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## MASTER OF MILITARY STUDIES

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### **TITLE:**

Understanding the Capability and Versatility of the KC-130J Harvest Hercules Airborne Weapons Kit (HAWK)

SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF MILITARY STUDIES

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# *Master of Military Studies Requirements for the Degree*

## **Executive Summary**

**Title:** Understanding the Capability and Versatility of the KC-130J Harvest Hercules Airborne Weapons Kit (HAWK)

**Author:** Major Kevin R. Herrmann, United States Marine Corps

**Thesis:** The KC-130J Harvest HAWK's capabilities must be understood by Marines at all levels of the MAGTF in order to avoid a lack of utilization of one of the most versatile and lethal Marine Corps assets.

**Discussion:** In October 2010, VMGR-352 deployed the first Harvest HAWK to Camp Dwyer, Afghanistan, in support of Operation Enduring Freedom (OEF). Over the next four years, Harvest HAWK's operational success would exceed expectations. In four years in support of OEF operations, Harvest HAWK flew 1,047 sorties, 6,930 flight hours, and employed 210 Hellfire and 91 Griffin missiles. Despite the aircraft's success in OEF, it has yet to deploy in support of a Marine Expeditionary Unit (MEU) or Special Purpose Marine Air Ground Task Force (SPMAGTF). In the Marine Corps Aviation Plan 2015, one of the goals for the KC-130J community is to transition Harvest HAWK from an OEF mission to a MEU and SPMAGTF mission. Harvest HAWK has proven its versatility: it is a force-multiplier for the commander, and can fulfill the SPMAGTF-CR-AF organic MIR and CAS shortfall. To the max extent possible, the Marine Corps should rely on organic CAS before reaching out to joint partners for assistance. The Marine Corps decided to upgrade to the Harvest HAWK Plus model in response to system limitations and to better support the MAGTF. The upgraded model will upgrade and reposition the targeting sensor, receive a newly designed fire control station, receive a new communication suite, and regain its left external fuel tank. These upgrades will address identified shortfalls and enhance its ability to support the MAGTF. The VMGR community and MAGTF planners must develop a plan to integrate Harvest HAWK into MAGTF operations. The KC-130J Harvest HAWK's capabilities must be understood at all levels of the MAGTF in order to avoid a lack of utilization of one of the most versatile and lethal Marine Corps assets.

**Conclusion:** The Marine Corps should deploy Harvest HAWK in support of the SPMAGTFs and MEUs to provide them with a MIR and CAS capability that has the range to cover a large area of operation such as Africa. MAGTF planners must not forget about Harvest HAWK's combat power. The foundation of Harvest HAWK is still a KC-130J, which is capable of conducting the full Mission Essential Task List in the KC-130J T&R. Harvest HAWK provides the MAGTF commander with the most versatile aircraft in the Marine Corps, an aircraft that is flexible to conduct a wide range of missions in an uncertain operation environment.

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## *Preface*

My goal in writing this paper is to inform commanders and planners of Harvest HAWK's capabilities. I am grateful for all the support I received from Maj J.M. Ellis, Maj C.D. O'Brien, and Maj A.D. Myers from the Marine Aviation Weapons and Tactics Squadron One (MAWTS-1) KC-130J Division. I would like to thank my mentor, Dr. Paul Gelpi for his guidance and patience and my faculty advisor, LtCol R.S. Peterson for the encouragement to take full advantage of the opportunity to earn a masters. Finally, I would like to thank my wife Jennifer and my three daughters for all their love and support.

## Appendix A – List of Acronyms

AFRICOM	U.S. Forces Africa Command
AGM	Air-To-Ground Missiles
AMC	Airborne Mission Commander
BLOS	Beyond Line of Sight
BMS	Battle Management Station
CAS	Close Air Support
CENTCOM	U.S. Forces Central Command
CFACC	Combined Forces Air Component Commander
COC	Combat Operations Center
FCO	Fire Control Officer
GBU	Guided Bomb Unit
Harvest HAWK	KC-130J Harvest Hercules Airborne Weapons Kit
HF	High Frequency
HOTAS	Hands On Throttle and Stick
IED	Improvised Explosion Device
JAGM	Joint Air-To-Ground Missile
JTAC	Joint Terminal Attack Controller
LAIRCM	Large Aircraft Infrared Countermeasures
LSD	Laser Spot Designator
LST	Laser Spot Tracker
MEU	Marine Expeditionary Unit
MIR	Multi-Imagery Reconnaissance
NAVAIR	U.S. Navy Naval Air Systems Command
NEO	Non-Combative Evacuation
NSWCDD	Naval Surface Warfare Center Dahlgren Division
PGM	Precision Guided Munition
PTO	Prepare To Deploy
OEF	Operation Enduring Freedom
SATCOM	Satellite Communications
SPMAGTF	Special Purpose Marine Corps Air-Ground Task Force
SPMAGTF-CR	Special Purpose Marine Corps Air-Ground Task Force Crisis Response
SPMAGTF-CR-AF	Special Purpose Marine Corps Air-Ground Task Force Crisis Response Africa
SPMAGTF-CR-CENT	SPMAGTF-CR Central Command
SWIR	Short Wave Infrared
TACC	Marine Tactical Air Command Center
TSS	Target Sight System
UHF	Ultra High Frequency
UNNS	Urgent Universal Needs Statement
VARs	V-22 Aerial Refueling System
VHF	Very High Frequency
WCS	Weapons Control System

