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MASTER OF MILITARY STUDIES

The KC-130 and Expeditionary Operations

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EXECUTIVE SUMMARY

Title: The KC-130 and Expeditionary Operations

Author: Major Robert P. Cote, United States Marine Corps

Thesis: The KC-130's ability to operate within today's expeditionary environment is limited.

Discussion: The KC-130 is an important force multiplier for the Marine Air Ground Task Force (MAGTF). Following Operation Desert Storm the Hercules has been employed in an increasingly expeditionary role. These missions, flown with airframes nearing the end of their service life, have highlighted deficiencies within the inventory of KC-130 aircraft. Complicating matters are enlisted aircrew manning shortages, conflicting viewpoints on KC-130 employment, and conflicting mission priorities which vary between administrative and tactical sorties.

Conclusion: The KC-130J will alleviate many of the current problems affecting the airframe. The increased demand for KC-130 support, particularly as an aerial refueler will highlight problem areas, especially during missions flown in an expeditionary environment. The KC-130 must be viewed as a tactical aircraft. In order for the KC-130 to be successfully utilized within an expeditionary environment, proper training and resources must be ensured.

METHODOLOGY

This essay reviews the KC-130's role in expeditionary operations and explores current issues that impact its ability to support the Marine Air Ground Task Force (MAGTF). While this discussion focuses on the Marine Expeditionary Unit (MEU), it also applies on a larger scale to the Marine Expeditionary Brigade (MEB) and Marine Expeditionary Force (MEF).

Chapter 1 introduces the reader to some relevant issues affecting the KC-130 community. These issues include deficiencies in the airframe and enlisted aircrew retention. The KC-130's role within the MAGTF is discussed, concentrating on recent MEU operations.

Chapter 2 discusses current limitations of the KC-130, mainly the airframe, Deceptive Electronic Countermeasures (DECM), Night Vision Lighting (NVL), and enlisted aircrew manning. The current inventories of KC-130F/R aircraft have reached the end of their service life. The majority of the KC-130 fleet lacks the DECM and NVL capability required to operate within a tactical environment. Enlisted aircrew manning shortages are a critical readiness degrader for KC-130 squadrons.

Chapter 3 discusses the command relationships of an active duty KC-130 squadron both while in CONUS and overseas. The KC-130 squadron's relationship as a supporting unit, combined with its worldwide commitments, underscores the necessity for a clear understanding of command relationships.

Chapter 4 continues with a discussion of the KC-130 relationship with the MEU. A deployment in support of 13th MEU from January to April 1999 offers several key points.

In the conclusion some final points are offered for the reader's dissemination.

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Chapter 1

INTRODUCTION

During the 1960's the Marine Corps acquired the Lockheed KC-130 Hercules to provide aerial refueling and assault support transport of personnel, equipment, and supplies.¹ The mission of the KC-130 is "to provide aerial refueling service to Marine aviation units and to serve as an airborne platform for the Direct Air Support Center (DASC(A)). Other tasks include assault air transport for air landed and air delivered personnel, supplies and equipment; ground refueling service to aircraft when other suitable means of refueling are not available; and air transport service for the evacuation of casualties and noncombatants."² When viewed as a part of the Marine Air Ground Task Force (MAGTF) the Hercules resembles a small cog within a large machine, but its ability to perform a wide variety of missions keeps it operationally committed worldwide on an almost daily basis. As the only long-range assault support element in the Marine Corps the multi role, multi mission KC-130 provides commanders with a flexible

¹Marine Corps Reference Publication (MCRP) 5-12D, *Organization of Marine Corps Forces* (Quantico, Va: Marine Corps Combat Development Command, 13 November 1998), 3-23.

²Marine Corps Warfighting Publication (MCWP) 3-2, *Marine Aviation* (Quantico, Va: Marine Corps Combat Development Command), 2-10.

response option during regional and smaller scale contingencies. Although some of its original requirements have diminished, such as providing routine transoceanic aerial refueling, the KC-130's primary mission remains aerial refueling.³

Today's KC-130 force in the Marine Corps consists of three active duty, two reserve and one Fleet Training Squadron.⁴ Almost half the airframes assigned to active duty squadrons are KC-130F models that average nearly forty years of age. The remaining KC-130R and T airframes are over twenty years old. One important difference between the KC-130F/R/T models is their total fuel capacity. The F model airframe is typically fitted with an internal 3600-gallon fuel tank. The fuselage tank can be removed to utilize the cargo compartment but total fuel capacity is reduced by about 25%, thus lowering the aircraft's range. KC-130R/T and select F model aircraft are equipped with external wing tanks (EWT) and usually fly without the fuselage tank installed.

³One of the VMGR missions is to "Provide long range aerial refueling service for air movement of FMF squadrons when other suitable means of aerial refueling services are not readily available." Today Marine Squadrons typically utilize Air Force refueling assets during transoceanic deployments.

⁴In May 2002 the active fleet consisted of 32 KC-130F and 13 KC-130R models. The reserve fleet has 28 KC-130T models.

As MEUs and MEBs continue to respond to smaller scale contingencies the KC-130's operational tempo will increase. Historically two KC-130 aircraft are assigned to support each MEU, but larger amphibious operations require a more robust detachment. During Operation Enduring Freedom, a six-plane detachment flew approximately 253 sorties over a two-week period. Of these, only two of these sorties were helicopter aerial refueling (HAR) missions during the initial assault. Air transport of Battalion Landing Team (BLT) assets and delivering supplies to Forward Arming and Refueling Point (FARP) sites comprised 95% of the sorties. The versatility of the KC-130 was influential in rapidly building combat power ashore.⁵ As the Marine Corps develops its concepts of operational maneuver from the sea, sustained operations ashore, and military operations other than war the requirement for the KC-130 is assured.

