD, 60/400HZ, 36K BTU (VERT) - F36TMPI		EA	N	O		1		1			1							
B00137B	Replacement	AIR CONDITIONER, MIL-STD, 60/400HZ, 36K BTU		EA	N	O		1		1			1							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		(VERT) - F36TMPI																		
B00147B	Replacement	ENVIRONMENTAL CONTROL UNIT, HORIZONTAL, 36K BTU - GL343ZAADWYX01 - WS CODE HAS BEEN UPDATED IN SS09. AIR CONDITIONER		EA	R	O		2					2	2						
B07307B		GENERATOR SET, 3KW, 60HZ, SKID-MTD - MEP831A		EA	R	O		10		10			10							
B08917B		GENERATOR SET, SKID MTD, 10KW/60HZ, TQG - MEP803A		EA	R	O		8		8			8							
B20047B		SKID ASSEMBLY, REMOTE, AIR CONDTNR TYPE B - SMV18 - USED W/TAMCNS B00037B, B00047B		EA	N	O		5		1			5	4						
B20067B		SKID MOUNTING ASSEMBLY, REMOTE, AIR CONDTNR TYPE C - SMV36 - USED W/TAMCNS B00057B, B00067B		EA	N	O		1		1			1							
B23652E		TOOL SET, EQUIPMENT REPAIR, ELECTRICAL -		EA	N	O		2		2			2							
C02602F		PULLOVER, NECK -	P	EA	N	I	182	0		182			182							
C10552F		CAP, FLEECE, COLD WEATHER, COYOTE - - SEE SL8 F/TARIFF NSNS		EA	N	I	182	0		182			182							
C10912F		DRAWERS, COLD WEATHER, LTWT - - SEE SL8 F/TARIFF NSNS		EA	N	I	364	0		364			364							
C11072F		GLOVE, SHELL, LEATHER, BLACK - -		PR	N	I	182	0		182			182							

Equipment Organization

M01480 - VMU-1 MACG-38 3D MAW

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		SEE SL8 F/TARIFF NSNS																		
C11202F	Replacement	GLOVE, CONTACT, COLD WEATHER - PS150 - SEE SL8 F/TARIFF NSNS		PR	N	I	364	0		364			364							
C12502F	Replacement	PULLOVER, POLAR FLEECE - - N		EA	N	I	182	0		182			182							
C12612F		UNDERSHIRT, COLD WEATHER, LTWT - - SEE SL8 F/TARRIFF NSNS		EA	N	I	364	0		364			364							
C20102F		APRON, PROTECTIVE, TOXICOLOGICAL AGENTS - SMALL		EA	N	O		0					0							
C20202F		BAG, WATERPROOFING, PROTECTIVE MASK - M1		EA	N	I	364	0		364			364							
C20752E		DECONTAMINATING KIT, SKIN, M291 - M291		BX	N	I	27	0		27			27							
C20832E		DECONTAMINATION SYSTEM, SORBENT (SDS) - M100		KT	N	O		178		178			178							
C21012E		KIT, DETECTOR, CHEM AGENT - M256A1 - REPL C2100 EOD USE ONLY		KT	N	O		5		5			5							
C21052E		DETECTOR, RADIAC, INDIV - DT236/PDR75		EA	N	I	182	0		182			182							
C21102E		DETECTOR, CHEM AGENT, PAPER - M9		EA	N	I	18	0		18			18							
C21302F		COVER, FOOTWEAR, PROTECTIVE, CHEM (OVERBOOTS) - - SEE SL8 F/TARRIF NSNS THIS ITEM HAS THE SAME PURPOSE AND FUNCTION AS THE OTHER ITEMS UNDER C2130		PR	N	I	364	0		364			364							