In an instant, the Special Purpose Marine Air Ground Task Force Crisis Response Africa (SPMAGTF-CR-AF) Marines could find themselves in a dangerous situation like the one the Navy SEALs did in Dec 2013. Three Navy SEALs were wounded in the back of a CV-22 while trying to conduct an evacuation mission in South Sudan.<sup>1</sup> After the failed evacuation attempt by the Navy SEALs in South Sudan, another course of action was selected to evacuate the embassy. The SPMAGTF relocated from Moron Air Base, Spain, to Djibouti, Uganda, and U.S Embassy Juba, South Sudan, within 48 hours from giving the order. In total, the KC-130 and MV-22 team flew more than 4,200 nautical miles to position themselves for the evacuation of the South Sudan American Embassy personnel.<sup>2</sup> This movement would not have been possible with Marine Corps helicopters or TACAIR without heavy lift and tanker support from the USAF. On January 3, 2014, a course of action was selected to utilize the SPMAGTF-CR-AF KC-130s to evacuate twenty personnel from the U.S. embassy in Juba, South Sudan. The operation was conducted with one KC-130J while one KC-130T stayed airborne in case it needed to assume the mission to evacuate personnel.<sup>3</sup> The CV-22 insert of Navy SEALs and the KC-130J embassy evacuation are perfect examples of missions that would have benefited from having Harvest HAWK on station. In both situations, the aircraft could have conducted MIR from a high altitude offset from the objective to avoid detection and replaced the KC-130T overhead. The Harvest HAWK would have been able to establish pattern of life, and position itself to react to a threat after the forces were inserted. In addition to providing CAS and MIR, the Harvest HAWK aircraft with VIASAT on board would have been able to give updates to the combat operations center (COC) over SATCOM or internet chat. In addition to the communications, the COC most likely would have been able to receive a real time video feed from the aircraft's sensor utilizing VIASAT.

## **Introduction**

On May 15, 2009, Commandant General James Conway told the Center for Strategic and International Studies, “We are developing a program called Harvest Hercules Airborne Weapons Kit (HAWK). You know, Marine commanders have lusted for years over the AC-130s that the special ops communities have.”<sup>4</sup> The commandant’s goal was not to copy the AC-130 but to take advantage of the KC-130J’s loiter time and create an multirole aircraft capable of multi-sensor imagery reconnaissance (MIR) and close air support (CAS). In October 2010, VMGR-352 deployed the first Harvest HAWK to Camp Dwyer, Afghanistan, in support of Operation Enduring Freedom (OEF). Over the next four years, the aircraft’s operational success would exceed expectations. Despite the Harvest HAWK success in OEF. The platform it has yet to deploy in support of a Marine Expeditionary Unit (MEU) or SPMAGTF. In the Marine Corps Aviation Plan 2015, one of the goals for the KC-130J community is to transition Harvest HAWK from an OEF mission to a MEU and SPMAGTF mission.<sup>5</sup> After action reports from SPMAGTF-CR-AF have identified organic MIR and CAS has a shortfall. The aircraft has proven its versatility is a force-multiplier for the commander, and can fulfill the SPMAGTF-CR-AF organic MIR and CAS shortfall. The strength of the MAGTF is its ability to provide organic aviation assets. To the maximum extent possible the Marine Corps should rely on organic CAS before reaching out to joint partners for assistance. The Harvest HAWK is no longer a proof of concept; it is a program of record. The Marine Corps decided to upgrade to the Harvest HAWK Plus model in response to system limitations and to better support the MAGTF. The Harvest HAWK Plus will upgrade and reposition the targeting sensor, receive a newly designed fire control station, receive a new communication suite, and regain its left external fuel tank. These upgrades will address identified shortfalls and enhance its ability to support the MAGTF. The

VMGR community and MAGTF planners must develop a plan to integrate Harvest HAWK into MAGTF operations. The KC-130J Harvest HAWK's capabilities must be understood by Marines at all levels of the MAGTF in order to avoid a lack of utilization of one of the most versatile and lethal Marine Corps assets.

### **Harvest HAWK Operational Success**

VMGR-352 received its first Harvest HAWK aircraft in late 2010; in just over eighteen months, Naval Air Systems Command (NAVAIR) was able to translate the Marine Corps' specific request to Lockheed Martin to develop Harvest HAWK.<sup>6</sup> In October 2010, VMGR-352 deployed to Afghanistan in support of OEF. The plan was to deploy the aircraft for a short-term proof of concept evaluation. After a few weeks in theater, the crew had its first engagement and word began to spread of the Marine Corps's newest CAS player. The short-term proof of concept deployment turned into a nine-month deployment. After nine months, a single Harvest HAWK aircraft had flown more than "1,500 flight hours, 200 sorties, found eight IEDs, and fired 42 Hellfire and 11 Griffin GPS guided missiles."<sup>7</sup> The KC-130J detachment's number of employments rival or exceed the employments of an entire AH-1W Cobra Squadron or an AV-8B Harrier squadron. Keep in mind that from 2010 to 2014 there was only one Harvest HAWK aircraft in theater. In four years in support of OEF operations, Harvest HAWK flew 1,047 sorties, 6,930 flight hours, and employed 210 Hellfire and 91 Griffin missiles.<sup>8</sup>

### **KC-130J Harvest HAWK Versatility**

Marine Corps commanders and planners must fully understand Harvest HAWK's versatility in order to capitalize on its ability to conduct MIR, CAS, and assault support missions. The VMGR Mission is to "Support the MAGTF Commander by providing air-to-air refueling, assault support, and close air support, day or night under all weather conditions during expeditionary,

joint, or combined operations.”<sup>9</sup> The two KC-130J squadrons stationed in the United States, VMGR-252 and 352, have the additional mission to conduct offensive air support. Each squadron has the equipment to outfit three Harvest HAWK aircraft. It is important to remember that the foundation of Harvest HAWK is a KC-130, a multirole aircraft that is a force-multiple to the MAGTF commander. The VMGR’s Mission Essential Task List consists of conducting Aviation Operations from Expeditionary Shore-Based Sites, Combat Assault Transport, Air-to-Air Refueling, Aviation-delivered Ground Refueling, Air Delivery, Battlefield Illumination, Close Air Support, and Multi-Sensory Imagery Reconnaissance.<sup>10</sup>