The frequency of expeditionary operations following Desert Storm shifted the KC-130's focus of employment towards a more tactical role. The United States' increasing response to smaller scale contingencies during the 1990s exposed the KC-130's limited ability to tactically support expeditionary operations. Among the

⁵Major Brian L. Magnuson, USMC, Operations Officer, Marine Aerial Refueler Transport Squadron 352, MCAS Miramar, CA, e-mail to author. Subject: "Afghanistan Operations." 27 December 2001.

issues that began to surface were airframes approaching or past their service life, lack of DECM, lack of NVL and enlisted aircrew manning shortages. With the operational tempo expected to remain at current levels these concerns need to be addressed before mission readiness is affected.

Sorties flown within an expeditionary environment place great stress upon an airframe. Cumulative structural fatigue, high operational tempo, and airframe corrosion combine with the stress of operating in an expeditionary environment to gradually reduce an aircraft's service life.

Aircraft require DECM to operate within a threat environment. This equipment is designed to deceive enemy radar and infrared weapons systems. Without DECM, flying in a low to mid threat environment would be extremely dangerous. Currently less than 25% of the KC-130s have this modification, making it unlikely that every KC-130 supporting a MAGTF would have this capability.

The ability to operate under conditions of darkness should be considered an important aspect of expeditionary operations. In order for an aircrew to use Night Vision Goggles (NVGs) the aircraft's cockpit must have Night Vision Lighting (NVL) installed. Currently only one active and eight reserve KC-130 airframes are compatible with Night Vision Devices. Although the active squadrons were

performing Night Vision Lighting modifications to their airframes, delays have forced squadrons to operate with a degraded night capability until the KC-130J model is integrated into the fleet.

Enlisted aircrew retention, especially within the Staff Non Commissioned Officer (SNCO) ranks, has become a critical readiness degrader affecting KC-130 squadrons. Enlisted aircrew have been leaving the Marine Corps faster than they can be replaced in part due to the high operational tempo. In 2000 fleet levels were well below the authorized Table of Organization (T/O) for flight engineers, aerial navigators and loadmasters.⁶ This problem needs to be alleviated before readiness is degraded to the point that squadrons are non deployable.

In addition to these issues are the self inflicted wounds that can impede a squadron's mission readiness just as easily as any material limitation. The relationship between a KC-130 squadron and its parent commands is unique and must be clearly understood. Because the KC-130 deploys frequently in smaller (two or three plane) elements, the detachment commander must be familiar with the administrative, tactical and operational (ADCON, TACON, and

⁶During 2000, an unofficial report conducted at VMGR-352 identified the flight engineers at 67%, aerial navigators at 70% and loadmasters at 74% T/O.

OPCON) relationships between supported and supporting units. These relationships should be clearly identified as early as possible to prevent miscommunication and minimize friction.

A paradigm exists regarding the employment of the KC-130. To effectively support Marines in an expeditionary role the KC-130 community needs to agree collectively upon an employment concept. Currently views differ between those who perceive the KC-130 as an administrative, non-tactical aircraft and those who support employment in a tactical role. Exposure to an aggressive aircrew training syllabus, whether as a Weapons and Tactics Instructor (WTI) or through an affiliation with the Marine Aviation Weapons and Tactics Squadron (MAWTS), acclimatizes pilots and aircrew to the tactical employment of the KC-130. Overall, the KC-130 will be employed in the manner it is advertised to the rest of the fleet.

The tactical training of KC-130 aircrews is adversely affected through employment in such roles as Combat Search and Rescue (CSAR). KC-130 participation in CSAR began as a stopgap measure to plug holes in coverage previously provided by Air Force assets. During these deployments, which can often last ninety days, crews spend the majority of their time on "strip alert." If a friendly aircraft

were lost in enemy territory, the KC-130 would provide aerial refueling for helicopters participating in the rescue effort. During these deployments training is minimized and flight time limited to administrative flights and a few tactical training sorties. These missions must be minimized or avoided completely. First of all, most KC-130 aircraft lack the Night Vision capability and DECM equipment required to operate effectively in this environment. Secondly the aircraft, aircrew and maintenance personnel required to support these deployments detract from training that could be conducted at home. Instead of conducting training sorties, crews spend their time on "strip alert" with an occasional break for limited training or administrative flights.

The misuse of KC-130 aircraft in support of CSAR pales in comparison to the fraudulent abuse that sometimes occurs. For instance, in 2000 a VMGR squadron was tasked to fly over 4,000 miles to pick up five civilian musicians for a change of command ceremony. Notwithstanding the blatant fraud, waste, and abuse of this incident, it is these types of tasks that cut into training hours and place further stress upon airframes already at the end of their service life.

The KC-130's main value to the Marine Corps is as an aerial refueler. The current KC-130 fleet comprises 45% of all Department of Defense (DOD) aircraft capable of helicopter aerial refueling.⁷ The recent ratio increase of CH-53Es within the MEU and the introduction of the tilt rotor V-22 Osprey will increase the demands upon the KC-130 as an aerial refueling platform.

The KC-130J model is scheduled to reach squadron strength at VMGR-252, MCAS Cherry Point by FY 2005. The KC-130J will offer increased speed, range, a DECM capability and NVL. While the KC-130J will eventually become the mainstay of the fleet, concerns exist that delays in delivery will result in a shortfall of aircraft.

⁷John Pike, "KC-130," 9 January 2002. *Global Security*. URL:<<http://www.globalsecurity.org/military/systems/aircraft/kc-130.htm>>, accessed 10 January 2002.

CHAPTER 2

Limitations

The increase in expeditionary operations during the 1990s exposed several limitations affecting the KC-130 and its community. Among the most significant issues are airframes approaching or exceeding service life, lack of aircraft equipped with DECM and NVL, and enlisted aircrew manning shortages. The expeditionary operations that began in response to the September 11th terrorist attacks against the United States will likely continue for an extended period of time. With the operational tempo expected to increase, these issues need to be addressed before readiness is critically degraded.