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C21322F		DELETE TAMCN AND MOVE NSN'S UNDER TAMCN C2130 - - MOVE THE NSNS UNDER THIS TAMCN TO TAMCN C2130 AND THEN DELET TAMCN C2132	P					370	6	364			370							
C21502F		GLOVE, PROTECTIVE, CHEM - DSSPM330-01 - MANAGEMENT ECHELON CODE: B2 DMIL: A CIIC: U		SE		I	364	0		364			364							
C23002F		SUIT, PROTECTIVE, OVERGARMENT, CHEM (SARATOGA) - W - SEE SL8 F/TARRIF NSNS		EA	N	I	364	0		364			364							
C23052F	Replacement	COAT, DESERT, OVERGARMENT, CHEM PROT (JLIST) - JSLIST-3XLL - THE PRICE ON THIS NSN WILL BE UPDATED ON 1OCT06. IDN 10883H ASSIGNED.		EA	N	I	364	0		364			364							
C23082F	Replacement	TROUSERS, WOODLAND, OVERGARMENT, CHEM PROT (JLIST) - JSLIST - SUP: SEE C23072F; SEE SL8 F/TARRIF NSNS		EA	N	I	364	0		364			364							
C30202E		INSERT, PROTECTIVE, SMALL ARMS (SAPI) - - SEE SL8 F/TARIFF NSNS; USED W/TAMCN C34942F.		EA	N	I	364	0		364			364							
C30402F		BELT, EQUIPMENT, INDIV, COTTON WEBBING, OD -		EA	N	I	182	0		182			182							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
C30602E		CANTEEN, WATER, PLASTIC OD 1 QT RIGID W/CHEM PROT - - N		EA	N	I	364	0		364			364							
C30702E		CARRIER, TOOL, ENTRENCHING, HAND, FOLDING, LTWT - - N		EA	N	I	182	0		182			182							
C31152F		CASE, AMMO, SML ARMS, 30 RD, F/RIFLE, M16 - W		EA	N	I	278	0		278			278							
C31242F		HELMET COVER, REVERSIBLE, WDLAND & DESERT - - SEE SL8 F/TARIFF NSNS SIZE: MEDIUM		EA	N	I	182	0		182			182							
C31302F		COVER, CANTEEN, WATER, COTTON, OD - - N		EA	N	I	364	0		364			364							
C31402E		CUP, WATER, CANTEEN, CRS, W/WIRE HANDLE - - N		EA	N	I	182	0		182			182							
C31502F		KIT, FIRST AID, INDIV -		EA	N	I	182	0		182			182							
C31952F		FRAME, FLD PACK (LINCLOE) - - N		EA	N	I	50	0		50			50							
C32152E		HELMET, PROTECTIVE, FRAG, LTWT - - CHANGE ID NUMBER FROM 08774D TO 08744D		EA	N	I	182	0		182			182							
C32302E		TOOL, ENTRENCHING, IMPROVED W/POUCH - - N		EA	N	I	182	0		182			182							
C32502E		KNIFE, CMBT -		EA	N	I	43	0		43			43							
C32702F		LINER, WET WEATHER, PONCHO - - N		EA	N	I	182	0		182			182							
C33102E		PAD, SLEEPING, COLD WEATHER - - N		EA	N	I	182	0		182			182							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
C33372F		PACK, FLD, MEDIUM - - N		EA	N	I	182	0		182			182							
C33902E		POLE, SECTION, TENT, SHELTER HALF -		EA	N	I	546	0		546			546							
C34002F		PONCHO, WET WEATHER, CAMO, WOODLAND - - N		EA	N	I	182	0		182			182							
C34092E		STRINGABLE TWO-LIGHT KIT, EMI -	P	KT	N	O		7					7	7						
C34102F		SHELTER HALF, TENT, OG -		EA	N	I	182	0		182			182							
- C33502E	C34102F - Consists Of	PIN, ALUMINUM, TENT, SHELTER HALF -		EA	N	I	910	0		910			910							
C34112F	Replacement	COMMAND POST SYSTEM, MODULAR, DESERT (MCPS) - MCPS		EA	N	O		3		3			3							
C34122F	Replacement	COMMAND POST SYSTEM, MODULAR, GREEN - MCPS - ID CHG PER ITEMAPPS		EA	N	O		3		3			3							
C34132F	Replacement	TENT SYSTEM, GP, MODULAR, GREEN (MGPTS) - 2480108		EA	N	O		4		4			4							
C34212F		MODULAR SLEEP SYSTEM - - N		EA	N	I	182	0		182			182							
C34232E		STAND, CUP, CANTEEN - - N		EA	N	I	182	0		182			182							
C34452F		SUSPENDERS, BELT, INDIV EQUIPMENT (LINCLOE) - - N		EA	N	I	43	0		43			43							
C34942F		VEST, TACTICAL, OUTER - - SEE SL8 F/TARIFF NSNS; USED W/TAMCN C30202F		EA	N	I	182	0		182			182							
C34942F	Replacement	VEST, TACTICAL, OUTER		EA	N	I	182	0		182			182							

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		- - SEE SL8 F/TARIFF NSNS; USED W/TAMCN C30202F																		
C34952E	Replacement	VEST, FRAGMENTATION PROTECTION, GROUND TROOPS - - N		EA	N	I	182	0		182			182							
C34982F		VEST, INDIV, LOAD BEARING, TACT - - N		EA	N	I	139	0		139			139							
C42592F	Replacement	CAMOUFLAGE NET SYSTEM, ULTRA LTWT - ULCANS - PHASE IN PHASE OUT FOR THE C6460 & C4261		SE	N	O		140	70	70			140							
C42602F		SUPPORT SYSTEM, SCREEN, CAMO - LCSS		EA	N	O		90		90			90							
C42612F	Replacement	CSS-LTWT, RADAR SCATTER, WOODLAND BLND, W/O SS - LCSS		EA	N	O		70		70			70							
C42622F	Replacement	CSS-LTWT, RADAR TRANSPARENT, WOODLAND W/O SS - LCSS		EA	N	O		20		20			20							
C42632E	Replacement	CSS-LTWT, R S DESERT W/O SS - C442SS-170560		EA	N	O		70		70			70							
C42642E	Replacement	CSS-LTWT, R T DESERT W/O SS - CSS_13226E1357		EA	N	O		20		20			20							
C42652F	Replacement	CAMOUFLAGE NET SYSTEM, ULTRA LTWT, DESERT, R/T -	P	EA	N	O		70					70	70						
C42662F	Replacement	CAMOUFLAGE NET SYSTEM, ULTRA LTWT, DESERT, R/S -		EA	N	O		70					70	70						
C42672F	Replacement	CAMOUFLAGE NET SYSTEM, ULTRA LTWT, WOODLAND, R/T -		EA	N	O		70					70	70						