The Harvest HAWK can still complete every Mission Essential Task with some degradation due to the unique configuration of the aircraft. In the current configuration of Harvest HAWK, the targeting sight sensor takes the place of the left wing external fuel tank, which results in a loss of 18,000 pounds of fuel. The M299 Hellfire Rack takes the place of the left wing refueling hose. Planners should not rely on Harvest HAWK as a primary tanker and must not forget its capability. In the winter of 2011, two AV-8B Harriers could not land at Kandahar Airfield due to wind limitations. The Harrier’s planned divert was Camp Dwyer, but it was not an ideal divert due to the high likelihood that the jets would suffer damage from a foreign object on the runway. Due the foreign object damage risk, the Marine Tactical Air Command Center (TACC) tasked Harvest HAWK aircraft to conduct air-to-air refueling with the two Harriers. Because of air-to-air refueling with Harvest HAWK, the Harriers were able to stay airborne until the wind at Kandahar was within landing limits. As the Harvest HAWK crew finished their post air-to-air refueling checklist, the TACC tasked them to support a priority Joint Tactical Airstrike Request.<sup>11</sup> Currently, the aircraft cannot carry palletized cargo due the configuration of the

Harvest HAWK fuselage, but that will not be an issue with Harvest HAWK Plus, which will be able to carry 4-5 pallets depending on the weight of the fifth pallet to place on the ramp.<sup>12</sup>

While not a mission essential task for the KC-130J, it has proven itself as an Air Mission Commander Platform during Operation Iraqi Freedom and OEF. The communication's suite of a standard KC-130J has two UHF and VHF radios, one ARC-210 (SATCOM, VHF, UHF), and two HF radios. In addition to the standard communication suite, a ViaSat antenna which is capable of transmitting and receiving satellite communications, can be mounted on the KC-130's overhead escape hatch. The ViaSat antenna adds a beyond line of sight (BLOS) capability to the aircraft and is currently utilized by the KC-130J SPMAGTF-CR-AF detachment. ViaSat provides the crew with BLOS satellite communications, unclassified and classified networks, and video teleconferencing.<sup>13</sup> If a Harvest HAWK aircraft was in support of SPMAGTF-CR-AF, it could transmit live sensor feed to the COC in Moron, Spain, while conducting a mission in central Africa. In the summer of 2014, a Harvest HAWK crew conducted a training mission, employing Hellfire and Griffin missiles in the Marine Corps Air Station Yuma, Arizona R-2507 range while transmitting live video footage to a command and control center located at Cherry Point, NC.<sup>14</sup> According to Maj Myers who was deployed to OEF with Harvest HAWK, "Harvest HAWK was used as an airborne mission commander (AMC) platform, which allowed a qualified AMC to manage multiple assault support assets from the fire control console on the Harvest HAWK-equipped Super Hercules. Additionally, the aircraft could simultaneously provide battlefield illumination and MIR of the objective area, further reducing the need for additional assets during operations."<sup>15</sup> The platform is a true a multirole aircraft that is capable of conducting multiple missions near simultaneously.

MAGTF planners must understand the full combat power that Harvest HAWK provides. The KC-130J ability to conduct a wide range of missions under all weather conditions is unmatched by any other Marine Corps aviation platform. When equipped with the ViaSat antenna, the Harvest HAWK aircraft has the ability to visually enhance the situational awareness of the troops on the ground, the commander in the COC, and other airborne aviation assets. The Deputy Commandant for Marine Corps Aviation, LtGen Davis, recognizes the versatility of the aircraft. He stated, “Harvest HAWK on a KC-130J brings unprecedented utility, exactly what our Corps should expect from all of our aviation assets.”<sup>16</sup>

### **Harvest HAWK Plus**

The Harvest HAWK Plus will address shortfalls in the legacy platform, enhance combat power and situational awareness, and increase the ability to survive in a threat environment. Due to the Urgent Universal Needs Statement (UNNS), the KC-130J Harvest HAWK was developed, tested, and declared operational by the Marine Corps in a very short period. The UNNS allowed contractors to skip several steps in the lengthy acquisitions process. The Harvest HAWK from conception to employment took just over eighteen months. The Marine Corps decided to go with a single source provider, Lockheed Martin to develop Harvest HAWK. The normal lifespan for a capability that is created in response to an UNNS is two to three years or until the requirement no longer exists. Its success in OEF convinced the Marine Corps to make Harvest HAWK a program of record.

After four years of lessons learned from combat, the Marine Corps decided to address some of the Harvest HAWK’s shortfalls. For example, the left external fuel tank and the left refueling pod are replaced with an inert pod to hold the sensor and the Hellfire M299 Missile Launcher. The Naval Air Systems Command (NAVAIR) was responsible for creation of Harvest HAWK

Plus. The NAVAIR approach incorporated lessons learned by Marine Corps Harvest HAWK, USAF programs such as Dragon Spear, and the civilian industry to create Harvest HAWK Plus.<sup>17</sup> The stated goal of NAVAIR when creating Harvest HAWK Plus was “to address existing system deficiencies, improve overall system performance, and enable utilization of current and upcoming variants of AGM-114 Hellfire II missiles to address AGM-114P2 obsolescence.”<sup>18</sup>