Corrosion, unscheduled inspections, maintenance man hours per flight hour (MMH/FH) and cannibalization have affected mission capable numbers.⁸ During the period 1997 to 2001, MMH/FH increased 27.1%, cannibalization increased 23%, and aircraft utilization decreased 21.5%. Over time this has resulted in a steady decrease in the number of aircraft available to fly. In 2001 the KC-130F/R fleet was 60.4% mission capable (MC) and 31.3 full mission capable

(FMC), well below the MC and FMC goals set by Chief of Naval Operations (CNO) and the Marine Corps Aviation Campaign Plan. Given an average PAA (Primary Aircraft Authorized) of 14 aircraft per fleet squadron, on average only six aircraft are in an "up" status. The KC-130F/R models, averaging 40 and 25 years respectively, are showing signs of stress and the airframes aren't getting any younger.⁹

A gap exists between the KC-130F/R airframes nearing the end of their service life and the introduction of KC-130J model.¹⁰ It is reasonable to assume the KC-130J will require less maintenance hours per flight hour, but overall there will be fewer aircraft on hand. It will remain to be seen what impact this will have on the KC-130's ability to support simultaneous operations worldwide.

DECM

Deceptive Electronic Countermeasures (DECM) permit an aircraft to operate in a hostile environment. The DECM gear currently utilized by Marine KC-130s consists of the AN/ALE-39 Countermeasures Dispensing Set, AN/APR-39A Radar

⁸Cannibalization refers to the transfer of parts or components from one aircraft to another.

⁹Captain Michael Fralen, "KC-130J," Program Manager Air (PMA) 207, January 2002, 10.

¹⁰Fralen, 7.

Signal Detecting Set, AN/AAR-47 Missile Warning System, and the AN/ALQ-157 Infrared Countermeasures System. The AN/ALE-39 provides for the release of chaff and flares designed to deceive enemy radar and infrared sensors. The AN/APR-39A monitors select radar frequency bands for threats, displaying threat symbols on a cockpit display. The AN/AAR-47 is a passive electro-optical threat warning system designed to protect the aircraft against surface to air and air-to-air missiles by detecting the exhaust plume radiation emissions of missiles fired at the aircraft. The AN/ALQ-157 is an active infrared jamming device that confuses and defeats missiles. DECM enables the KC-130 to operate in a low altitude environment with the ability to defend itself against weapons systems such as the ZSU-23/4, and missile systems including the SA-7, SA-8, SA-9, SA-13 SA-14 and SA-16.¹¹

During Desert Shield/Desert Storm, funding became available to install defensive systems on the active and reserve KC-130 fleet. The DECM equipment procured for the KC-130 consisted of components already installed on Marine Corps helicopters including the CH-46, CH-53, and UH-1N. Since the major components were already in service, they

¹¹Major Robert E. Hughes, "KC-130 DECM/IRCM: Modernization for the Future." (Quantico, VA: US Marine Corps Command and Staff College), 3.

could be acquired with a substantial savings in research and development costs. In 1990, the estimated cost was estimated to be approximately \$600,000 per aircraft, or 43 million for the entire fleet of KC-130s in the Marine Corps.¹²

The Navy, however, approved funding for only five KC-130Fs and eight KC-130Rs from the active fleet, plus six KC-130T's from the reserves. Why was the decision made to modify the older KC-130F? Originally procured between 1960 and 1962, the KC-130F was expected to reach the end of its service life in 1998.¹³ The rationale behind this decision is unclear.

Currently only 18 of the 45 active aircraft, and 8 of the 28 reserve aircraft are equipped with DECM.¹⁴ This becomes a limiting factor when planning missions in a threat environment. A commander cannot assume the KC-130 supporting his MAGTF will have a DECM capability. The chances of conducting a multi-plane mission within a threat environment are low.

¹²M.P. Caulfield, Operational Requirement for KC-130 Defensive Electronic and Infrared Countermeasures (Quantico, VA: Marine Corps Combat Development Command) 17 Sept 1990.

¹³Major Robert E. Hughes, "KC-130 DECM/IRCM: Modernization for the Future." Quantico, VA: US Marine Corps Command and Staff College, 4.

¹⁴Hughes, 2.

During Desert Storm, the KC-130 primarily conducted aerial refueling of fixed wing assets. Employed in this role involved flying almost exclusively behind the Forward Edge of the Battle Area (FEBA). The number of expeditionary operations following the Gulf War exposed the KC-130 to an increase in tactical missions flown in a low to medium threat environment. The requirement for DECM became apparent. During Operation Restore Hope eight KC-130's from VMGR-352 flew missions that included Rapid Ground Refueling, airborne direct air support center (DASC), aerial refueling and logistical flights into unimproved airfields. Of the eight aircraft involved in this mission, only two had an ASE capability.¹⁵

NVL

Currently a limited number of KC-130 aircraft are equipped with the night vision lighting required to use night vision goggles. Lacking a night vision capability has not prevented KC-130s from performing night tactical missions. When conducting helicopter aerial refueling (HAR) or Temporary Landing Zone (TLZ) evolutions the pilots use their unaided eyes for visual reference. Using night vision devices enhances an aircrew's situational awareness.

¹⁵Hughes, 10.

For example, a KC-130 pilot using NVGs while conducting a night rendezvous with a section of CH-53Es can clearly see the aircraft. When an aircraft's lighting is not compatible with NVGs the cargo compartment lighting is secured and the refueling pods lights are covered with tape so the pilots in the receiving aircraft can continue to use NVGs while refueling. The crewmen operating in the cargo compartment can use NVGs only after attaching infrared chemical lights to the inside of the aircraft. This can make the rendezvous between tanker and receiver an extremely tedious evolution, especially with background lighting that can easily cause spatial disorientation.