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C49002E		FRAME A, PORTABLE, ALUMINUM, 12 FT SPAN - - N		EA	N	O		1		1			1							
C50202T		HOIST, CHAIN, SPUR GEAR, 4,000 LB -		EA	N	O		1		1			1							
C50802T		JACK, DOLLY, TYPE-10 -		EA	N	O		1		1			1							
C50902T		JACK, HYDRAULIC, 4T -		EA	N	O		1		1			1							
C52652E		JOINT SERVICE GENERAL PURPOSE MASK, FIELD - M50 - LARGE - PLEASE REGISTER USMC AS A USER		EA	N	I	182	0		182			182							
C54302F	Replacement	MARINE LOAD SYSTEM, RIFLEMAN SET - - N		EA	N	I	139	0		139			139							
C54312F		MARINE LOAD SYSTEM, PISTOLMAN SET - - N		EA	N	I	43	0		43			43							
C54322F		MARINE LOAD SYSTEM, GRENADIER SET - - N		EA	N	I		0					0							
C54342F		MOD LTWT LOAD CARRYING EQUIP (MOLLE), CMBT MED BAG -		EA	N	I	3	0		3			3							
C54402F	Replacement	IMPROVED LOAD BEARING EQUIPMENT (ILBE) - - DEMIL: A CIIC: U		EA	N	I	198	0	198				198							
C56522F		PARKA, COLD WEATHER, APECS, 3D GENE. - - SEE SL8 F/TARIFF NSNS		EA	N	I	182	0		182			182							
C60302E		SEAL, HAND, IMPRESSION -OFFICIAL USMC SEAL- - - N		EA	N	O		1		1			1							
C61902T		SOLDERING AND		EA	N	O		2		2			2							

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		BRAZING OUTFIT - - N																		
C63882F		TARPAULIN, 26ft X 22ft - GS8750-3-1		EA	N	O		5		5			5							
C64002F		TENT, FRAME TYPE, MAINT, MEDIUM - MIL-T-41813 - BEING REPLAC442D BY C6415 (LME)		EA	N	O		4		4			4							
C64152F		ENCLOSURE, MAINT, LTWT - LME		EA	N	O		8		8			8							
C64202F		TENT, SHELTER, MAINT - MIL-T-41813 - BEING REPLAC442D BY C6415 (LME)		EA	N	O		4		4			4							
C65202T		TOOL KIT, COIL THREAD INSERT -		SE	N	O		1		1			1							
C66302T		TROLLEY, I-BEAM - - N		EA	N	O		1		1			1							
C66322F	Replacement	TROUSERS, COLD WEATHER, APECS, 3D GENE. - - SEE SL8 F/TARIFF NSNS		EA	N	I	182	0		182			182							
C66502T		TRK, LIFT, WHEEL -		EA	N	O		1		1			1							
C70362T		TOOL KIT, MECHANIC, GENERAL - 12B472000-1 - DMIL: A CIIC: M REVIEW ATTACHMENTS		KT	N	O		10		10			10							
C70407G		ANALYZER SET, ENGINE STE/ICE-R - 12259266		SE	N	O		1		1			1							
C70732B		TOOL SET, COMMON NO.1, OM, 2D ECH -		SE	N	O		1		1			1							
C79042B		SHOP EQUIPMENT, GP, COMMON #10 -	P	EA	N	O		1					1	1						
C79207B	Replacement	ANALYZER SET, VEHICULAR - 00006A0010		EA	N	O		1					1	1						

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		- DMIL: A CIIC: U NEW ID: 10791B NEW NOMEN: ANALYZER SET, VEHICULAR (VADS) CM2 MODEL #00006A0010																		
D00227K	Replacement	TRUCK, UTILITY: EXPANDED CAPACITY, ENHANCED, 11,500 GVW, 4X4, M1152, 2 DOOR ; P/N 12479198 - M1152 - CONTRACT NO. DAAE-07-01-C-S-001 DEMILIZATION CODE: A SHELF LIFE CODE: Z CONTROLLED INVENTORY ITEM (CIIC): U	P	EA	R	O		10	10				10							
D00337K	Replacement	TRUCK, UTILITY: EXPANDED CAPACITY, ENHANCED, ARMORED (2-DOOR) - M1152A1 - CONTRACT NO. DAAE-07-01-C-S-001 DEMILIZATION CODE: A SHELF LIFE CODE: Z CONTROLLED INVENTORY ITEM (CIIC): U	P	EA	R	O		10	10				10							
D00807K		CHASSIS, TRLR, GP, 3 1/2T, 2-WHL - M353		EA	N	O		2		2			2							
D01987K	Replacement	TRK, CARGO, 7T, W/WINCH (MTVR) - MK25		EA	R	O		2		2			2							
D04752E	Replacement	TOOL KIT, OM, 2D ECH, HMMWV - W		EA	N	O		1		1			1							
D07512E	Replacement	TOOL KIT, OM, 2D ECH,		KT	N	O		1		1			1							

