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14. ABSTRACT

Historically, drones have been used extensively to support a plethora of U.S. military operations from land-based locations; the precision and lethality of applying these assets in the counterterrorism (CT) realm is well documented. Recently the U.S. Navy has offered the Joint Force Commander (JFC) an effective and efficient means of prosecuting targets of opportunity through the employment of sea-based unmanned aerial vehicle (UAV) assets. These UAVs can give the JFC a capability close to the fight; an asset at his disposal to improve operational and tactical flexibility and a relocatable launch platform minus the concerns of a land-based footprint.

This paper will consider the employment of maritime-based UAVs (mbUAVs) as a JFC asset from an operational art, factors and functions perspective. Employment of these assets has created an enormous appetite at the operational level for persistent intelligence, surveillance, and reconnaissance (ISR) to support CT operations. Focusing on the advantages of employing this maritime-based asset with its unique capabilities in ISR will require further doctrine development in order to adequately assist the JFC in his decision making process; it will also provide recommendations for the same and access the potential uniqueness and flexibility of these assets in the littorals and on the high seas.

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MARTIME-BASED UAVS: A KEY TO SUCCESS FOR THE JOINT FORCE COMMANDER

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: _____

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List of Acronyms

APG	Aerial Precision Geolocation
AIS	Automatic Identification System
AQAM	Al Qaeda and its Associated Movements
AQAP	Al Qaeda in the Arabian Peninsula
AOR	Area of Responsibility
BOO	Base of Operations
BAMS	Broad Area Maritime Surveillance
CJCS	Chairman of the Joint Chiefs of Staff
COG	Center of Gravity
CCDR	Combatant Commander
C2	Command and Control
COIN	Counterinsurgency
CT	Counterterrorism
DES	Desire End State
EO/IR	Electro-Optical/Infrared
FMV	Full Motion Video
HALE	High Altitude Long Endurance
HD	High-Definition
HNS	Host Nation Support
ISR	Intelligence, Surveillance, Reconnaissance
IS	Islamic State
JFC	Joint Force Commander

JOA	Joint Operating Area
lbUAV	Land-Based Unmanned Aerial Vehicle
LOO	Lines of Operation
mbUAV	Maritime-Based Unmanned Aerial Vehicle
OJL	Operation Jukebox Lotus
OE	Operational Environment
O.O.	Operational Objective
OTH	Over-the-Horizon
SIGINT	Signals Intelligence
SOF	Special Operations Forces
TCO	Transnational Criminal Organization
USAFRICOM	United States Africa Command
USG	United States Government
USSOCOM	United States Special Operations Command
UAV	Unmanned Aerial Vehicle
UCAV	Unmanned Combat Air Vehicle

Abstract

Historically, drones have been used extensively to support a plethora of U.S. military operations from land-based locations; the precision and lethality of applying these assets in the counterterrorism (CT) realm is well documented. Recently the U.S. Navy has offered the Joint Force Commander (JFC) an effective and efficient means of prosecuting targets of opportunity through the employment of sea-based unmanned aerial vehicle (UAV) assets. These UAVs can give the JFC a capability close to the fight; an asset at his disposal to improve operational and tactical flexibility and a relocatable launch platform minus the concerns of a land-based footprint.

This paper will consider the employment of maritime-based UAVs (mbUAVs) as a JFC asset from an operational art, factors and functions perspective. Employment of these assets has created an enormous appetite at the operational level for persistent intelligence, surveillance, and reconnaissance (ISR) to support CT operations. Focusing on the advantages of employing this maritime-based asset with its unique capabilities in ISR will require further doctrine development in order to adequately assist the JFC in his decision making process; it will also provide recommendations for the same and access the potential uniqueness and flexibility of these assets in the littorals and on the high seas.

INTRODUCTION

> *The operational commander should also have the ability to properly evaluate the impact of new and future technologies on the conduct of operational warfare. However, he must not focus on specific weapons or weapon platforms and sensors but should anticipate the influence these will have on the conduct of campaigns or major operations when used in large numbers.*
>
> *Milan Vego, Joint Operational Warfare: Theory and Practice, 2006*[i]

The events that transpired on the evening of September 11, 2012, resulting in the murder of four Americans including U.S. Ambassador to Libya John Stevens was another significant outrage committed in the name of Islamic terrorism. In response to those heinous acts, a whole-of-government interagency approach was undertaken to apprehend those responsible. Through the coordinated efforts of U.S. Army Special Forces, CIA, FBI, and the U.S. Navy, the operation successfully culminated in the capture of the criminal mastermind, Ahmed Abu Khatallah, on June 17, 2014.[ii] One of the more notable measures of success employed throughout the endeavor was the effective and robust intelligence, surveillance, and reconnaissance (ISR) provided by the U.S. Navy. The Navy asset responsible was an MQ-8B Fire Scout.[iii] The Fire Scout, a maritme-based unmanned aerial vehicle (mbUAV), is designed to take-off and land at the same location on a U.S. Navy ship operating in close proximity to a designated target's location within the littorals or "coastal region[s]."[iv] Assets like Fire Scout equip the Joint Force Commander (JFC) with a capability to rapidly arrive on station, provide timely and accurate ISR information to an intelligence collection manager, relative ease of recovery and quick return to action for the next mission.[v] By providing the JFC with the situational awareness and flexibility of having a capability close to the fight, mbUAVs could be an ideal capability in future counterterrorism (CT) operations.