Due to the success of the Harvest HAWK, the program office received funds to invest in correcting some of Harvest HAWK’s shortfalls after it became a program of record. When the opportunity came around to for the KC-130 Program Office to upgrade Harvest HAWK, it explored its options. The Marine Corps fielded contract bids from several companies to build Harvest HAWK Plus. In the end, the decision to cut ties with the original Harvest HAWK manufacture, Lockheed Martin, and award the contract to Naval Surface Warfare Center Dahlgren Division (NSWCDD). The NSWCDD is able to modernize the system and provide a more capable MIR and CAS platform than Lockheed Martin’s design. One of the major concerns with the aircraft was a limited number of Lockheed Martin’s AN/AAQ-30 Target Sight Systems (TSS), which is also the sensor for the AH-1Z.<sup>19</sup> Due to the competing efforts between the Harvest HAWK and AH-1Z programs, the KC-130 squadrons are often without a spare TSS. The TSS has poor sensor fidelity and stability at higher altitudes since it is manufactured for low altitude operations.<sup>20</sup>

The Harvest HAWK Plus will replace the AN/AAQ-30 TSS with the L3 WESCAM MX-20D High Definition sensor. The MX-20D will improve sensor reliability and expand the tactical envelop. Inventory will not be an issue with the MX-20D sensor. Currently, “WESCAM’s systems can be found on over 100 different types of platforms, including fixed-wing, rotary-wing, UAV and aerostat airborne platforms, numerous surface vehicles and marine-based

platforms.”<sup>21</sup> WESCAM provides MX-20D sensors for the USAF and USN, which allows for a greater supply system.

In addition to the Laser Target Designator (LSD), the MX-20D will have an Infrared (IR) Pointer and a Laser Spot Tracker (LST), which were not capabilities on Harvest HAWK TSS.<sup>22</sup> The MX-20D is also capable of short wave infrared (SWIR), which allows the Fire Control Officer (FCO) to see Laser energy from the sensor. This capability is beneficial to the FCO for a sparkle talk-on and identifying friendlies marked with infrared tape. During thermal crossover, the ability to identify a target can range from difficult to impossible using an infrared sensor. The MX-20D has a fusion capability that blends electro-optical and infrared sensor feeds that provides utility during thermal crossover. This capability will ensure that Harvest HAWK crews are not degraded when conducting MIR and CAS during thermal crossover.

The MX-20D will be mounted on the chin of the aircraft. With the sensor mounted on the chin, Harvest HAWK will no longer have to deal with the sensor masking issue from the left wing. The sensor will now have a 360-degree line of sight below the aircraft. The aircraft will no longer have to fly left-hand orbits around the target in order to maintain positive identification. The Harvest HAWK will not be able to conduct a cardinal direction offset orbit if required and still be able to maintain contact.

With the removal of the TSS external pod Harvest HAWK will regain its left external fuel pod. The external fuel pods of the KC-130J must have symmetrical fuel loads; therefore, the right tank on Harvest HAWK is always empty. The reposition of the sensor to the nose of the aircraft will allow the aircraft to regain 18,000 pounds of fuel, topping off at 60,000 pounds.<sup>23</sup> The additional fuel translates into four more hours of flight time, allowing Harvest HAWKs to stay on station between 12-14 hours depending on flight profile.

The most significant change to Harvest HAWK Plus is its ability to transmit video data to the controller on the ground. One of the biggest challenges with the legacy Harvest HAWK system is its Tactical Command Data Link frequency transmits in Ku Band. The Joint Terminal Attack Controllers (JTAC) in Afghanistan had a difficult time receiving Harvest HAWK's video transmission. The lack of ability to transmit video led to extraneous voice communications between Harvest HAWK and the JTAC as well as other aircraft in the CAS stack. The Harvest HAWK Plus communication suite will have Dual Vortex Full Motion Video communications with the ability to transmit and receive encrypted transmission in Ku, C, L, or S band vice Ku.<sup>24</sup> This system will include dual mission recording and playback. Another capability of the Vortex radios is the ability for the Battle Management System (BMS) to transmit and receive tracks from other assets. In addition, Harvest HAWK will incorporate LINK-16 with future KC-130J software block upgrades.

The Harvest HAWK Plus modified airframes will be the first Marine Corps KC-130J aircraft to receive AAQ-24B(V) Large Aircraft Infrared Countermeasures and Advance Threat Warning system (LAIRCM/ATW).<sup>25</sup> The AAQ-24B will replace the current ALQ-157 Infrared Counter Measures that are on the KC-130J aircraft. One of the benefits of LAIRCM over the current system is its ability to defeat ground-launched missiles with Directed Laser Countermeasures.<sup>26</sup> LAIRCM provides the aircrew with one of the most sophisticated aviation defensive systems. It will enhance the threat awareness of the crew, enabling them a greater ability to avoid, detect, and defeat the threat. The upgrade to LARICM will increase the survivability of the crew and ensure Harvest HAWK in able to operate safer in a surface-to-air threat environment.

Sierra Nevada Corporation will design the new Weapons Control System (WCS). The new design is more ergonomical than the legacy system which allows the one FCO to effectively

operate the system. The system will face the right side of the fuselage in the cargo compartment. The software will incorporate targeting and weapons employment. In the legacy Harvest HAWK system, the FCO had to arm and launch the Griffin and Viper Strike Missiles by a separate laptop. The new BMS by Dahlgren will integrate the Hellfire, Griffin, Viper Strike and future munitions into one mission management system, allowing one operator to control the entire system. The legacy system design is not optimal to be employed by one FCO. When conducting CAS from Harvest HAWK, especially when employing near simultaneous Hellfire and Griffin shots, it is beneficial to have two fire control officers. The WCS will now have four High Definition displays with multiple viewing options. The WCS will have a mission list and status, map overlays, and deconfliction overlays. The Hands On Throttle and Stick (HOTAS) on the WCS is the same HOTAS from the F-35 Joint Strike Fighter. The buttons were reprogrammed for Harvest HAWK Plus operations and allow the FCO at the WCS to conduct an entire engagement without taking his hands off the HOTAS. The FCO has to take his hand off the HOTAS in order to use the computer mouse in the legacy Harvest HAWK system.