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		F/TRK, 7T - W																		
D07552E	Replacement	TOOL KIT, OM, 2D/3D ECH, F/TRK, 5T - M809/M939		EA	N	O		1		1			1							
D08507K		TRLR, CARGO, 3/4T, 2-WHL - M101A3		EA	N	O		16		16			16							
D08607K		TRLR, CARGO, 1 1/2T, 2-WHL - M105A2		EA	N	O		2		2			2							
D08627K	Replacement	TRLR, MTVR, CARGO - C10AB10C1000 - PDIWG 2006 0428 OH QTY 0 CONTR #: M67854-05-C-5112DMIL: A SHELF-LIFE COED: (SLC): 0 CONTROLLED INVENTORY ITEM (CIIC): U		EA	N	O		2					2	2						
D08807K		TRLR, TANK, WATER, 400 GAL, 1 1/2T, 2-WHL - M149A2		EA	R	O		2		2			2							
D10627K	Replacement	TRK, CARGO, 7T, XLWB, W/O WINCH (MTVR) - MK27		EA	R	O		7		7			7							
D11587K	Replacement	TRK, UTIL, CARGO/TRP CARR, 1 1/4T, W/EQP, HMMWV - M1123A2		EA	R	O		10		10			10							
D11807K		TRK, UTIL, SHELTER CARRIER, 1 1/4T, W/O WINCH - M1037 - PLEASE REMOVE ALL D1180 FROM THE MARINE CORPS INVENTORY BY DEC 31, 2006 AND REPLACE WITH D0022 (M1152).		EA	R	O		6		6			6							

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E00502E		BAYONET, MULTI-PURPOSE, W/SCABBARD & LEG STRAP - OKC3S		EA	N	I	139	0		139			139							
E01807B		CIRCLE, AIMING - M2A2		EA	R	O		6		6			6							
E02102E		COMPASS, MAGNETIC, UNMOUNTED, W/E - M2		EA	N	O		22		22			22							
E04357M	Replacement	FOLLOW-ON RPV SYSTEM -	P	EA	N	O		4					4	4						
E07297M		VEHICLE, REMOTELY PILOTED, INTERIM -	P	EA	N	O		2					2	2						
E08927M	Replacement	LAUNCHER, GRENADE, 40MM - M203		EA	N	O		14		14			14							
E09557B		LIGHT, AIMING, INFRARED - AN/PAQ4C		EA	N	O		8		8			8							
E09567B		BORESIGHT SYSTEM, LASER - LBS-050 - DEMIL: B CIIC: U		EA	N	O		3		3			3							
E09897M		MACHINE GUN, MEDIUM, 7.62MM, GROUND VERSION - M240B - DMIL'D'CIIC - 2MEC - 13NEW VARIANT FOR E1839		EA	R	O		20		20			20							
E11202B		MOUNT, TRIPOD, MG, 7.62MM - M122 - DEMIL: C CIIC: 7		EA	N	O		20		20			20							
E11212B	Replacement	MOUNT, TRIPOD, MG, LTWT - MK125 - Program was not funded	P	EA	N	O		20					20	20						
E11522B		GOGGLES, NIGHT VISION, INDIV - AN/PVS7B		EA	N	O		48		48			48							
E11587G		SIGHT, NIGHT VISION,		EA	N	O		10		10			10							

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		WEAPON, INDIV - AN/PVS-2B - PDIWG 20060426																		
E12107B		POSITION AZIMUTH DETERMINATION SYS(PADS) - AN/USQ70		EA	R	O		1		1			1							
- A20777GC	E12107B - Consists Of	RADIO SET, VEHICULAR - AN/VRC91D		EA	N	O		1		1			1							
E12502M		PISTOL, 9MM, SEMIAUTOMATIC - M9		EA	N	I	43	0		43			43							
E14412M		RIFLE, 5.56MM, M16A2 - M16A2		EA	N	I	139	0		139			139							
E17612M		SHOTGUN, 12 GAUGE, COMBAT - M1014		EA	N	O		2		2			2							
- E09897M	E18397M - Consists Of	MACHINE GUN, MEDIUM, 7.62MM, GROUND VERSION - M240B - DMIL'D'CIIC - 2MEC - 13NEW VARIANT FOR E1839		EA	R	O		20		20			20							
E19487G		TEST SET, ELECTRONIC SYSTEMS - TS4348/UV		EA	N	O		1		1			1							
E19757G		SIGHT, WEAPON, THERMAL, MEDIUM (MTWS) - AN/PAS13D(V2) - USED W/TAMCNS E09607M, E09897M DMIL D SLC 0 CIIC 4 CG, MCLC LTR 4410 CODE 572-3 OF 15 JUNE 06		EA	N	O		20	20				20							
E28292E		TOOL KIT, OM, F/M240 MG -		EA	N	O		1		1			1							
E29002E		TOOL KIT, SMALL ARMS,		SE	N	O		1		1			1							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		REPAIRMAN'S - SC4933-95CLA07																		
E79007B	Replacement	TOOL KIT, SMALL ARMS - TK2111		EA	N	O		1		1			1							