Efforts have been underway to modify existing aircraft with Night Vision Lighting. Plans were scheduled for a total of 13 active KC-130F/R models and 8 KC-130 T models to be modified with Night Vision Lighting by FY 2004.¹⁶ However, due to contract disputes only a fraction of the anticipated total will be completed. Only until the current fleet of aircraft is replaced by the KC-130J will the entire fleet have Night Vision Lighting.

The KC-130R mishap in Pakistan on 9 January 2002 may provide valuable insight into the requirement for night

¹⁶Major Anthony S Barnes, USMC, Aviation Maintenance Officer, Marine Aerial Refueler Transport Squadron 352, MCAS Miramar, CA, telephone interview by author, 9 January 2002.

vision devices. Flying in a rugged, mountainous area is a challenge for any pilot. Conducting night landings in unfamiliar terrain leaves little margin for error. Although the cause of this mishap may never be discovered it is clear that night vision lighting, although not technically required, may have provided the crew with enough extra situational awareness to safely land their aircraft.

A recent article in the *Washington Post* addressed the absence of Night Vision Lighting on the KC-130 that crashed in Afghanistan.¹⁷ KC-130s have been safely flying unaided night tactical missions for years. Although NVG's add an additional degree of situational awareness, they have not been a priority acquisition for the Marine Corps.

ENLISTED AIRCREW MANNING

Another issue adversely affecting KC-130 operations is enlisted aircrew retention, particularly among Flight Engineers. Flight engineers complete a rigorous training syllabus and emerge intimately familiar with aircraft systems and are able to perform limited maintenance while deployed. Presently the active squadrons have approximately the same number of flight engineers as

airframes. When deploying overseas a squadron will usually send extra aircrew as augments. Unanticipated events (emergency leave, medically down status, etc) further reduce the number of available flight engineers. As the KC-130 is increasing employed in expeditionary operations around the world, the lack of enlisted aircrew could become a limiting factor. No matter how many aircraft are available, they are useless unless qualified aircrews exist to fly them.

Despite efforts to retain personnel, the Marine Corps continues to face enlisted aircrew shortages. Current proposals include a reevaluation of enlisted flight incentive pay, minimizing Fleet Assistance Program (FAP) billets until manning within operating squadrons increases, and reviewing the enlisted training system. Even small gains in enlisted aircrew manning will greatly reduce the impact of this critical readiness degrader.

¹⁷Steve Vogel, "Marine KC-130 That Hit Mountain Had No Night

Chapter 3

Command Relationships

The Marine Corps KC-130 squadron shares a unique command relationship within the Marine Aircraft Wing (MAW). The Marine Aerial Refueler Transport Squadron (VMGR) is located under the direct command of the Marine Aircraft Group (MAG) Commanding Officer. The MAW exercises greater control over a VMGR squadron's operational tasking than other squadrons.

The relationship between a VMGR squadron and the MAG is of an administrative nature. VMGR squadrons have a high operational tempo, constantly in demand for both tactical and administrative missions. These missions range from routinely scheduled sorties to the "pop up frags" such as hauling spare engines and maintenance personnel to rescuing a broken aircraft. Supported units can usually identify and block off dates to conduct training. The KC-130 operational tempo is such that it is unusual to have all

Vision," *Washington Post*, 17 February 2002, A17.

aircraft parked on a squadron's tarmac simultaneously, let alone get together en masse.

Although the KC-130 squadron remains ADCON to the MAG, it is OPCON to the MAW. The MAW primary interaction with the VMGR squadron is through the Air Transportation Coordination Officer (ATCO). The ATCO, part of the G-3, is an important liaison between the VMGR squadron and the MAW. The ATCO processes tactical and administrative requests for KC-130 support and assigns mission priorities. When an urgent requirement for a KC-130 arises the ATCO will make liaison with the squadron and if necessary reassign mission priorities. Specific units have a notorious reputation within VMGR squadrons for submitting these types of urgent requests. Despite its administrative nature, these flights may be assigned a high priority because they often operate according to strict time schedules that require transportation to separate locations within a short period of time. Individually these flights do not impact a squadron, but cumulatively they can siphon away valuable training time. Administrative missions will never disappear, and the KC-130 will continue to support them, but these requests must be closely scrutinized in order to minimize the impact on training and readiness.

The perception of KC-130 employment differs between commands. The VMGR community needs to be proactive and educate staff and personnel on their aircraft's capabilities. Clearing up any misconceptions will permit VMGR squadrons to focus more time on tactical training and reduce administrative sorties.

When supporting a MEU in the Continental United States (CONUS) and not aboard ship, "the Marine Expeditionary Force Commander exercises operational control (OPCON) of the MEU."¹⁸ Two KC-130s support the MEU during its CONUS training. When the MEU deploys, the KC-130 detachment will remain behind on a 96-hour tether.¹⁹ Usually the KC-130 detachment will join a MEU for a few weeks during its deployment to participate in a preplanned exercise such as Eager Mace or Bright Star. Should a contingency arise, "command relationships will be prescribed in the alert, warning, and/or execute order." If additional aircraft are involved but not directly supporting the mission, their command relationships must be clearly understood.

¹⁸Commandant of the Marine Corps, Marine Corps Order 3120.9A W/CH 1, Subject: "Policy for Marine Expeditionary Unit (Special Operations Capable (MEU(SOC)))," 24 November 1997, 16. Cited hereafter as MCO 3120.9A W/CH 1.

¹⁹The VMGR squadron's only continuity with the MEU during its work up and deployment is the KC130 planner. This will be covered in more detail in the following chapter.