The appalling murders mentioned above occurred in the Libyan coastal city of Benghazi. Occupying the littoral regions of the world, cities similar to Benghazi, have become increasingly more important from a "political, social, economic, and military"[vi] perspective. The 2015 version of *A Cooperative Strategy for 21st Century Seapower* stated, "70 percent of the world's population lives within 100 miles of the coastline an area known as the littorals."[vii] Dr. Milan Vego, U.S. Naval War College, Joint Maritime Operations faculty assesses that these regions have seen significant changes over the last 20 years suggesting that the littorals are driving a global economic engine.[viii] Unfortunately, the littorals globalization into urbanized commercial regions and global commerce centers has attracted the likes of terrorists, insurgents, pirates, and transnational criminal organizations (TCO) that threaten peace and stability. In order to defeat these armed groups and non-state actors, the JFC will need to optimize his counter threat advantages. The employment of mbUAVs potentially offers the JFC an unparalleled capability to exploit a number of advantages for defeating irregular threats like these facing the United States.

BACKGROUND

UAVs have been used in numerous military applications on the battlefield. It was General Henry "Hap" Arnold, Commanding General of the Army Air Forces in 1945, who envisioned the more modern idea of a conceptual shift from manned to unmanned aviation.[ix] However, his vision was never fully realized until years later during the Yom Kippur War where Israeli innovations drove the U.S. into the realm of UAV research and development resulting in the adoption of the Hunter and Pioneer programs.[x]

The Hunter and Pioneer UAVs were used extensively during the First Gulf War. According to a report published in 1993 by the U.S. House of Representatives Committee on

Armed Services, UAVs provided "substantial imagery support to Marine, Army, and Navy units during Operation Desert Storm."[xi] Operation Desert Storm commanders soon realized that the "utility of drones" would provide a "force multiplier" for future operations.[xii]

TRANSFORMING THE FUTURE: INTEROPERABILITY IS THE KEY

In the years that followed, the U.S. armed forces worked very closely with defense contractors to develop a number of UAV variants based on the lessons learned from Desert Storm. Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) presented a number of operational challenges prompting a military transformation across the entire joint spectrum.[xiii] Following a decade of sustained combat operations in Southern Asia and the Middle East, the JFC now has at his disposal a number of CT mission enhancing UAV options. According to Paul Meyer, the Sector Vice President of Advanced Capabilities Development for Northrop Grumman Integrated Systems, they have adopted an innovative approach to "the development of a system of interoperable systems possessing certain essential attributes."[xiv] One of these attributes needed was the capability to get into the fight sooner and provide the JFC persistent and reliable ISR in a timely manner. The evolution of mbUAVs has provided a response to that need.

This idea was demonstrated in 2011 when an embarked ScanEagle[xv] detachment on USS MAHAN (DDG 72) provided "essential information directly to the decision makers" during the outbreak of hostilities in Libya.[xvi]

This paper will present a critical analysis of mbUAVs and examine the JFC's advantages and disadvantages through the lens of operational art. Maritime-based UAVs empower the operational commander with the ability to properly balance the operational

factors of time, space, and force; the synchronization of operational functions in a framework that will effectively enable the JFC's decision-making process in CT operations.

By using operational art as a model, this paper will provide answers to several questions that contribute insight into the thesis – Does operational art provide a suitable framework for using mbUAVs in addressing the problems posed by non-state actors in the joint operating area (JOA)? What will be done to manage the amount of data mbUAVs provide in the network-centric environment? How will the proliferation of mbUAVs advantage or hinder the JFC in ongoing U.S. operations?

The JFC uses operational art to formulate and design a plan of action to achieve an objective by defeating an enemy center of gravity (COG). This operational idea is nested in the political and strategic desired end state (DES). For the sake of this paper it will only address components of operational art in analyzing how the use of mbUAVs enhance the JFC's ability to defeat irregular threats.

IS TECHNOLOGY THE ANSWER FOR THE JFC?

It has been said, "the basics of [operational warfare] remain immutable, only the character, driven largely by technology, has changed".[xvii] It is understood that technology is not in itself an end, but a means to an end. The conflicts facing decision makers in the post-9/11 landscape often appear very blurry in comparison to the hostilities the U.S. was confronted with in the past. Today, along with past conventional conflicts, combat operations around the world involve non-state actors who can easily penetrate the porous boundaries of fragile states struggling with instability and inadequate security apparatuses. In order to prevail in the CT and counter-insurgency (COIN) environments, the human element will continue to be an essential component in the critical decision-making process

utilizing operational art. Operational art, as it implies, is an art and not a science. It, therefore, requires a creative and innovative human input, an input critical to determining decisions that spell victory or defeat.