Section II

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
H20472G		ANTENNA GROUP - OE254/GRC		EA	N	O		0					0							
H20842B		CABLE ASSEMBLY, TELEPHONE, 250FT - CX4566A/G - EXIT DATE EXTENSION REQUESTED BY LOGISTICS MANAGEMENT SPECIALIST (LMS)		EA	N	O		7		7			7							
H21052B		CABLE, TELEPHONE ON RL159 - WD1A2		RL	N	O		0					0							
H22072B		DISTRIBUTION BOX - J1077A - EXIT DATE EXTENSION REQUESTED BY LOGISTICS MANAGEMENT SPECIALIST (LMS)		EA	N	O		0					0							
H22402E		GAUGE, GAFF - TL144		EA	N	O		0					0							
H23012B		INTERCOMMUNICATION SET, VEHICLE - AN/VIC2(V)		EA	N	O		0					0							
H23792B		RADIO SET, CONTROL GROUP - AN/GRA39B		EA	N	O		0					0							
H24352E		TAG, BLANK, ASSORTED COLORS - MX893/G - EXIT DATE EXTENSION REQUESTED BY THE		BD	N	O		0					0							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		LOGISTICS MANAGEMENT SPECIALIST																		
H24432E		TELEPHONE SET - TA312/PT		EA	N	O		0					0							
H24442E		TELEPHONE SET - TA938/G		SE	N	O		0					0							
H24652B		SWITCHBOARD, TELEPHONE, MANUAL - SB22A/PT		EA	N	O		0					0							
H70302B		MULTIMETER, DIGITAL, HANDHELD - 77/BN		EA	N	O		0					0							
H72282E		CASE - BC5		EA	N	O		0					0							
H72552B		KIT, GROUNDING - MK2551A		KT	N	O		0					0							
H72702B		INDICATOR, PHASE SEQUENCE, 60HZ - K7		EA	N	O		0					0							
H72992B		KIT, WORK STATION, ELECTRONIC - MPW 39221015		KT	N	O		0					0							
H77202B		CHARGER, BATTERY, UNIVERSAL, PORTABLE - PP8444A/U		EA	N	O		0					0							
H79142B		TOOL KIT - TE33		EA	N	O		0					0							
H79212B		ADAPTER KIT, TEST - MKXXXX/U		EA	N	O		0					0							
H79242E		TEST SET, COMPUTER - TS4516/U		EA	N	O		0					0							
H79402E		TOOL KIT, COMM-ELEC, COMMON -		EA	N	O		0					0							
H80362B		ACCESS POINT -		EA	N	O		0					0							
H81002B		COMPUTER, LAPTOP - PENT II		EA	N	O		0					0							
H82002B		COMPUTER, DSKTOP - PENT II		EA	N	O		0					0							

Equipment Organization

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TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
H83002B		COMPUTER, SRVER - PENT II		EA	N	O		0					0							
H84102B		PRINTER, HP, LASER JET -		EA	N	O		0					0							
J30302B		CAMERA SET, STILL PICTURE, POLAROID - SX70		SE	N	O		0					0							
J30752E		LATRINE BOX, PREFABRICATED -		EA	N	O		0					0							
J31912B		REFRIGERATOR, MECH HOUSEHOLD -		EA	N	O		0					0							
J32102E		ROPE, MANILA, 3 STRANDS, 1/2 IN DIA. -		CL	N	O		0					0							
J33202E		TRK, HAND LIFT, PALLET TYPE -		EA	N	O		0					0							
K40042E		ARMOR, BODY, LOWER TORSO, FRAG PROTECTIVE - OG107 - ADDITIONAL NSN'S & I.D. NO.S LISTED IN THE SL-3		EA	N	O		0					0							
K40102F		BAG, PERSONAL EFFECTS, MIL PERSONNEL, DECEASED - - N		EA	N	O		0					0							
K40122E		BAG, MAIL CARRIERS - - N		EA	N	O		0					0							
K40302F		BAG, WATERPROOF, CLOTHING - - N		EA	N	I		0					0							
K40362F		BLANKET, BED, GREEN -		EA	N	O		0					0							
K40382E		BINOCULAR SYSTEM, 7X50 - M22 - REASSIGNED FROM N60012E		EA	N	O		0					0							
K41112E		CABINET, FILING, 2-DRWR, W/COMB LOCK - - N		EA	N	O		0					0							
K41122E		CABINET, FILING, SECURITY - - N		EA	N	O		0					0							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
K41282E		CAN, GASOLINE, MILITARY, SCREW CAP - - N		EA	N	O		0					0							
K41652E		CHAIR, FOLDING - - N		EA	N	O		0					0							
K41782E		KIT, MARTIAL ARTS -		EA	N	O		0					0							
K41792E		CHEST, RECORD, FLD, COMPANY - - N		EA	N	O		0					0							
K41822E		CHEST, PISTOL, WOOD - - N		EA	N	O		0					0							
K41832E		CHEST, ARTILLERY, EMPTY - - N		EA	N	O		0					0							
K42222E		COMPASS, MAGNETIC, UNMOUNTED - - N		EA	N	O		0					0							
K42352E		CORD, EXTENSION, LIGHT, 110V, HEAVY DUTY - - REQUEST TAMCN DELETION. ITEM IS CONSIDERED CONSUMABLE AND DOESN'T REQUIRE MANAGEMENT.		EA	N	O		0					0							
K42362E		COT, FOLDING, ALUMINUM AND NYLON - - N		EA	N	I		0					0							
K42452E		COPY MACHINE, TABLE TOP - 7020S - AFMSG 300226Z SEP 91		EA	N	O		0					0							
K42502E		CONTAINER, WATER, PLASTIC - - N		EA	N	O		0					0							
K42672E		DECONTAMINATING AGENT, STB, 50 LB DRUM - STB		DR	N	O		0					0							
K42882T		DRILL, ELECTRIC, PORTABLE - - N		EA	N	O		0					0							
K43152E		EMBOSSING MACHINE,		EA	N	O		0					0							