The Harvest HAWK Plus will also include an upgraded Hellfire Missile. Currently, the aircraft carries the AGM-114P2A Hellfire, AGM-176B Griffin, and GBU-44 Viper Strike. Harvest HAWK is capable of carrying four Hellfire Missiles. The “P” designation means that Hellfire has a gyro to enable off boresight employments and the ability to employ from high altitudes. Due to the limited inventory of the AGM-114P2A, Harvest HAWK will upgrade to the P+ and P4 Hellfire in 2017. Further down the road, P+ and P4 will be upgraded to the JAGM, which around 2019 will be initial operational capable.<sup>27</sup> In OEF, the Hellfire was the predominant weapon employed by Harvest HAWK. The weapon is lock on after launch and has the same fragment sleeve as the AGM-114K2A. The Harvest HAWK fire control officer has the

ability to select the impact angles: high, direct, or low modes. The normal time of flight ranges from 15-19 seconds. The Hellfire is a well-known and trusted munition, which gave the terminal controllers confidence on the ground when employing it from Harvest HAWK.

The Griffin Missile did not have the same notoriety with JTAC's controls in the beginning, which is one of the reasons it was not employed as much as the Hellfire. Due to the JTAC's unfamiliarity with the Griffin Missile, they opted for the Hellfire until they were familiar with some of the advantages of the Griffin Missile. Until the Harvest HAWK received the Derringer Door, the crew had to depressurize the aircraft in order to open the cargo door for employment, which caused friction to the employment. The Griffin Missile does have some advantages over the AGM-114P2A. It is a subsonic, which means the target will not receive any aural indications that a missile has been fired. The ability to either select point detonate or height of burst is another weaponeering benefit to the Griffin. The Griffin Missile has become a very popular weapon in the United States inventory. The Griffin time of flight is just slightly longer than the Hellfire; normal time of flight is 25-30 seconds. The Griffin is a very responsive weapon; it has the ability to be shot off boresight that enables the Harvest HAWK aircraft to shoot from the orbit if desired. Some of the current platforms that employ the Griffin Missile are Harvest HAWK, Air Force Special Operations Command AC-130W Dragon Spear, and AC-130W Stinger II, and it has been tested on the MV-22 Osprey.<sup>28</sup> The Marine Corps employs the AGM-176 Griffin A Block II. The normal Griffin Missile lead-out is ten, but the the aircraft is not limited to ten. Technically, the aircraft can carry as many that will fit in the cargo compartment. Raytheon is also working on upgrading the Griffin Block II to Block III, which will have an improved "semi-active laser seeker and a new multi-effects warhead system that maximizes the weapon's lethality against a variety of targets."<sup>29</sup> The Air Force will receive the advertised Block

III missile, but the Navy, which affects the Marine Corps, has opted for the modified Block III missile. The Navy and Marine Corps Griffin A Block III variant will have the improved semi-active laser seeker, but will not have the enhanced warhead. The Griffin Missile will continue to serve Harvest HAWK Plus for years to come.

The third munition that Harvest HAWK is currently cleared to employ is the GBU-44 Viper Strike developed by Northrop Grumman. Like the Griffin, Viper Strike launches from the Harvest HAWK cargo compartment through the Derringer Door. With no propulsion, it utilizes parachutes to control its rate of descent and glide to the target. Northrop Grumman states the missile “is a gliding munition capable of precision attack from extended stand-off ranges using GPS-aided navigation and a semi-active laser seeker.”<sup>30</sup> Viper Strike has a very small warhead with low collateral damage and is advertised to hit moving vehicles at high rates of speed. Viper Strike’s limiting factor, and the reason Harvest HAWK crews shy away from employing the weapon, is the time of flight which can range anywhere from 1 to 3 minutes. The time of flight makes it very difficult to maneuver the aircraft around the objective and maintain positive identification with the target. The normal flight profiles used to employ the Hellfire or Griffin Missiles in an urban environment must be modified in order to employ Viper Strike. The time of flight makes managing laser geometry difficult to maintain due to terrain and man-made structures. Another disadvantage is Viper Strike does not have a predictable flight path, which makes deconfliction very difficult in the objective area with other CAS platforms. Due to the unpredictable flight path, the aircrew cannot assure that the missile will not pass over friendly ground forces enroute to the target. Due to the difficulty to maintain laser geometry and the time to kill, Viper Strike would not be the most advantageous weapon for Harvest HAWK to employ. The Marine Corps still has Viper Strike munitions in its inventory, but there are no plans to

purchase any more Viper Strike Missiles for Harvest HAWK.

The upgrade to Harvest HAWK Plus will have a significant impact on the aircrew's ability to perform MIR, CAS, and command and control missions. The upgraded version will have an increased on-station time, a more powerful sensor with a greater field of view, an increased communication and video transmission range, increased capacity to carry cargo and passengers, and a robust countermeasure system. The tangible upgrades to the system will enhance the crew's situational awareness and enable communicate a more informed tactical picture. The Harvest HAWK Plus's communications suite, combined with the ViaSat antenna adheres to one of Davis's priorities which is digital interoperability.<sup>31</sup>