The tenets of operational art provide the tool necessary for the operational commander to identify, access, and deconstruct the critical strength and weakness to support victory. In *Operational Warfare at Sea*, Vego advocates operational art as the superior to technology, "[t]echnological advances have considerably affected and will continue to influence both the theory and the practice of operational art. However, in contrast to some popular views, technology will not eliminate operational art as the intermediate component of military art."[xviii] The Chairman of the Joint Chiefs of Staff (CJCS), General Martin Dempsey, who eloquently points out military operations continue to be an inherent human endeavor regardless of the "increasingly sophisticated technologies", shares a similar view.[xix] In the end, it is the human element that will make all the difference in forcing terrorist organizations to culminate. Technology will certainly help facilitate the decision-making process, but it will not by itself determine the outcome. How can the JFC successfully plan to defeat terrorism at the operational level? So, is technology the answer? In many cases technological advancements have shaped and changed the character of war such as the U.S. decision to use the atomic bomb thus ending World War II.

Crucial to victory is the JFC's understanding of balancing the factors of time, space, and force and the synchronization and sequencing of functions for success. The JFC can do this with respect to the functions of command and control (C2) and intelligence more effectively by employing mbUAVs.

MAINTAINING THE STATUS QUO: ADVOCATING LAND-BASED UAVS

Proponents of land-based UAVs (lbUAVs) would argue that mbUAVs offer no new advantages to the JFC. Land-based UAVs, such as the U.S. Air Force's MQ-1 Predator and MQ-9 Reaper offer the same level of ISR capability and have proven to be very effective in hunting down and killing terrorists in "remote areas of Afghanistan and Pakistan."[xx] But using these UAVs requires months of diplomatic planning and preparation to negotiate a base of operations (BOO) via host nation support (HNS) and approval.[xxi] Darrel Mathis, in his 2003 Naval War College paper speaks to the advantages of HNS in establishing a logistical footprint. "However, a functioning government must be available and local procurement efforts may have political ramifications"[xxii] – something the JFC would have little of no concern with when using a sea-based asset.

However, mbUAVs are still impacted by some of the similar constraints of traditional manned aircraft. Environmental conditions such as weather and sea state provide significant hindrances on the operational employment of mbUAVs. Both Fire Scout and ScanEagle are not robust airframes in comparison to equivalent manned or lbUAV assets. The lack of robustness makes these mbUAVs very susceptible to the elements. In 2012, the Naval Safety Center reported on two separate mishaps involving the Fire Scout. In both cases, the UAVs encountered icing conditions inevitably losing control and crashing into the water.[xxiii]

Land-based UAVs as well as manned aircraft maintain significant advantages in both sensor and payload capability and range and endurance over mbUAVs. The U.S. Navy recently developed, in conjunction with Northrop Grumman Corporation, the MQ-4C Triton Broad Area Maritime Surveillance (BAMS) UAV. The MQ-4C is an lbUAV modeled after the P-3 Orion and P-8 Poseidon manned aircraft.[xxiv] It is capable of 24-hour surveillance at a

range of 8,200 miles that includes sophisticated sensor payloads.[xxv] The limitations of mbUAVs in comparison to land-based counterparts in this area significantly hinder the ability to support the JFC.

With all the success that mbUAVs have had in support of the JFC, limitations are still preventing these assets from being more effective. There will always be a desire to see closer in and to provide a more informative picture of the battlefield to the warfighter, "particularly for difficult sensing situations."[xxvi] Technology that exists today, such as the VORTEX[xxvii] and ROVER[xxviii], provide tactical fires and allow troops on the ground to carry around a handheld device and view the aerial picture from the UAVs perspective. However, this technology does not provide the high-definition (HD) quality aspect operational tempo and the JFC demands.[xxix] Fiscal constraints on Department of Defense (DoD) and service budgets are making acquisition of this type of technology difficult resulting in the DoD and the services opting for more cost effective options.[xxx] Another issue that continues to limit mbUAVs is constraints imposed by the command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) infrastructure and the constant struggle to acquire more bandwidth.[xxxi] As technology improves, the issue of getting information to the end user will improve. However, according to the *National Research Council* an appetite for more information and improved technology, such as HD capabilities, will continue to place a strain on required bandwidth.[xxxii] Until this problem is remedied, the full potential of mbUAVs may not be realized.

A BALANCED APPROACH: EFFECTS ON TIME, SPACE, AND FORCE

Professor James Butler, Naval War College's Joint Maritime Operations Department advises to better understand the operational objective (O.O.) and COG, "information

obtained from analysis of the operational factors" of time, space, and force are necessary for the JFC to comprehend the operating environment and to make sound operational decisions.[xxxiii] If the JFC is to achieve the O.O., defeating known terrorist threats in the JOA, it will be necessary to acquire actionable intelligence through a persistent ISR capability. Maritime-based UAVs can accomplish that goal. In the discussion that follows, the author asserts that the use of mbUAVs will provide the necessary means to assist the JFC in balancing the operational factors of time, space, and force.