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
		ADDRESS PLATE - - DOG TAG MANUFACTURER MACHINE																		
K43212E		EXTINGUISHER, FIRE, DRY CHEMICAL, 10LB - - N		EA	N	O		0					0							
K43242E		EXTINGUISHER, FIRE, WATER, HAND 2 1/2 GAL - - N		EA	N	O		0					0							
K43432E		KIT, BARBER - - N		KT	N	O		0					0							
K43442E		KIT, FIRST AID, GP - - N		EA	N	O		0					0							
K43452E		FLASHLIGHT, BATTERY OPERATED, WATERPROOF - - N		EA	N	O		0					0							
K43852F		GLOVE, LEATHER, WORK, LINEMAN - - SEE SL8 FOR TARIFF NSNS		PR	N	O		0					0							
K44102B		KIT, REPAIR, TENTAGE - MIL-C-3372		KT	N	O		0					0							
K44292E		INSECT BAR, NYLON NETTING, COT TYPE OD -		EA	N	O		0					0							
K45012E		LADDER, EXTENSION, 30FT - - N		EA	N	O		0					0							
K45202E		MACHETE, HANDLE, RIGID - - N		EA	N	O		0					0							
K45222F		LINE, TENT, COTTON - W		EA	N	O		0					0							
K45452E		NECKLACE, PERSONNEL, ID TAG - - N		EA	N	O		0					0							
K45852F		NET, INSECT, HEAD, NYLON, GREEN - - N		EA	N	O		0					0							
K46182F		OVERALLS, WET WEATHER, NYLON TWILL, GREEN - - SEE SL-8 FOR TARIFF NSNS		EA	N	I		0					0							

Equipment Organization

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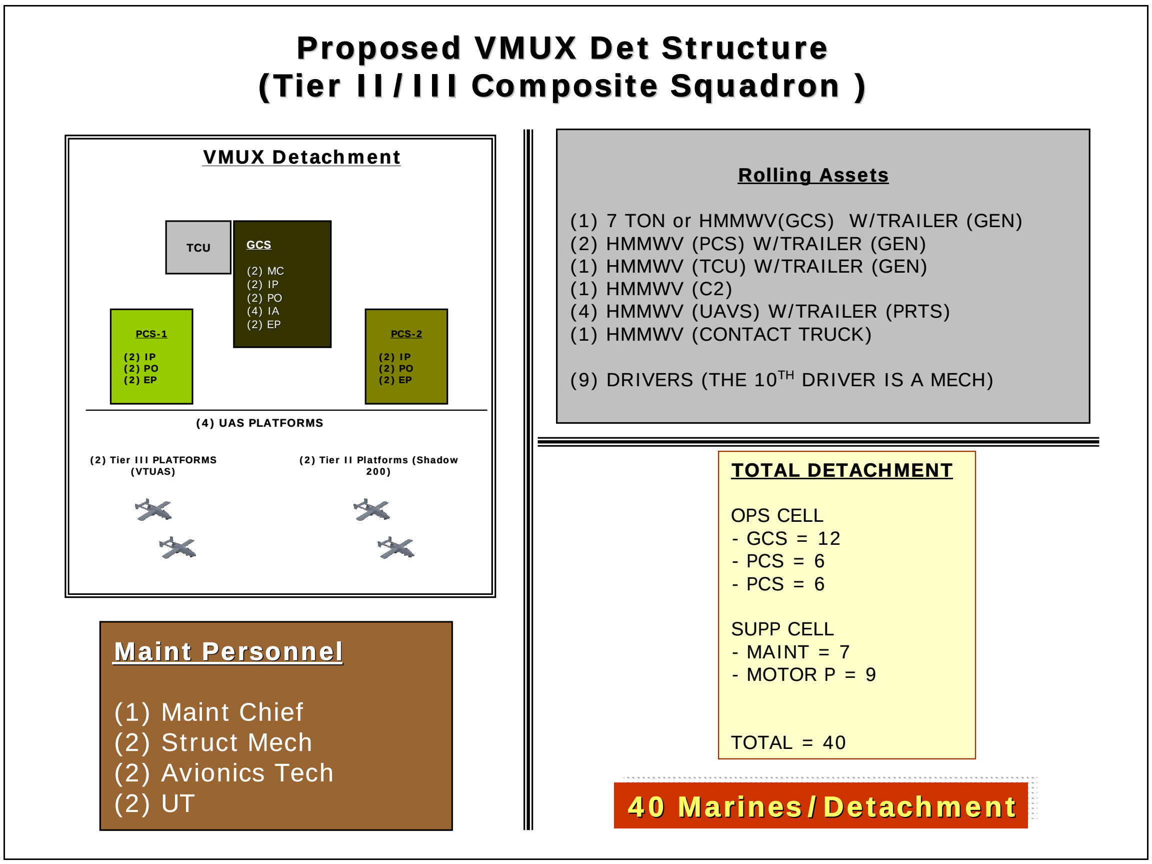
TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
K47032F		PARKA, WET WEATHER, LTWT - - SEE SL8 F/TARIFF NSNS		EA	N	O		0					0							
K47072F		PARKA, WET WEATHER - - SEE SL-8 FOR TARIFF NSNS		PR	N	I		0					0							
K47102E		PRESS, LAMINATING - GBC425LM - N		EA	N	O		0					0							
K47312E		POLE, COT, FOLDING, INSECT BAR, SET OF FOUR - - N		SE	N	I		0					0							
K48102E		SHEATH, MACHETE - - N		EA	N	O		0					0							
K48952E		SPOUT, CAN, FLEXIBLE, 16IN, W/FILTER - - N		EA	N	O		0					0							
K48982E		SPRAYER, INSECTICIDE, 2GAL - - N		EA	N	O		0					0							
K49462E		STRAP, WEBBING, WAIST, W/QUICK RELEASE F/FRAME FP - - N		EA	N	O		0					0							
K49502F		SUITCASE, CENTER FOLDING TYPE - - N		EA	N	I		0					0							
K49512E		SUPPLY SET, TYPEWRITER - - 11"FLD;UNITS MAY ORDER ANY NSN AVAIL		SE	N	O		0					0							
K49552E	Replacement	SUPPLY SET, OFFICE - - FLD DESK;UNITS MAY PROCURE ANY NSN DESIRED		EA	N	O		0					0							
K49572E		SWORD, NCO, W/SCABBARD, F/USE W/HONOR GUARDS - - N		EA	N	O		0					0							
K49612E		TABLE, END W/2 FOLDING ADJ., W/DESK, TYPIST - - - AVN PECULIAR-		EA	N	O		0					0							