Unlike a maritime propositioning force, a KC-130 detachment does not have an organic sustainment capability.²⁰ In the event of a short notice deployment strategic airlift assets may be unavailable, requiring the use of additional squadron aircraft to backup or assist the detachment by transporting aircraft parts, support equipment and personnel.

A KC-130 squadron's command relationships are unique, whether operating in a supporting or supported role. Command relationships must be clearly understood, especially when supporting contingency operations. Because a KC-130 detachment is land based and separated from forces embarked on shipboard assets the potential exists for conflicting directives that could negatively impact a mission.

Chapter 4

Supporting the MEU

The Marine Expeditionary Unit is "organized, trained, and equipped as a self-sustaining, general-purpose expeditionary force that possesses the capability to conduct a wide spectrum of conventional and selected maritime special operations, rather than a force which is tailored for a specific operation or area of responsibility."²¹ The MEU provides combatant commanders with "a forward-deployed, rapid crisis response capability by conducting conventional amphibious and selected maritime special operations under the following conditions: at night; under adverse weather conditions; from over the horizon; under emissions control; from the sea, by surface and/or by air."²² The KC-130 compliments a MEU by providing "refueling services for embarked helicopters and AV-8B aircraft, and performing other support tasks (e.g.,

²⁰Marine Corps Doctrinal Publication (MCDP) 3, *Expeditionary Operations* (Quantico, Va: Marine Corps Combat Development Command. 16 April 1998), 81.

²¹MCO 3120.9A W/CH 1, 9.

²²MCO 3120.9A W/CH 1, 9.

parachute operations, flare drops, cargo transportation, etc.)" as required.²³

The KC-130 is considered an assault support asset. The seven categories of assault support are Combat Assault Transport, Aerial Delivery, Aerial Refueling, Air Evacuation, Tactical Recovery of Aircraft and Personnel, Air Logistic Support, and Battlefield Illumination.²⁴ Assault support is a function of Marine Aviation that provides direct support for transporting and sustaining landing forces ashore. The KC-130 provides a back-up option for relieving helicopter assets should they become over extended or if their speed, range and load capability don't fit the mission. Although the primary mission of the KC-130 is aerial refueling, possessing the versatility to perform a variety of missions have made it a valuable force multiplier.

The MEU is commonly referred to as the nation's "911" force because of its ability to provide a quick response capability worldwide. MEUs have made recent headlines conducting missions such as Noncombatant Emergency Operations (NEO), Humanitarian Assistance (HA) and Tactical Recovery of Aircraft and Personnel (TRAP).

²³MCO 3120.9A W/CH 1, 5.

A textbook example of KC-130 employment in support of MEU contingency operations came on 6 June 1998. The 11th MEU was called upon to conduct a Noncombatant Emergency Evacuation (NEO) as a precautionary measure in response to an escalating border dispute between Ethiopia and Eritrea. The mission, named Operation Safe Departure, involved 2 KC-130s from VMGR-352 temporarily operating from Jordan. With less than 48 hours warning the aircraft flew to Asmara, Eritrea with a Forward Command Element (FCE) and security detachment. Over a fifteen hour period a total of 172 people were evacuated, including 105 American citizens.²⁵

The practice of pairing a KC-130 planner with the Aviation Combat Element during MEU exercises began in 1993. In 1994 the 11th MEU became involved in Operations Continue Hope, Quick Draw and Distant Runner. During these East African expeditionary operations KC-130s supported MEU operations in a variety of roles. The KC-130 planner's coordination between the MEU and shore based aircraft was a major factor in these successful evolutions. Shortly

²⁴Marine Corps Warfighting Publication (MCWP) 3-24, *Assault Support* (Quantico, Va: Marine Corps Combat Development Command), 2-2.

²⁵Eleventh Marine Expeditionary Unit (Special Operations Capable) message to Third Marine Aircraft Wing, Subject: "Operation Safe Departure, Asmara, Eritrea," 101300Z June 1998.

thereafter, 3rd MAW started to assign a KC-130 planner with each MEU.²⁶

At the beginning of a MEU's work up cycle the VMGR squadron assigns an individual as its KC-130 planner. This experienced pilot or navigator works with the Aviation Command Element (ACE) offering specific KC-130 knowledge and tactical expertise during mission planning. The KC-130 planner participates with the ACE during training and work up exercises until the MEU deploys, then joins the MEU in theater during any scheduled training or contingency operations.

One particular advantage the KC-130 planner provides is a familiarity with the Foreign Clearance Guide (FCG), a Department of Defense (DOD) publication used when planning international operations. The FCG contains useful information such as a particular country's travel restrictions, overflight requirements and specific templates for requesting diplomatic clearances. The information and lead time for these requests depends on the specific country and can vary from a few days to several weeks. Because MEUs regularly conduct operations on short notice it is imperative that planners be familiar with the FCG. If over flight or landing rights need to be obtained

²⁶Major Adam P. Holmes, "KC-130s: An Expeditionary Asset."

on short notice, the FCG may provide appropriate points of contact and other key information to ensure mission success and prevent any potential international incidents.

The value of the KC-130 planner cannot be underestimated. Because KC-130s will most likely be operating hundreds of miles from the Command Element, it is necessary to have a qualified individual present to participate in the planning process and answer specific questions as they arise. An unqualified individual can cripple the lines of communication between the Command Element, the ACE and the KC-130 detachment.

13th MEU WESTPAC 1999: "A Real Mission"

*"I would never send you half the way around the world to sit on your hands... this isn't dragging your hoses around the Bristol MOA, this is a real mission."*²⁷

Quote attributed to Commanding General, 3rd Marine Aircraft Wing in November 1998 while addressing Marines of VMGR-352.

"Provide aerial refueling service in support of Marine aviation operations"²⁸

Marine Corps Gazette, July 1996, 35.