### **Harvest HAWK MAGTF Integration**

The SPMAGTF-CR-AF uses Moron AB, Spain, as its hub location and relocates to other countries as necessary to support Marine Corps Forces Africa. SPMAGTF-CR-AF is postured to execute a variety of missions which include a Quick Reaction Force, Theater Security Cooperation, Noncombatant Evacuation Operations, Tactical Recovery of Aircraft and Personnel, Foreign Humanitarian Assistance, and Foreign Disaster Relief. The 2015 Aviation Plan states, "The SPMAGTF-CR forces are being used every day and around the world and the speed with which we employ them are attributed to the aggressive maneuverist philosophy with which we train and educate our Marines and their leader."<sup>32</sup> Currently, the SPMAGTF does not have any organic CAS platforms. The distance covered rules out the use of attack helicopters, and with no organic TACAIR, the SPMAGTF-CR must rely on MIR and CAS support from the United States Air Force or joint partners.<sup>33</sup>

In March 2013, in cooperation with the Spanish government, Moron Air Base, Spain, was selected to be the hub for the basing of SPMAGTF-CR.<sup>34</sup> Over the last three years the KC-130J

detachment has gone from two to four aircraft and the MV-22 detachment has gone from six to 12 aircraft. According to Maj Ellis, “The MV-22 and KC-130 team brings speed and responsiveness to the MAGTF that did not exist a decade ago. It also creates a paradigm shift in how the MAGTF will view the size of an area of operations.”<sup>35</sup> The SPMAGTF-CR-AF has the ability to conduct missions in an objective area 1500 NM away but does not have an organic CAS capability.<sup>36</sup> The MV-22 and KC-130 team has expanded the MAGTF area of operations outside the operational limit of the Marine Corps helicopters and jets would require additional assets to support.

Of course, some will argue to attach an HMLA or VMA squadron to the SPMAGTF, but that would only create more issues. The first hurdle would be to convince the host nations to allow those aircraft specifically designed for offensive air support into their country. Even if the SPMAGTF did have an HMLA attached, the Cobras or Hueys would have to be repositioned by either a C-17 or C-5 to get them close to the objective. Planning a strategic lift is obviously not an option for a mission that requires a rapid response. The ideal helicopter for this kind of environment would be the MH-60L Direct Action Penetrator, which is an attack helicopter that has a refueling capability flown by U.S. Army Special Forces.

The Marine Corps is used to conducting operations from sea, a Forward Operating Base, or Forward Arming and Refueling Point. The issue with the SPMAGTF area of responsibility is it requires numerous diplomatic overflight clearances to reach the objective in Africa.<sup>37</sup> It is much easier to obtain an overflight clearance than to receive a landing clearance in most countries. Due the requirement to obtain country clearances and the vast area of the operations, Marine Corps Cobras and Hueys are not a feasible option for providing close air support.

Marine Corps Tactical Aircraft (TACAIR), which consists of the AV-8B Harrier, F/A-18 Hornet, and F-35B Lightning, could provide MIR and CAS if attached to the SPMAGTF. The addition of a TACAIR squadron would increase the SPMAGTF-CR-AF footprint, which is not the intent of the Marine Corps. In order to support those jets SPMAGTF-CR-AF would require additional KC-130s or joint tankers to conduct air-to-air refueling. The Marine Corps cannot afford to put extra hours on the jets that have a very low probability to conduct a mission. One of the benefits for the Marine Corps during OEF was having Harvest HAWK alleviate some of the burden placed on the jets. It is more cost efficient to fly Harvest HAWK than a tactical aircraft. Based on 2014 cost per flight hour numbers, the F/A-18 was four times more expensive per flight hour than the KC-130J.<sup>38</sup> Unlike Harvest HAWK, which operates autonomously, the jets would require a tanker to conduct their mission. U.S. Air Forces Africa could provide the tanker, but that just adds more coordination and forces the Marine Corps to rely on joint assets. In a crisis environment, the more external players could lead to more friction. Another option is to have the KC-130s refuel the TACAIR, but that would require a plus up of KC-130s attached to SPMAGTF. Due to operation requirements, the deployment-to-dwell ratio for a VMGR squadron would only increase if required to provide more aircraft or crews.

The Aviation Plan 2015 outlines a plan to add an air-to-air refueling capability and an offensive weapon capability for the MV-22. The primary purpose for the V-22 Aerial Refueling System (VARS) is to conduct air-to-air refueling with the F-35 in conjunction with shipboard operations, with a future capability to possibly refuel MV-22s and helicopters.<sup>39</sup> In December 2014 and March 2015, AGM-117 Griffin Missiles were fired off an MV-22.<sup>40</sup> The demonstration of the capability is significant, but a precision guided weapon capability for the MV-22 is still years away from being operational. The Marine Corps must focus on the current problem, which

is no organic CAS assets in support of SPMAGTF-CR-AF, and not look to future capabilities to solve present problems.

There is no point in keeping a capability like Harvest HAWK out of the fight when it would be beneficial in the current operating environment. One argument against deploying Harvest HAWK in support of the SPMAGTF mission is the Marine Corps losing operational control of the asset. The fear is the commander of U.S. Forces Africa Command (AFRICOM) will reallocate the Harvest HAWK aircraft in support of joint operations. There are many negatives to having this capability stripped away from the Marine Corps' control. The additional burden on logistics and manpower are serious considerations when Harvest HAWK is not in a shared location with the detachment. This burden was felt by VMGR detachment in Afghanistan when the crew and aircraft were not co-located with the main detachment located at Kandahar. The aircraft was located at Camp Dwyer due to the limited parking at Kandahar. There are negatives to loosing Harvest HAWK to the joint force. The Marine Corps must take a holistic approach to National Security. If Harvest HAWK can fulfill a joint mission, then the Marine Corps should feel obligated to support. The fear of losing control of the asset to support joint operations should not be the reason Harvest HAWK does not deploy.