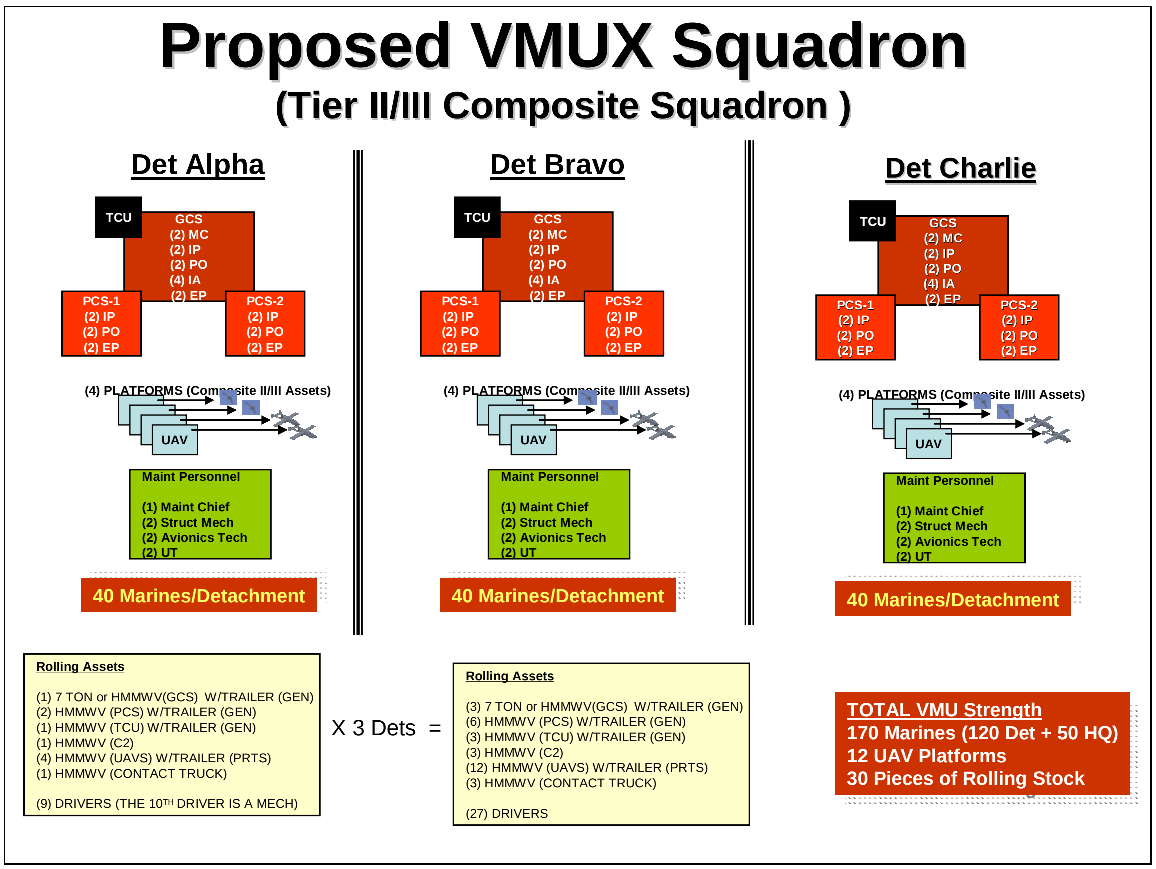
Equipment Organization

M01480 - VMU-1 MACG-38 3D MAW

TAMCN	Parent TAMCN	Nomenclature (Name - Model - Memo)	Plan	U/I	Readiness Rptble	Type Allow CD	Ind Qty	Org Qty	Unf Qty	Auth Qty	Spl Qty	On-Hand Qty	AAO Qty	Pro Plan 2007	Pro Plan 2008	Pro Plan 2009	Pro Plan 2010	Pro Plan 2011	Pro Plan 2012	Pro Plan 2013
K49642E		TAG, IDENTIFICATION, PERSONNEL - - N		EA	N	I		0					0							
K49912F		TENT, CP - M1945 - K49912F MAINTAINED UNTIL FIELDING OF C3412 AO MET		EA	N	O		0					0							
K49932F		TENT, GP, MEDIUM - MIL-T-1712 - K49932F MAINTAINED UNTIL FIELDING OF C34112 AO MET		EA	N	O		0					0							
K50092F		TROUSERS, WET WEATHER, LTWT - - SEE SL-8 F/TARIFF NSNS		EA	N	O		0					0							
K50112E		TRUNK, LOCKER, BARRACK, PLYWOOD - - N		EA	N	O		0					0							
K50222E		VIEWER, MICROFICHE, DUAL LENS, PORTABLE - - N		EA	N	O		0					0							
M50012E		CHARGER, BATTERY, AUTOMATIC - PCWV+ - THIS CHARGER IS FOR AUTOMOTIVE BATTERIES AND CAN CHARGE THE NEW ABSORBED GLASS MAT BATTERIES. SOME DISTRIBUTED TO C7073.		EA	N	O		0					0							
M50022E		CLEANER, STEAM PRESSURE, TRLR MTD - 200C		EA	N	O		0					0							
M50302E		TOW BAR KIT, MEDIUM DUTY (F/MTVR) - 3428515		EA	N	O		0					0							

APPENDIX B.


Proposed VMUX Det Structure
(Tier II/III Composite Squadron)
VMUX Detachment
TCU
GCS
(2) MC
(2) IP
(2) PO
(4) IA
(2) EP
PCS-1
(2) IP
(2) PO
(2) EP
PCS-2
(2) IP
(2) PO
(2) EP
(4) UAS PLATFORMS
(2) Tier III PLATFORMS (VTUAS)
(2) Tier II Platforms (Shadow 200)
Maint Personnel
(1) Maint Chief
(2) Struct Mech
(2) Avionics Tech
(2) UT
Rolling Assets
(1) 7 TON or HMMWV(GCS) W/TRAILER (GEN)
(2) HMMWV (PCS) W/TRAILER (GEN)
(1) HMMWV (TCU) W/TRAILER (GEN)
(1) HMMWV (C2)
(4) HMMWV (UAVS) W/TRAILER (PRTS)
(1) HMMWV (CONTACT TRUCK)
(9) DRIVERS (THE 10TH DRIVER IS A MECH)
TOTAL DETACHMENT
OPS CELL
- GCS = 12
- PCS = 6
- PCS = 6
SUPP CELL
- MAINT = 7
- MOTOR P = 9
TOTAL = 40
40 Marines/Detachment


Proposed VMUX Squadron