²⁷The Bristol Military Operating Area is located near Twenty-nine Palms and frequently used by KC-130 squadrons to conduct aerial refueling.

²⁸Marine Corps Warfighting Publication (MCWP) 3-2, *Marine Aviation*, (Quantico, Va: Marine Corps Combat Development Command, 9 May 2000), 2-10.

The Commanding General's remarks turned out to be prophetic. During the early part of 1999 the border dispute between Ethiopia and Eritrea had continued to smolder when the 13th MEU secured liberty in Phuket, Thailand and set sail for Africa. The 13th MEU received a warning order to prepare to conduct NEOs in Eritrea and Djibouti in addition to a Humanitarian Assistance Operation in Kenya.²⁹ On 16 January 1999, after weeks of preparation and anticipation of participating in a real world contingency, four airplanes departed MCAS El Toro, California for NAS Sigonella, Italy. Sigonella is an important logistical base of operations in the Mediterranean from where necessary parts or personnel could be quickly ferried into the 13th MEU's area of operation. Of the four aircraft, only two were in direct support of the MEU. 3rd MAW directed the third aircraft to remain in Sigonella as a "spare and parts runner."³⁰ The fourth aircraft on this flight was not considered mission essential but provided an extra airframe in the event maintenance problems arose. Delayed while waiting for the

²⁹Thirteenth Marine Expeditionary Unit, *Command Chronology For Period 1 January Through 30 June 1999*, (Marine Corps Historical Center, Washington Naval Yard, Washington D.C.), 7.

³⁰Major David Krebs, Director of Safety and Standardization, Marine Aerial Refueler Transport Squadron 253. E-mail to author. Subject: "VMGR-352 support to 13th MEU," 1999.

deployment order, on 19 January the aircraft arrived in Sigonella and awaited an execution order from the 13th MEU to proceed to Mombassa, Kenya.³¹

The chain of command was a source of confusion because while the two plane detachment were chopped to U.S. Naval Sixth Fleet; the third plane would remain under the command of 3rd MAW. Furthermore, the detachment was unclear as to when they would officially report to Sixth Fleet.³² As a result the DET OIC was essentially working for two commands, the 13th MEU and 3rd MAW.

On January 20, a fifth aircraft departed El Toro carrying spare parts and equipment to repair an aircraft that was broken in Rota, Spain. This rescue aircraft was delayed while awaiting a diplomatic clearance and finally reached Rota on the 25th. Ironically, due to further maintenance problems, the rescue aircraft did not return to El Toro until 29 January.³³ Out of fourteen total aircraft assigned to VMGR-352, at one point five aircraft were in

³¹Krebs Interview.

³²Krebs Interview.

³³The author was the aircraft commander on this particular flight.

Europe (two in Rota, three in Sigonella) supporting a two-plane detachment.³⁴

On 27 January, three aircraft departed on a "red eye" to Mombassa, stopping in Djibouti enroute to refuel. After arriving in Mombassa, the third aircraft immediately returned to Sigonella and awaited further orders. The MEU ensured that the necessary facilities were in place when the aircraft arrived at Mombassa and the aircrew and maintenance personnel were billeted at the airfield. By 29 January VMGR-352 was flying training missions in anticipation of an impending contingency operation.³⁵

In early February the aircraft based in Sigonella flew to Mombassa on a logistical mission and was directed to remain in Kenya.³⁶ On 14 February the MEU Commanding Officer notified the detachment in Mombassa of an imminent and credible terrorist threat against the Marines stationed in the Port and airfield.³⁷ Finding a secure airfield in

³⁴Remember, VMGR-352 was still flying local missions in support of III MEF. Refer to Chapter 2, Figure 1 to appreciate this difficult evolution.

³⁵Major David Krebs, Director of Safety and Standardization, Marine Aerial Refueler Transport Squadron 253. E-mail to author. Subject: "VMGR-352 support to 13th MEU," 1999.

³⁶It is unclear whether this order came from 3rd MAW or the 13th MEU.

³⁷Major David Krebs, Director of Safety and Standardization, Marine Aerial Refueler Transport Squadron 253. E-mail to author. Subject: "VMGR-352 support to 13th MEU," 1999.

Eastern Africa with the necessary facilities to accommodate 3 KC-130's, their aircrews, and maintenance personnel with less than 24 hours notice presented a challenge. The Marines had no idea of their final destination but were assured by the MEU that a suitable facility would be found. Adding to the confusion, at approximately the same time the detachment received a call from the ATCO, 3rd MAW directing it to immediately depart Mombassa.³⁸ At dawn on 15 February 3 heavily loaded KC-130's departed Mombassa.³⁹ After a fuel stop in Djibouti the planes continued to Beni Suef, an F-16 base located approximately 300 nautical miles south of Cairo, Egypt. While at Beni Suef the Marines stayed at a compound built by General Dynamics, enjoying comfortable living arrangements but unable to venture outside its perimeter.⁴⁰

Approximately two weeks later the three aircraft departed Beni Suef.⁴¹ From 10 to 24 March the KC-130 detachment operated from Ali Al Salem, Kuwait and supported the MEU during operation Eager Mace. On 1 April 1999 the

³⁸ Krebs Interview.

³⁹ Krebs Interview.

⁴⁰ Krebs Interview.

⁴¹ Krebs Interview.

KC-130 Deployment returned home.⁴² While deployed, the squadron had relocated from El Toro to MCAS Miramar.

At the conclusion of this deployment some serious lessons were learned. First and foremost was the requirement for a clear understanding of the command relationships before the aircraft deployed. Once in theater, conflicting directives contributed to the fog and friction and eroded the cohesiveness between supporting units.

The KC-130 planner was an overall detriment to the deployment. This Marine was scheduled to depart with the KC-130 detachment and join the MEU in theater. It soon became apparent this individual's primary goal was to fly and not participate in any MEU planning.

