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**JOINT FORCES STAFF COLLEGE
JOINT ADVANCED WARFIGHTING SCHOOL**

**PREPARING FOR THE LONG WAR:
TRANSFORMATION OF UAVS IN FUTURE FORCE STRUCTURE PLANNING
FOR
JOINT CLOSE AIR SUPPORT OPERATIONS**

by

Daren S. Sorenson

Major, USAF

A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning and Strategy.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

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14 April 2006

ABSTRACT

As the U.S. military is deeply engaged in the Global War on Terrorism, it must face the challenges of juggling transformation and combat operations around the globe. Special care must be given to satisfy the requirements of the combatant commander during a time of war and the long term requirement to maintain a credible military force capable of executing a major theater war in support of the U.S. National Security Strategy. The forces are stretched thin and equipment is starting to wear out. The nation's combat aircraft are older than they've even been in the past and new aircraft are not being developed and procured fast enough to replace the aging fleet. If current operations remain at their current levels, the nation could face an airpower capability shortfall if a scenario developed that required a major air operation in a combatant commander's overall campaign. The development and use of unmanned aerial vehicles must be carefully considered.

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ACRONYMS

AAA	Anti-aircraft Artillery
ACTD	Advanced Demonstrator
AEF	Air Expeditionary Force
AEW	Air Expeditionary Wing
AI	Airborne Interdiction
AO	Area of Operations
AOR	Area of Responsibility
ATO	Air Tasking Order
BDA	Battle Damage Assessment
BLACS	Barometric Low-Altitude Control System
C2	Command and Control
CAS	Close Air Support
CAOC	Combined Air Operations Center
CENTCOM	Central Command
CFACC	Combined Force Air Component Commander
CFLCC	Combined Forces Land Component Commander
CJTF	Combined Joint Task Force
COA	Course of Action
COMINT	Communications Intelligence
CONOP	Concept of Operations
CI	Counter Insurgency
CT	Counter Terrorism
DARPA	Defense Advanced Research Projects Agency
DCO	Direct Control Operators
DMZ	Demilitarized Zone
DOD	Department of Defense
ECM	Electronic Countermeasures
ELINT	Electronic Intelligence
FOB	Forward Operating Base
GAO	Government Accounting Office
GWOT	Global War on Terrorism
ISR	Intelligence, Surveillance and Reconnaissance
IPL	Integrated Priority List
JAWS	Joint Advanced Warfighting School
JDAM	Joint Direct Attack Munition
JFCOM	Joint Forces Command
JOA	Joint Operating Area
JSCP	Joint Services Capabilities Plan
JTAC	Joint Terminal Air Controller
JTF	Joint Task Force
KTO	Kuwaiti Theater of Operations
LGB	Laser Guided Bomb
MARSOC	Marine Corps Special Operations Command

MAW	Marine Air Wing
MCO	Major Combat Operations
MEF	Marine Expeditionary Force
NTISR	Non-traditional ISR
OAF	Operation Allied Force
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
ONW	Operation Northern Watch
OSD	Office of the Secretary of Defense
OSW	Operation Southern Watch
OTH	Over the Horizon
PGM	Precision Guided Weapons
PID	Positive Identification
QDR	Quadrennial Defense Review
QRF	Quick Reaction Force
ROE	Rules of Engagement
ROVER	Remote Operations Video Enhanced Receiver
SAM	Surface to Air Missile
SDB	Small Diameter Bomb
SOF	Special Operation Forces
TAC	Tactical Air Command
TACP	Tactical Air Control Party
TST	Time Sensitive Targets
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Aerial Vehicles
XCAS	On Call CAS

CHAPTER 1

INTRODUCTION

“The unmanned aerial vehicle is able to circle over enemy forces, gather intelligence, transmit information instantly back to commanders, then fire on targets with extreme accuracy. Now it is clear the military does not have enough unmanned vehicles. We’re entering an era in which unmanned vehicles of all kinds will take on greater importance.”

-President George W. Bush

Currently in both Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), there are considerable numbers of conventional air assets deployed in theater to support joint Close Air Support (CAS) missions. The high deployment rate of these limited assets will have a dramatic effect on our nation’s airpower capability in the years to come. Due to the high cost of fighter aircraft research and development, new aircraft are not being developed and procured fast enough to replace our aging fleet. If current operations continue at this pace, our nation could face a capability shortfall if a scenario developed that required a major air operation during the overall campaign. A new force structure for joint CAS operations needs to be developed to be used in operational level planning. This structure should be based more on newer technologies and capabilities found in Unmanned Aerial Vehicles (UAVs) and less on conventional fighter or strike aircraft. This bias towards less fighter aircraft deployed will extend the life of our nation’s critical airpower capability and help ensure our dominance for the future.