Time and Space: Getting the JFC closer to the fight – Improving operational reach. It has been said that success in combat is simply a mastery of time – the ability to reach your objective "faster than your opponent."[xxxiv] For many reasons, time is the most critical factor shaping the outcome of events because it is neither controllable nor recoverable. The JFC is always in a position where he must properly manage time. An observation echoed by General Dempsey in his *Mission Command White Paper* supporting this sentiment stating that leaders must "understand and rapidly exploit opportunities in both time and space, guided by their understanding of intent, their mission, environment and the capability of their force."[xxxv] Staying ahead of the problem requires the JFC to use all his available resources in an effective and efficient manner.

One of the many problems facing the JFC in today's operational level of warfare is the execution of CT operations in overseas environments. Terrorist organizations have penetrated the littoral regions of the world, including coastal cities in North and East Africa, making it more difficult to gather intelligence or prosecute these targets who routinely camouflage themselves among the local population. However, the Navy has recently

developed an effective means to combat these non-state actors by providing the JFC an opportunity to get closer to the fight.

The use of mbUAVs affords the JFC an increased opportunity to manage time by getting him much closer to these coastal regions in comparison to land-based assets. But equally as important is the level of persistent ISR mbUAVs provide. By keeping eyes on the target longer, the JFC not only achieves a quick response asset but one that is able to maintain a lengthy on station time, a claim shared by Scott Osborne, a member of the John Hopkins University Applied Physics Laboratory and Rear Admiral Brian Prindle, U.S. Navy, former MIT Fellow and P-3 pilot.[xxxvi] Staying on station longer allows the JFC greater ease in picking out a target in a crowded city area or determining the target's pattern of life (POL) by observing the individuals routine, day-to-day activity.

By staying close to the fight, mbUAVs allow the JFC to balance time through the intelligence function with a persistent and sustained ISR capability. These observations highlight the value mbUAVs provide the JFC in balancing time and space.

So far, it has been demonstrated that mbUAVs provide a tactical advantage over lbUAVs by getting the JFC closer to the fight. However, as UAVs proliferate in the realm of military operations, the sovereignty of states will remain a concern for the operational commander. This concern must be carefully evaluated throughout the risk mitigation process. Micah Zenko, the Douglas Dillon fellow at the Council on Foreign Relations and former professor at the Harvard Kennedy School, supports the idea of mbUAVs by suggesting that states may be more resistant to cooperate with the United States Government (USG) by allowing certain lbUAVs to penetrate their airspaces.[xxxvii] Zenko concludes that the "effectiveness of [certain lbUAVs, such as the Predator or Reaper,] would be sharply

reduced.[xxxviii] He conceives that the use of UAVs "that can be flown off U.S. Navy ships [will] lessen the need for host-state support [and fill the void left by lbUAVs]."[xxxix] In the end, the JFC will accept some level of risk to conduct mbUAV operations to track a terrorist target. By balancing time and space, mbUAVs can easily deploy from a naval vessel that does not require "HN approval to base"[xl] which not only improves operational flexibility for the JFC but also gains a quicker response asset in support of CT operations.

Space and Time: Looking beyond traditional methods towards broadened opportunities. It is understood that space is necessary to accomplish successful "military operations."[xli] Vego points out, balancing the factors of time and space will provide the operational commander some advantages and opportunities in achieving his objective such as "shorter lines of operation" and the ability to quickly deploy "forces closer to the scene of potential conflict."[xlii] It is these advantages that mbUAVs provide the JFC and are necessary to be successful in the littorals.

The littorals are changing the landscape of today's battlefield. The challenges of these urbanized 'spaces' require innovative ideas and creative ways of countering the threats that exist in these regions. The operational reach of mbUAVs provides the JFC a way to shrink the lines of operation (LOO) and overcome space domain challenges. The recent *Unmanned Systems Integrated Roadmap FY2013-2038* provided a reflection of this reality as the U.S. transitions from hostilities in Iraq and Afghanistan. "DoD is looking beyond Iraq and Afghanistan towards a world of rapid deployments to trouble spots where airfields may not be available … [Commanders] expect to focus on contingency missions where the United States may have no established presence. [Unmanned aerial systems] UAS must then operate from ships or beaches rather than from fixed spaces."[xliii]

The shorter distances from base to the target area that mbUAVs enjoy allow the JFC to balance time and space that significantly improves his operational reach. It is understood that supporting CT operations may be inherently more risky than in other types of missions. To mitigate this risk and minimize the type of incidents described above, Navy officials are working closely with defense contractors such as Northrop Grumman and Boeing to create more robust mbUAVs capable of operating in the harsh maritime environment.