The value of the KC-130 planner became apparent when VMGR-352 was tasked by the 13th MEU to conduct a logistics flight from Mombassa to Bahrain. This particular mission required over flight of several countries to include Saudi Arabia, which requires an over flight request submitted in advance. After discovering this it was suggested that the aircraft navigate the Straits of Hormuz. This was to be flown at night aboard an aircraft equipped with a single

⁴² Marine Aerial Refueler Transport Squadron 352, "*Command Chronology For Period 1 January Through 30 June 1999*" (Marine Corps Historical Center, Washington Naval Yard, Washington D.C.).

Inertial Navigation System that drifted an average of 1 degree an hour. If the KC-130 planner were present and active in the planning process the inherent risks and limitations of this mission would have been pointed out immediately.⁴³

⁴³Major David Krebs, Director of Safety and Standardization, Marine Aerial Refueler Transport Squadron 253. E-mail to author. Subject: "VMGR-352 support to 13th MEU," 2001.

Chapter 5

CONCLUSION

The Marine Corps expeditionary warfare concepts consists of "operational maneuver from the sea, sustained operations ashore, military operations other than war, and maritime propositioning force operations."⁴⁴ With aerial refueling the KC-130 will increase a MAGTF's power projection, enabling it to strike an opponent's center of gravity or critical vulnerability. As an assault support asset the KC-130 provides direct support for transporting and sustaining forces ashore.

The KC-130 will continue to support the Marine Corps well into the 21st Century. The Hercules provides the MAGTF with mission flexibility while enhancing the expeditionary maneuver warfare concept. Increased ship to objective distances have led MEUs to increase the ratio of CH-53E helicopters, which in turn will increase the demand for aerial refueling assets. The implementation of the MV-22, Joint Strike Fighter (JSF) and even ground assets such as the Advanced Amphibious Assault Vehicle (AAAV) will increase the demands on the KC-130 as the United States

⁴⁴ MCDP-3, 89.

continues its response to regional and smaller scale contingencies.

The KC-130J was originally scheduled to enter the fleet at a procurement rate of 4 aircraft per year, replacing the fifty-one active duty KC-130F/R aircraft in 2012.⁴⁵ As the KC-130J is introduced the existing airframes will be retired or redistributed to balance the number of core aircraft between squadrons. Thirteen KC-130F/R airframes have been labeled as core aircraft, meaning they are equipped with external wind tanks (EWT), NVL, DECM, and communication upgrades. This list will probably be modified after the losses of aircraft 160021 in January and 148815 in February of 2002.⁴⁶ These losses, combined with the increased operational tempo following September 11, 2001 led to additional funding for the KC-130J. As of February 2002 the Marine Corps was scheduled to receive 31 KC-130Js through fiscal year 2007.⁴⁷

The KC-130 must be equipped with DECM to operate in a threat environment. Deploying aircraft without this

⁴⁵United States Marine Corps Department of Aviation, "Aviation Implementation Plan (AIP) 00-01," <www.radiantgames.com/infowar/aip.pdf>, accessed 31 March 2002, B-14.

⁴⁶Aircraft 160021 was equipped with ASE and EWT. Aircraft 148895 which crashed in the vicinity of 29 Palms in February 2002, was assigned to VMGR 252 and scheduled for retirement in July 2003.

⁴⁷ Major Adam P. Holmes, USMC, E-mail to author, Subject: "KC-130J DECM Systems." 28 December 2001.

capability limits it to a non-tactical role. Since the original procurement of DECM gear in 1990 the Marine Corps has met limited success in acquiring additional funding to modify its remaining aircraft. The KC-130 community itself deserves a portion of the blame for the lack of DECM modifications, partly due to disagreement within the community itself. During the 1995 Operators Advisory Group (OAG) conference, KC-130 squadron commanders ranked DECM fifth in importance.⁴⁸ A limited number of KC-130 aircraft supporting Operation Enduring Freedom were equipped with DECM gear. With the advanced age of the KC-130F it is not feasible to spend the money required for these modifications.

The KC-130J will have a fully funded DECM system, but the ALR-56M (the replacement of the APR-39) will not be fully operational until FY-04.⁴⁹ Until the KC-130J is fully integrated into the fleet, the absence of DECM on existing aircraft will limit its capacity to operate in a hostile environment.

The KC-130 has a unique relationship with the MAW and MAG. Constantly in demand, squadrons consistently maintain a high operational tempo. In order to fully support the

⁴⁸Hughes, 4.

⁴⁹Holmes email.

MAGTF during expeditionary operations the KC-130 must be tactical proficient. In order to maintain this competency excessive administrative airlift commitments must be minimized. This should not preclude the KC-130 from supporting administrative missions altogether; however with limited flight hours a priority must be agreed upon. As the active KC-130 fleet is outfitted with NVL and DECM, training time must be dedicated to remain proficient within these areas.

Command relationships should be clearly outlined before a detachment departs. Failure to clearly delineate these relationships is at best a nuisance, but at its worse can incapacitate a mission.

It is an onus upon the VMGR community to thoroughly educate the MAGTF about the capabilities of the KC-130. The exploitation of the KC-130 as a purely administrative platform is a partial result of the poor advertising of its real potential. Prioritizing the KC-130 as an administrative platform is an underutilization of an important asset and sacrifices valuable training hours.

The KC-130 is a multidimensional airframe that must be modernized if it is to support the Marine Corps at its current operational tasking. The recent increase in expeditionary operations coupled with the mishap on 9

January 2002 publicized the importance of acquiring the KC-103J. The KC-130 mission must be clearly defined and understood to fully exploit its potential within an expeditionary environment.