The Marine Corps could also deploy Harvest HAWK in support of SPMAGTF United States Central Command (SPMAGTF-CENT). Marine Corps aviation assets in support of SPMAGTF-CENT are MV-22s, KC-130Js, and AV-8Bs or F/A-18C/Ds.<sup>41</sup> Marine Corps TACAIR units are currently flying missions tasked by the Combined Forces Air Component Commander (CFACC). Since the Marine Corps does not have a large number of ground forces on the ground in Iraq it is tasked by the CFACC to support joint missions. If the Marine Corps is willing to provide TACAIR assets in support of the CFACC, then it shouldn't be an issue if Harvest HAWK gets

tasked to support joint missions. The current environment in Iraq is similar to the operating environment during OEF. The Harvest HAWK's precision guided weapons, ability to stay on station for long periods of time, and satellite communications suite would contribute toward the effort to combat Islamic State of Iraq and Syria. In the future, if Marine Corps ground forces are used to conduct kinetic missions in CENTOM area of operation then Harvest HAWK should deploy for the same reasons that the UNNS was submitted in 2008.

The Marine Corps KC-130J squadron, VMGR-152, stationed in Iwakuni, Japan is the only active duty squadron that does not have a Harvest HAWK equipped aircraft. The Marine Corps Requirements Oversight Council Decision 19-2012 cut the total number of fully operational Harvest HAWK kits by three aircraft, leaving six total kits between and 2d and 3d Marine Air Wing.<sup>42</sup> Even though there are no Harvest HAWK aircraft organic to 1<sup>st</sup> Marine Air Wing, if required, the aircraft could be requested to support operations in that region. Due to their range across the Asia-Pacific region, VMGR-152 plays a pivotal role when natural disasters. The Harvest HAWK's ability to conduct airborne command and control, and MIR with a 10+ hour on station time in poor weather conditions could greatly enhance the situational awareness for the MAGTF commander.

The Harvest HAWK is a very capable aircraft to support the SPMAGTF-CR-AF MIR and CAS requirement. In addition to its MIR and CAS capabilities, the most significant factor is often overlooked which is that Harvest HAWK does not have an aggressive posture on the flight line. It is a big difference for a country like Spain to host MV-22s and KC-130s vice hosting a TACAIR squadron. Even when armed on the ground, it is hard to see the four Hellfire missiles on the left wing of Harvest HAWK unless close to the aircraft. At a glance, it looks like the typical KC-130J. The aircraft can be configured without any external weapons and still maintain

its ability to conduct CAS utilizing the Griffin missile. The Hellfire rack could stay in place with no hellfire missiles loaded, or the left wing refueling pod could be put back on the aircraft. One of the concerns about deploying Harvest HAWK with the SPMAGTF is manpower and aircraft availability. In an ideal world, Harvest HAWK would replace one of the four aircraft deployed. The Harvest HAWK Plus's fuel load will be identical to KC-130J cargo configured aircraft. If the M299 Hellfire Rack was taken off it would give Harvest HAWK two air-to-air refueling pods. The Harvest HAWK Plus has the ability to carry passengers and cargo due to the reconfiguration of the cargo compartment. The inconspicuous profile of the Harvest HAWK may be its greatest asset. Its non-threatening posture when in support of humanitarian assistance, non-combatative evacuation (NEO), or a crisis response mission allows the MAGTF to forward deploy its most aviation asset.

The Marine Corps Aviation Plan states that the Marine Corps “expects that the forward deployed MEUs and SPMAGTF-CR will be foundational for addressing threats around the world.”<sup>43</sup> If the MEU and SPMAGTF are going to continue to be the Marine Corps crisis response units, then the KC-130J Harvest HAWK must be considered for support. Having Harvest HAWK sit on the flight line at Cherry Point and California does not help the Marine Corps or the joint players in responding to a crisis.

### **Implications to deploying Harvest HAWK**

There are many benefits to deploying Harvest HAWK in support of SPMAGTF and MEU missions. The first issue being readiness, the detachment can have a “jack of all trades, master of none” mentality. The MAWTS-1 KC-130 Division SPMAGTF-CR-AF after action report from 2014 addresses aircrew readiness to conduct long rang missions.<sup>44</sup> The KC-130J detachment from VMGR-252 said it did execute a long-range MV-22 tanking movement prior to the

detachment, but it still was not enough repetitions in order to be ready to execute upon attaching to SPMAGTF.<sup>45</sup>

VMGR-252 from Second Marine Air Wing has supported the SPMAGTF-CR-AF since its creation. Adding Harvest HAWK to SPMAGTF will only increase the deployment-to-dwell time for the squadron unless SPMAGTF will allow Harvest HAWK to replace one of the four cargo configured KC-130Js. The Marine Corps would like to increase its current deployment-to-dwell ratio from 1:2 to 1:3 but that goal has been determined unfeasible.<sup>46</sup> The deploy-to-dwell ratio ensures that for every month that a Marine is deployed he or she would be non-deployable for double the time deployed. The Marine Corps leadership feels that a 1:2 deployment-to-dwell is not long enough time to ensure the health of the Marines and the equipment.<sup>47</sup> The operational demand of KC-130 squadrons was recognized by the Assistant Commandant of the Marine Corps General Paxton in his testimony to the House Armed Services Readiness Subcommittee in March 2015. In that testimony, he discussed why all Marine Corps units can not adhere to the 1:2 deployment-to-dwell ratio.

First, for some units – infantry battalions, MV-22 Osprey squadrons, and KC-130 tanker squadrons – the problem is increased demand. The Marines’ response to that demand has been the creation of two land-based Special Purpose Marine Air-Ground Task Forces for crisis response missions in U.S. Africa Command (AFRICOM) and U.S. Central Command (CENTCOM).<sup>48</sup>

The VMGR deployment-to-dwell ratio does not meet Commandant’s guidance. The current deployment-to-ratio for VMGR squadrons is 1:1.1-1.5 depending on the squadron. In order to crew Harvest HAWK, the detachment would have to add additional pilots to operate the Fire Control Station, which would only make the deployment-to-dwell ratio worse.