Force: Fostering economy of force and concentration of effort. The term force is normally understood to mean the "military source of power."[xliv] However, it can mean a number of things both physical in nature as well as those elements that are more abstract in meaning. In terms of mbUAVs, the operational impact for the JFC is significant in two ways.

First, in a tangible sense, mbUAVs are a joint capability providing the JFC with "multiple operational and tactical options in carrying out his responsibilities."[xlv] By providing effective and persistent ISR, mbUAVs give the JFC an unparalleled force multiplier capability in any waterspace whether that is the littorals or the high seas. Following the events described in the introduction, U.S. Africa Command (USAFRICOM) responded to the crisis by uniting a contingency of DoD and interagency groups that cooperatively and collectively worked to apprehend terrorist suspects involved with the incident. *Operation JUKEBOX LOTUS* (OJL), as it was known, was a joint effort in which ISR assets, specifically mbUAVs, played a significant role in providing crucial intelligence throughout the operation to the JFC.[xlvi]

In April 2009, after the *Maersk Alabama* and its crew were hijacked by a group of Somali pirates, the ScanEagle demonstrated its profound impact at the operational level.

This mbUAV played a crucial role in a joint effort by U.S. Naval Forces Central Command and U.S. Special Operations Command (USSOCOM) by providing real-time video as events unfolded.[xlvii] The end result was the successful rescue of the *Maersk Alabama's* crew and pirate apprehension as portrayed in the 2013 movie *Captain Phillips*.[xlviii] Taking place on the high seas, this event demonstrated the operational flexibility of mbUAVs regardless of the waterspace.

Secondly, mbUAVs can provide the JFC an intangible means in the form of psychological effects on an adversary. To a lesser extent, it is possible that if a terrorist has an idea that a UAV may be watching his every move, the UAV may provide a deterrent effect and prevent the target from committing further violence.[xlix]

Maritime-based UAVs remain a very operationally flexible JFC tool. This flexibility allows a much more diverse and unique capability with the advent of the "dual-air vehicle" (DAV) concept of operations (CONOPS). A concept unique only to the Fire Scout at this time, DAV allows a single mbUAV operating crew to maintain continuous ISR coverage over a target with multiple mbUAVs.[l] DAV operations allow the Fire Scout to mitigate its limitations and maintain a sustained and persistent ISR presence over a target more effectively.[li] Having this type of airborne redundancy, the JFC is able to gain multiple perspectives over a given target area simultaneously by balancing the factors of time and force for more effective CT operations.

EMPLOYING MBUAVS TO SYNCHRONIZE AND SEQUENCE FUNCTIONS

Similar to the operational factors, the functions provide the JFC the ability to not only understand his own strengths and weaknesses but also the capabilities of the enemy so the JFC can make sound decisions on how to exploit its vulnerabilities. Joint Publication 3-0

Joint Operations defines joint functions as "related capabilities and activities grouped together to help JFCs integrate, synchronize, and direct joint operations."[lii] It is essential that military operations are properly synchronized, coordinated, and integrated to ensure unity of effort across the entire interservice spectrum in order to achieve success at the operational level of war.[liii] In this way, the U.S. Navy provides a force multiplier to support the JFC through the use of mbUAVs in a cooperative effort creating an effective joint partnership.

The discussion that follows will focus on Command and Control (C2) and Intelligence since they "apply to all operations."[liv] By disregarding the remaining four functions, the paper does not imply a lack of importance of those other functions at the operational level. It is simply articulating that the C2 and intelligence functions are more relevant to the employment of mbUAVs in the joint environment.

Command and Control: A balanced approach towards Mission Command. In today's vast battlespace, the JFC is confronted with an adversary who has proven to be both elusive and resilient by using the littorals to his advantage. Overcoming these threats challenge the JFC. Groups such as Al Qaeda and its associated movements (AQAM) and the Islamic State (IS) threaten peaceful states and their coastal areas when spreading radical Islam. These groups are becoming more savvy and proficient by inducing fog and friction through cyber operations such as electronic jamming and spoofing and deception techniques designed around elaborate viruses that disable network centric systems – a significant threat to mbUAV operations.[lv] These non-lethal, asymmetric attacks from hackers can happen anywhere at anytime by the push of a button disabling an entire military infrastructure and capability.

The JFC must synchronize his C2 structure in an effective manner to achieve his objective of defeating known terrorist suspects and other criminal adherents. According to U.S. joint doctrine, "C2 encompasses the exercise of authority and direction by a commander over assigned forces to accomplish a mission."[lvi] Through effective C2, the JFC can use mbUAVs as a means to shrink the battlespace and overcome an own small force-to-space ratio with time-sensitive reconnaissance, situational awareness, and precision targeting support.

C2 is the most important function because it synchronizes and links the other functions. C2 involves the human element that drives the other functions. Exercising the appropriate level of C2 is, therefore, necessary by the JFC in employing his forces. By using effective C2, the JFC is able to use mbUAVs to provide actionable intelligence acquired via the efforts of his tactical subordinate commanders.