In the future the KC-130 will continue to play an important role for the Marine Corps. First and foremost, its aerial refueling capability will increase a MAGTF's combat radius and provide flexibility when selecting objectives. The incorporation of the variable speed drogue and its own aerial refueling system could reduce KC-130 sorties while simultaneously improving its on station time. While its primary mission remains aerial refueling, the KC-130 will continue to conduct missions such as assault transport, aerial delivery, air evacuation, TRAP, air logistic support and battlefield illumination. The Hercules is a proven force multiplier that will continue to serve the Marine Corps for years to come.

BIBLIOGRAPHY

- Caulfield, M. P. Operational Requirement for KC-130 Defensive Electronic and Infrared Countermeasures (Quantico, VA: Marine Corps Combat Development Command, 17 Sept 1990) 1-3.
- Commandant of the Marine Corps. Marine Corps Order 3120.9A W/CH 1. Subject: "Policy for Marine Expeditionary Unit (Special Operations Capable (MEU(SOC)))." 24 November 1997.
- Barnes, Anthony S., Major USMC. Aviation Maintenance Officer, Marine Aerial Refueler Transport Squadron 352, MCAS Miramar, CA. Telephone interview by the author, 9 January 2002.
- Broadway, Michael W. "The Marine KC-130: Evolution of a Warrior." *Marine Corps Gazette* (May 1994).
- Bunker, Robert J. "Rethinking OOTW." *Military Review Vol. 75, no. 6* (November-December 1995): 34-41.
- Busby, Steven W, LtCol USMC, former Commanding Officer, Marine Aerial Refueler Transport Squadron 352, MCAS Miramar, CA. Interview by the author, 17 December 2001.
- Department of the Navy, Office of the Chief of Naval Operations. KC-130 Tactical Manual NWP 55-10-KC-130 (REV. B) NAVAIR 01-75GAA-1T. Washington, DC: Department of the Navy, January 1990.
- Domingue, Ronald A. "KC-130s and the MEU(SOC): Let's Exploit the Potential." *Marine Corps Gazette* (August 1999): 37-38.
- Eleventh Marine Expeditionary Unit (Special Operations Capable) message to Third Marine Aircraft Wing. Subject: "Operation Safe Departure, Asmara, Eritrea." 101300Z June 1998.
- Fralen, Michael. "KC-130J." Program Manager Air (PMA) 207. (January 2002).

Grinaker, Greg. "19 Dec 01 ASOAG Revisions." Headquarters United States Marine Corps, APW-61. (January 2002).

Holmes, Adam P. "KC-130s: An Expeditionary Asset." *Marine Corps Gazette* (July 1996): 35-36.

_____. "KC-130s in MOOTW." *Marine Corps Gazette* (May 1999): 37-38.

_____. E-mail to author. Subject: "KC-130J DECM Systems." 28 December 2001.

Hughes, Maj Robert E. "KC-130 DECM/IRCM: Modernization for the Future." Quantico, VA: Marine Corps Command and Staff College (1993).

Krebs, David, Major USMC, Director of Safety and Standardization, Marine Aerial Refueler Transport Squadron 253. E-mail to author. Subject: "VMGR-352 support to 13th MEU," 1999.

_____. Director of Safety and Standardization, Marine Aerial Refueler Transport Squadron 253, MCAS Cherry Point, NC. Interview by the author, 26 October 2001.

Lorenz, Col. F. M. "Forging Rules of Engagement: Lessons Learned in Operation United Shield." *Military Review* Vol. 75, no. 6 (November-December 1995): 17-25.

Magnuson, Brian L., Major, USMC. Operations Officer, Marine Aerial Refueler Transport Squadron 352, MCAS Miramar, CA. E-mail to author. Subject: "Afghanistan Operations." 27 December 2001.

Marine Aerial Refueler Transport Squadron 352. *Command Chronology For Period 1 January Through 30 June 1999*. Marine Corps Historical Center, Washington Naval Yard, Washington D.C.

Marine Corps Department of Aviation. *Aviation Implementation Plan (AIP) 00-01*. <www.radiantgames.com/infowar/aip.pdf>. accessed 31 March 2002.

Marine Corps Doctrinal Publication (MCDP) 3. *Expeditionary Operations*. Quantico, Va: Marine Corps Combat Development Command. 16 April 1998.

Marine Corps Doctrinal Publication (MCDP) 6. *Command and Control*. Quantico, Va: Marine Corps Combat Development Command. 4 October 1996.

Marine Corps Reference Publication (MCRP) 5-12D. *Organization of Marine Corps Forces*. Quantico, Va: Marine Corps Combat Development Command. 13 November 1998.

Marine Corps Warfighting Publication (MCWP) 0-1.1. *Componency*. Quantico, Va: Marine Corps Combat Development Command. 5 June 1998.

Marine Corps Warfighting Publication (MCWP) 3-2. *Marine Aviation*. Quantico, Va: Marine Corps Combat Development Command, 9 May 2000.

Marine Corps Warfighting Publication (MCWP) 3-24. *Assault Support*. Quantico, Va: Marine Corps Combat Development Command. 2 August 1999.

Pais, Maj Anthony B. "The KC-130 Replacement Aircraft: A Case for Modernization." Quantico, VA: Marine Corps Command and Staff College (1993).

Pike, John. "KC-130." 9 January 2002. *Global Security*. URL:<<http://www.globalsecurity.org/military/systems/aircraft/kc-130.htm>>, accessed 10 January 2002.

Seigel, Adam B. "Lessons Learned From Operation EASTERN EXIT." *Marine Corps Gazette* (June 1992): 75-81.

Thirteenth Marine Expeditionary Unit. *Command Chronology For Period 1 January Through 30 June 1999*. Marine Corps Historical Center, Washington Naval Yard, Washington D.C.

Vogel, Steve. "Marine KC-130 That Hit Mountain Had No Night Vision." *Washington Post*. 17 February 2002. A-17.