(Tier II/III Composite Squadron)
Det Alpha
Det Bravo
Det Charlie
TCU
GCS
(2) MC
(2) IP
(2) PO
(4) IA
(2) EP
PCS-1
(2) IP
(2) PO
(2) EP
PCS-2
(2) IP
(2) PO
(2) EP
(4) PLATFORMS (Composite II/III Assets)
UAV
Maint Personnel
(1) Maint Chief
(2) Struct Mech
(2) Avionics Tech
(2) UT
40 Marines/Detachment
Rolling Assets
(1) 7 TON or HMMWV(GCS) W/TRAILER (GEN)
(2) HMMWV (PCS) W/TRAILER (GEN)
(1) HMMWV (TCU) W/TRAILER (GEN)
(1) HMMWV (C2)
(4) HMMWV (UAVS) W/TRAILER (PRTS)
(1) HMMWV (CONTACT TRUCK)
(9) DRIVERS (THE 10TH DRIVER IS A MECH)
X 3 Dets =
Rolling Assets
(3) 7 TON or HMMWV(GCS) W/TRAILER (GEN)
(6) HMMWV (PCS) W/TRAILER (GEN)
(3) HMMWV (TCU) W/TRAILER (GEN)
(3) HMMWV (C2)
(12) HMMWV (UAVS) W/TRAILER (PRTS)
(3) HMMWV (CONTACT TRUCK)
(27) DRIVERS
TOTAL VMU Strength
170 Marines (120 Det + 50 HQ)
12 UAV Platforms
30 Pieces of Rolling Stock

Proposed VMUX Composition

- **3 Dets = 1 VMU**

- **VMU HQ element:**
  - Command — 3 (CO, XO, 1st Sgt)
  - S-1 — 4 (Chief, UD, PARs, 2 Admin Clerks)
  - S-2 — 3 (1 intel Off, Intel Analyst)
  - S-3 — 5 (Current Ops Off, Future Ops Off, Trng Chief, Ops Clerk
  - S-4 — 8 (1 OFF, 1 WO, Supp, Log, Ammo/Armory, Embark
  - S-6 — 7 (Chief Data, Radio, Repairman)
  - Misc — 20 (Drivers, additional billets Safety, NATOPS)

TOTAL HQ element = 50 Marines

Overall VMUX Structure

- **PERSONNEL**
  - HQ Element = 50 Marines (Officers and Enlisted)
  - Detachment = 40 Marines x 3 dets = 120 Marines (Ops/Maint Supp)
  - TOTAL VMU Strength = 170

- **CAPABILITIES**
  - 12 Assets (Composite squadron – 6 Tier III and 6 Tier II Platforms)
  - 3 GCS/TCU, 6 PCS
  - 3 separate Maint teams with independent capabilities
  - Independent rolling assets
  - 16 to 24 hrs ops (Sustain and Surge capability)

- **ASSETS**
  - 3 7-ton trucks (Not including redundancy)
  - 27 HMMWVs (Operational dets only)
  - Misc. Supply and maint assets

LIST OF REFERENCES

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