Finding the appropriate level of C2 can sometimes be challenging for a commander who operates in a network-centric battlespace populated by ISR platforms and sensors emitting a continuous flow of data and information. All this available data can sometimes have serious repercussions. One detrimental effect is in the breakdown of centralized control and decentralized execution – a joint operational tenet where the relationship between the operational commander and his tactical subordinates can be jeopardized by extensive oversight. Vego, in *Operational Warfare at Sea*, expounds on this point referring to it as a "serious problem" by "restricting freedom to act throughout the chain of command."[lvii] General Dempsey makes a similar observation of this phenomenon in his *Mission Command White Paper* resulting from the inevitable pitfall of micromanagement.

> "In a network-enabled force, the commander can easily penetrate to the lowest level of the command and take over the fight. This is dangerous for a number of reasons.

> No C2 technology has ever successfully eliminated the fog of war, but it can create the illusion of perfect clarity from a distance. This can lead to micromanagement, a debilitating inhibitor of trust in the lower echelons of force."[lviii]

The 'inappropriate' C2 as described above highlights the potential issues that could develop at the operational level preventing subordinate commanders the freedom of action to make tactical decisions. The use of mbUAVs can inhibit this C2 breakdown by providing a mechanism for tactical subordinates to prosecute efficiently a target in a timely manner without the unnecessary micromanagement of the operational commander as described above.

However, there are those situations that require a "more detailed control" of certain situations as described by General Dempsey in his *Capstone Concept for Joint Operations.*[lix] CT operations that involve high-profile terrorists, such as the Bin Laden raid in May 2011, warrant more control by decision makers who can witness tactical actions real time thanks to advanced sensors. That operational reach, though, needs to be tempered with the appropriate level of C2 that begins with the commander's intent and trust in his subordinates to execute mission command. This commander's trust empowers the JFC to promote the important joint operational tenet of centralized control and decentralized execution.[lx] Mission command coupled with clear and concise joint doctrine offers a tremendous advantage; an enhanced advantage gained through the use of mbUAVs. This is particularly useful in high visibility CT operations.

Intelligence: The right information to the right user at the right time. "The nature of warfare has changed significantly," blurring the lines "between civilians and combatants."[lxi] The previous statement does represent truth considering the littoral areas throughout the world, similar to those described above in places such as North Africa and the

Middle East, are plagued by Islamic extremists and other criminal organizations. The proximity of terrorists to the civilian populations in these areas makes it increasingly challenging for the JFC to target and defeat these groups. Staying ahead of these threats is a serious concern that the JFC can attack by balancing time and synchronizing the intelligence function. In order to balance time and gain the initiative, the JFC must have the necessary resources to gain actionable intelligence. In the littorals I submit a key resource necessary is the JFC's employment of the effective ISR capability of mbUAVs. Sensors like the mbUAV can be used to acquire the initiative and potential freedom of action necessary to disseminate crucial intelligence to the warfighter in a timely manner.

"The intelligence function supports [understanding of the operating environment (OE)] … [It] tells JFCs what the enemy is doing, what the enemy is capable of doing, and may do in the future."[lxii] Sensor technology has provided the JFC with a distinct advantage in understanding the non-state actor and their intentions. Advanced sensors on mbUAVs such as electro-optical/infrared (EO/IR) cameras provide crucial full motion video (FMV) used to watch the activities of suspect individuals.[lxiii] The aerial precision geolocation (APG) capability provides the necessary signals intelligence (SIGINT) to determine the POL of certain targets.[lxiv] It was the use of these sensors onboard the mbUAVs used during joint OJL and the *Maersk Alabama* events that helped result in successful efforts.

These sensors are making additional advances that will add to the technological advantage. Future mbUAV variants will include additional payloads such as airborne identification system (AIS)[lxv] and radar that will provide a better over-the-horizon (OTH) capability to the JFC. These advancements, in conjunction with an array of existing weaponized payloads, will further improve the operational flexibility and operational reach

of mbUAVs in any environment, at any time.[lxvi] By providing a sustained and persistent ISR capability, mbUAVs are able to synchronize intelligence with operations and plans to achieve the JFC's desired effects in the least amount of time.

CONCLUSION

> *A warship can be a way of forward-deploying national territory [and] bringing all the national freedom of action that implies.*
>
> *Jane's Navy International, 2015*[lxvii]

It appears political instability will continue to be a contributing driver behind sectarian violence and uncertainty that threatens U.S. interests in certain regions of the world for the foreseeable future. Events triggered by groups such as IS in its continued attempts to establish a regional caliphate, the destabilization of the Arabian Peninsula by groups such as the Houthis and Al Qaeda in the Arabian Peninsula (AQAP), and the continued civil unrest in the wake of the Arab Spring of 2010 in Northern Africa are prime non-state actors and instability causing examples. To overcome the threat posed by these groups, the JFC must continue to employ innovative and creative approaches. The threat has managed to proliferate in the littoral areas as well as the high seas. Prosecuting these criminal elements is now significantly more challenging in the littorals due to civilian proximity. The objective of mitigating terrorist activities by minimizing the spread of Islamic extremism can be enhanced through the evolutionary growth of and use of mbUAVs. The USG in cooperation with defense contractors must work to develop better and more effective High Altitude Long Endurance (HALE) UAVs such as the U.S. Air Force's RQ-4 Global Hawk and the U.S. Navy's MQ-4C Triton. The lbUAVs described above give the JFC the ability to project a long-range ISR presence capable of staying on station for a sustained period of

time. However, these assets require more planning and coordination and do not provide the JFC operational flexibility in an adversarial littoral environment.