SPMAGTF-CR-AF is postured to execute at the critical moment when U.S interests are at risk; in other words, it is not a consistent mission like OEF. The non-persistent mission could

negatively VMGR readiness would be if Harvest HAWK deployed and was not able to conduct MIR and CAS proficiency training. If the Marine Corps decides to deploy Harvest HAWK, the Marine Corps must ensure that there is already an agreement in place with the Spanish government and military to allow the crew to conduct training missions.

Another option for Harvest HAWK is to issue a prepare to deploy (PTO) order; this is a common practice for Marine Corps KC-130s tasked to support the MEU. In 2006, two KC-130 crews received word after going to work that day to deploy to Cyprus in order to support 24 MEU Lebanon NEO. Within 48 hours, the KC-130J detachment from Cherry Point, NC, was operational in Cyprus. The Harvest HAWK Plus can reach Moron, Spain, in one leg, less than twelve hours of flight time. At the very least, Harvest HAWK should be placed on a 96 hour PTO in order to support SPMAGTF-CR-AF operations.

There are negative implications to deploying Harvest HAWK in support of the SPMAGTF missions; however, the need for a long-range organic CAS capability outweighs the negative effects. If practicable, Harvest HAWK should deploy for the duration of the deployment cycle but the Marine Corps leadership should allow the VMGR community flexibility when feasible. Allowing Harvest HAWK to plus up the SPMAGTF when required, or operate off a PTO may be the middle ground necessary to preserve the VMGR manpower while still providing the SPMAGTF-CR-AF Commander with a required capability.

## **Conclusion**

LtGen Davis stated, “From past to present, Marine aviation has been and will continue to be active and evolving, and-like we have done since our inception-making ourselves ready to fight today's and tomorrow's battles.”<sup>49</sup> His goal is to make everything the Marine Corps flies a “sensor, a sharer, and a shooter.”<sup>50</sup> Marine Corps Aviation must continue to evolve. Every

aviation program should be focused on accomplishing Davis's goal to make every aircraft a sensor, a sharer, and a shooter. However, in chasing that goal, the Marine Corps cannot forget about current platforms that can solve today's issues. In the case of the SPMAGTF-CR-AF, they rely on U.S. Air Force capabilities when Harvest HAWK can fill the MIR and CAS gap. Until the VMGR community is tasked with a real-world mission, Harvest HAWK crew proficiency will continue to suffer. It is up to the VMGR community to ensure that Harvest HAWK aircrews stay tactically proficient in MIR and CAS for it is not known when the Marine Corps will call on them to execute operational missions. While squadrons have made an effort to increase support in large force exercises and the Weapons and Tactics Instructor Course, it is not the VMGRs primary focus of effort.

The Marine Corps understands that the key to success in today's operational environment is joint force participation. Often though, joint participation means to the Marine Corps that they keep control of its assets while filling the gaps with joint assets. The bedrock of the Marine Corps fighting force is the MAGTF, to be able to support its assigned mission with organic Marine Corps assets. The SPMAGTF-CR-AF has an identified organic MIR and CAS shortfall. Joint and coalition TACAIR assets cover the MIR and CAS shortfall. Joint assets are more than capable of providing support but additional coordination is required to receive their support. In addition to the SPMAGTF-CR-AF, Harvest HAWK is well suited to provide offensive air support to SPMAGTF-CENT. The Marine Corps should deploy Harvest HAWK in support of the SPMAGTFs and MEUs to provide them with a MIR and CAS capability that has the range to cover a large area of operation such as Africa. The VMGR community has proven its ability to conduct MIR and CAS. MAGTF planners must not forget about Harvest HAWKs combat power. The foundation of Harvest HAWK is still a KC-130J, which is capable of conducting the full

Mission Essential Task List in the KC-130J T&R. Harvest HAWK provides the MAGTF commander with the most versatile aircraft in the Marine Corps, an aircraft that is flexible to conduct a wide range of missions in an uncertain operation environment.

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<sup>10</sup> Headquarters United States Marine Corps, *KC-130J Training and Readiness (T&R) Manual*, 27 July 2015.

<sup>11</sup> Major Jason Dale, interview with author, January 21, 2016.

<sup>12</sup> Major Jason Ellis, email message to author, January 15, 2016.

<sup>13</sup> Ellis, "Built for SPMAGTF-CR Speed and Responsiveness," 22-25.

<sup>14</sup> Major Andrew Alissandratos, interview with author, January 19, 2016.

<sup>15</sup> Bock, "Force Multiplier in the Sky," 28-33.

<sup>16</sup> Davis, "Forward to the Fight." 20-22,24-26,28-30,32-42.

<sup>17</sup> Munoz, Carlo. "AFSOC, Marine Corps Collaborating on C-130 Modification Programs." *Inside the Pentagon's Inside the Air Force* 21, no. 13 (Apr 2, 2010, 2010): <http://search.proquest.com.lomc.idm.oclc.org/docview/992861755?accountid=14746>.

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<sup>47</sup> Exstein, "Gen. Paxton: Some Marine Units Operating at Less Than 1:2 Deployment-to-Dwell Ratio." March 27, 2015.

<sup>48</sup> Exstein, "Gen. Paxton: Some Marine Units Operating at Less Than 1:2 Deployment-to-Dwell Ratio." March 27, 2015.

<sup>49</sup> "Ready to Fight," *Marine Corps Gazette* 99, no. 5 (May 2015, 2015): 16-18.

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