The 2006 Quadrennial Defense Review (QDR) report states that the United States is a nation engaged in what will be a long war. One of the key fundamental imperatives for the Department of Defense (DOD) listed in the QDR is to “Continue to reorient the Department’s

capabilities and forces to be more agile in this time of war, to prepare for wider asymmetric challenges and to hedge against uncertainty over the next 20 years.” One of the four priorities of the focus of the QDR is “Defeating terrorist networks” and it describes a key adjustment to better capture the realities of a long war by, “Giving greater emphasis to the war on terror and irregular warfare activities, including long-duration unconventional warfare, counterterrorism, counterinsurgency, and military support for stabilization and reconstruction efforts.”

Over the past four years joint forces have adapted to the demands of long-duration, irregular operations. One of the greatest challenges facing U.S. forces is finding the enemy and then rapidly acting on that information. The long war against terrorist networks extends far beyond the borders of Iraq and Afghanistan and includes many operations characterized by irregular warfare – operations in which the enemy is not a regular military force of a nation-state. Long-duration, complex operations involving the U.S. military, other government agencies and international partners will be waged simultaneously in multiple countries around the world, relying on a combination of direct and indirect approaches. Above all, they will require persistent surveillance and vastly better intelligence to locate enemy capabilities and personnel. A key capability listed in the QDR for defeating terrorist networks is “**Persistent surveillance to find and precisely target enemy capabilities in denied areas.**” The QDR goes on to describe visions for joint air capabilities that are systems with far greater range and loiter ability; larger and more flexible payloads for surveillance or strike; and the ability to penetrate and sustain operations in denied areas. But this is as far as this transformational vision extends. While there are several service and joint efforts underway to explore the extent of this persistent surveillance and strike capability, a strategic plan to implement these

transformational capabilities does not exist¹. Current Concepts of Operations (CONOPS) that do exist employ the systems but are not truly transformational, but merely add a capability to existing operations and tactics, techniques and procedures (TTPs).

As the QDR states, “the military’s role in the long war will likely be characterized by irregular warfare”. Yet, after four years of military action in the war on terror, we continue to use many conventional assets in an unconventional war. Due to the enormous scope of military transformation, this paper is focused on the joint air component capabilities to best support the visions stated in the 2006 QDR. It is this author’s opinion that the current vector of the services and joint organizations is on the correct path, but falls short of achieving true transformation in this area.

Transformational air component capabilities addressed in this study will focus on operations other than Major Combat Operations (MCO). Force structure, capabilities and campaign planning for MCOs fall beyond the scope of this study. Air component operations that will be discussed in depth are low-intensity CAS missions, unconventional and counterinsurgency operations and the transformational concepts of “persistent surveillance and strike”. Currently, these mission requirements are being filled by traditional air component strike assets in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) in the CENTCOM Area of Responsibility (AOR). These assets are composed primarily of conventional fighter and bomber strike aircraft and Intelligence, Surveillance and Reconnaissance (ISR) platforms. While traditional strike aircraft have proven effective in supporting CAS missions, they are hardly an efficient long-term solution to supporting the Global War on Terror (GWOT). CAS for the long war could not have been foreseen prior to

9/11, but now that the requirement exists, it is critical to understand why the status quo is not an acceptable solution.

Aircraft have been doing CAS since they first carried bombs but due to the complexity and risk of employing high explosive weapons in close proximity to friendly troops, the CAS mission was traditionally reserved for a select few airframes and highly trained aircrew. This was mainly due to the tactics required for effective CAS. Early weapons consisted of unguided “dumb” bombs, rockets and bullets. These older weapons forced the aircraft to deliver them at low altitudes and close ranges; directly in the heart of enemy weapon’s envelope ranges. Due to the high number of aircraft losses across all services in Vietnam, the A-10 was designed specifically for the CAS mission and entered service in the Air Force in 1975.ⁱⁱ For approximately the next 25 years, the A-10 became the primary and often preferred CAS platform for the U.S. military. While the A-10 community focused on CAS, other airframes focused mostly on airborne interdiction (AI) missions which had no interaction with friendly forces on the ground. One of the common justifications for not having to train to the CAS mission was that the risk was too high for aircraft other than the A-10 and the high loss rates that were seen during Vietnam were unacceptable. This philosophy prevailed until precision guided weapons (PGMs) came of age. Even though PGMs were first used at the very end of Vietnam, they saw limited combat during Desert Storm in 1991.ⁱⁱⁱ It wasn’t until OEF in 2001 that PGMs finally became a dominant weapon for CAS and completely changed how all services now look at supporting ground commanders.^{iv}