A path forward for the JFC that will provide a measure of success and an innovative approach is through the use of mbUAVs and the levels of persistent ISR capability it promotes. As irregular threats continue to make conditions more challenging, especially in the littoral regions of the world, there will always be an ever-growing appetite for more information. The Navy will continue to appease this appetite by providing a persistent ISR capability through the use of mbUAVs that are able to meet the demands. In their 2003 article, Osborne and Prindle supported this claim by stating, "naval ISR programs appear to be designed to address such threats in both littoral and urban warfare environments and promise to provide the detail and persistence warfighters believe they need to defeat threats under uncertain and challenging conditions."[lxviii] This endorses the idea that mbUAVs are able to provide the JFC a quick response by getting him to the fight quickly and providing a presence over a target for a sustained period of time in the littoral environment.

The challenges that the end user faces today is how to effectively utilize the plethora of data that mbUAVs are providing in the ever important network centric environment. General Dempsey recently spoke of these challenges in his *Intelligence, Surveillance, and Reconnaissance Joint Force 2020 White Paper* and underscored a number of problems that persist, specifically in terms of 'efficiency of information'.[lxix] General Dempsey stated,

> "These ISR assets provide us with more data than a previous generation would have believed possible. However, they now present a massive challenge: to build ISR capabilities that rapidly provide Warfighters and decision makers with fused intelligence they can act on, rather than proliferating a multitude of systems that may only bury these users in data."[lxx]

However, these challenges can be minimized and overcome with an emphasis on joint UAV doctrine combined with a sustained focus on mission command.

Conflicts today are not likely to mirror those of the past. Large conventional military forces similar to what had been used recently in OIF and OEF are likely a thing of the past due to the fiscal costs associated with manning, equipping, and training those forces. Irregular threats such as al Qaeda and IS are shaping the operational environment and forcing the JFC to adapt and field innovative technology as a means to achieve the objective – defeating the adversary.

To achieve the objective, the JFC must first start by balancing the operational factors and synchronizing and sequencing the joint functions through the use of mbUAVs. Offering a fantastic opportunity to get close to the fight, mbUAVs are not constrained by a land-based footprint. Second, by providing increased operational flexibility and agility, mbUAVs provide the JFC with a greater freedom of action and the ability to extend operational reach in the joint environment of CT operations. Capable of aerial refueling, Northrop Grumman's X-47b unmanned combat air vehicle (UCAV) an advanced mbUAV is demonstrating the continued flexibility and unlimited potential of these assets in support of joint operations.[lxxi] Finally, success will be dependent on the integration of joint forces and reliance on innovative ideas that focus the warfighter and decision makers on employing the right combination of doctrine and technological changes that will shape future operations.[lxxii]

RECOMMENDATIONS

The use of mbUAVs as a tactical asset able to provide sustained and persistent ISR has afforded the JFC a significant advantage in the realm of CT operations. Many of these advantages have been described throughout the course of this paper. However, there are also

a number of challenges that exist, leading to some recommendations for doctrinal consideration.

First, the use of ISR has drastically changed over the years with the number of conflicts involving the U.S. There is only one publication that addresses the use of UAVs in a joint context. The Joint Publication 3-55.1 *Joint Tactics, Techniques, and Procedures for Unmanned Aerial Vehicles*[lxxiii] was published in 1993. As Reinhardt, James, and Flanagan have pointed out, "it is outdated and does not reflect the capabilities of current systems",[lxxiv] to include mbUAVs. A concerted effort must be undertaken to address the many changes that have occurred since its last revision. Interoperability of mbUAVs, as ISR assets, has altered the character of warfare requiring a more intrusive look at the tactics, techniques, and procedures (TTPs). In his *Capstone Concept for Joint Operations*, General Dempsey has commented on the need for "global standardization" in which TTPs will be standardized across the joint global network allowing forces to seamlessly transition from one theater to the other.[lxxv]

Secondly, as the Services and Joint Forces have become more dependent on network centric capabilities, information management has become increasingly important to the decision maker and warfighter alike. The dependency on these networks has created an enormous amount of collected data than can be adequately processed. To mitigate this problem, it will be necessary to invest valuable resources that can manage and synthesize this data in a timely and effective manner.[lxxvi] The *ISR Joint Force 2020* adequately addresses this problem by proposing collaborative efforts making the use of mbUAVs by the JFC much more efficient ISR assets.

Third, the development of a comprehensive ISR joint doctrine should focus on refining C2 capabilities to avoid the inherent problems with centralized control and decentralized execution. The enormous amount of data collection from the various ISR sources has almost encouraged an "over-intrusive" response from senior leadership. To avoid the pitfalls of micromanagement by operational commanders at the tactical level, it is imperative that doctrine discriminate the clear lines of responsibility. Further, a joint ISR architecture must be developed that caters to the appetite of both the decision maker and warfighter and minimizes the problems described above. As one author has pointed out, focusing doctrine on communication throughout the chain of command "can reduce mutual interference and offer solutions to problems of information flow."[lxxvii]

Finally, continue to build and refine a joint ISR architecture that is able to support the decision makers in an organized and more efficiently managed way without impeding on the efforts of tactical commanders. It requires increases in bandwidth usage necessary for the operational demands. Through process improvements and technological advancements such as HD cameras, the operational commander will be provided a more detail-oriented picture.

Though the recommendations suggested above are not all encompassing, these suggestions provide a good starting point for the JFC as a way forward in using mbUAVs at the operational level of war. If executed effectively, mbUAVs could have a profound impact on disrupting irregular threats that are proliferating the littorals throughout the world. Is it time for the joint force to embrace the unlimited potential mbUAVs bring to the fight now and in the future? The answer to that question is a resounding yes.

NOTES

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[ii] Michael Martinez, Evan Perez, Barbara Starr, "Sources: Benghazi 'mastermind' captured without a single shot fired," *CNN.com*, June 17, 2014, accessed on March 8, 2015, http://www.cnn.com/2014/06/17/world/africa/benghazi-suspect-captured/.

[iii] The MQ-8B Fire Scout is a vertical take-off and landing unmanned aerial vehicle (VTUAV). Manufactured and engineered by Northrop Grumman Corporation, it was designed to provide situational awareness and precision targeting support to the military services. Originally designated the RQ-8A, the U.S. Navy placed a contract with Northrop Grumman in March 2004 and redesignated it MQ-8B for deployment on Littoral Combat Ships (LCS). It is modeled after a four-bladed rotor, Schweitzer 333 helicopter capable of an eight-hour endurance based on payload configuration. Baseline payload incorporates an AN/AAQ-22D electro-optical/infrared (EO/IR) BRITE Star Block II camera as well as a weapons capability upgrade (WCU) package that includes TWISTER and VORTEX modules. Additional payload upgrades will include radar and electronic support measures (ESM) as well as modifications to carry the Advanced Precision Kill Weapon System (APKWS). These additional payload items are more likely to be included on the next generation Fire Scout, the MQ-8C. See http://www.naval-technology.com/projects/fire-scout-vtuav/ for more detail.

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[xiv] Ibid.
[xv] ScanEagle is a low-cost, long-endurance UAV designed and engineered by Boeing in cooperation with the Insitu Group that entered service in 2005. Equipped with an inertially stabilized EO/IR camera, it provides real-time intelligence and situational awareness. Designed for modular mission upgrades, it has recently been outfitted with one of industry's smallest Synthetic Aperture Radars (SAR), capable of providing high quality ground imagery through challenging environmental conditions. The next generation of ScanEagle, known as the NightEagle, has been designed and awaiting operational testing. It will be capable of nighttime operations. A versatile asset, ScanEagle does not require an airfield for launch or recovery. Instead the Isitu "Superwedge" launcher provides the system its take-off capability and the "Skyhook" retrieval system supports its recovery operations. See http://www.naval-technology.com/projects/scaneagle-uav/ for more detail.
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[xxxiii] James P. Butler, "Operational Factors (Seminar)," (Joint Maritime Operations, February-June 2015 Syllabus, Naval War College, Newport, RI, 2015), 63.
[xxxiv] Vego, *Joint Operational Warfare*, III-19.
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[xxxix] Ibid.
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[xli] Vego, *Joint Operational Warfare*, III-7.
[xlii] Vego, *Operational Warfare at Sea*, 126.
[xliii] DoD, *Unmanned Systems Integrated Roadmap*, 80.
[xliv] Vego, *Joint Operational Warfare*, III-33.
[xlv] Ibid., III-44.
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[l] Mike Gerhart, "Fire Scout: Is the Future Now?," *Rotor Review*, Winter 2014, 57, accessed on March 12, 2015, http://issuu.com/rotorrev/docs/rr123digitalver3?e=3739680/7000489. The author is a former Fire Scout detachment OIC who thinks DAV is an effective CONOPS that could be employed by any number of future mbUAV variants. DAV operations was a very effective tool in developing POL on Ahmed Abu Khatallah during *Operation Jukebox Lotus*. The effectiveness of DAV operations was one of the most significant reasons for Abu Khattah's capture and apprehension.

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[liii] Ibid.

[liv] Ibid.

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[lxii] CJCS, *Joint Operations*, III-20.

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