PGMs had proliferated to most strike airframes by the time OEF started. Most fighter aircraft were equipped with either laser guided bombs (LGBs) or precision missiles. Bomber aircraft were capable of dropping the relatively new Joint Direct Attack Munition (JDAM)

which adds an inertial navigation system/global positioning system (GPS) guidance kit to legacy dumb bombs to form an extremely accurate weapon. These weapons allowed CAS employment tactics to change from low altitude to higher altitude deliveries without sacrificing accuracy which lowered the risk to aircraft and aircrew. This new capability allowed senior leaders to categorize most platforms as “CAS capable” for the purposes of supporting the large CAS requirement from the ground forces in OEF. It soon became clear that if you wanted to participate in OEF and the GWOT, you had better start training for the CAS mission. OEF became the first for many. Not only was it the first time many of the airframes had ever performed CAS, but it was the first time since Desert Storm that all services were contributing to joint CAS operations.^v Many lessons have been learned since the beginning of OEF, but it is easy to overlook the fact that all services continued to be engaged in joint CAS missions in support of both OEF and OIF.

Even though the threat has changed significantly in both OEF and OIF, the CAS requirements have remained relatively static. This is due in part to several factors. The first factor is the standing requirement from the land component commander. The ground commander sets the requirement for CAS based on the situation on the ground and the projected need for CAS support for daily combat operations and force protection. The issue with the standing requirements is how they are resourced by the air component. Currently, the air component is filling the standing requirements through a politically correct process using available assets from all services. Current long range plans show very little change to this current process.^{vi} The problem with this philosophy is three fold. First, this process is being funded through supplemental war funds and it doesn’t appear any thought is being given to the cost inefficiencies of the current force structure. Second, many of the airframes

being used today for CAS in the long war are the same airframes that flew in Desert Storm, the endless years of the no-fly zones over Iraq in Operation Northern and Southern Watch (ONW, OSW), Operation Allied Force (OAF), and now OEF and OIF today. As the airframes reach and now exceed their expected service life, the services are forced to use band-aid repairs to extend their life for the foreseeable future.^{vii} Lastly, aircrew skill sets are extremely perishable. With the current transition from the F-15C to the F-22A, there is no longer a single mission aircraft in the U.S. military. As aircrew train to multiple missions, precious flight time must be divided between missions and the weight of effort is often given to the current fight. Over-confidence from past successes in air-to-air combat has also contributed to the decline of emphasis in air-to-air training within the service components. As the long war continues, critical aircrew skills needed for major combat operations will continue to wither away on the vine if the long term force structure philosophy doesn't change.

This study will examine a new force structure for joint CAS requirements for the long war against terrorism. This structure would be based more on newer technologies and capabilities found in UAVs and less on traditional strike aircraft. This bias towards less fighter aircraft deployed would extend the life of our nation's critical airpower capability and help ensure our dominance for the future.

CHAPTER 2

HISTORY OF UAVs

As the GWOT continues on as the long war, the contributions of unmanned aircraft to the combatant commander continue to increase. As of September, 2004, twenty different types of UAVs have flown over 100,000 total flight hours in support of OEF and OIF.^{viii} Their missions have expanded from just ISR to Time Sensitive Targeting (TST), force protection, and communication relay. These systems range in cost from a few thousand dollars to tens of millions of dollars, and range in size from miniature drones weighing less than a pound to full size aircraft that weigh over 40,000 pounds.^{ix} The scope of this study will be limited to large UAVs capable of delivering PGMs, but it is important to understand the history of UAVs and how they have evolved within the DOD.

The first use of an unmanned aircraft as an instrument of destruction was during World War II when the Germans used the V1 missile and V2 rockets against London. The Allies also experimented with unmanned aircraft packed with high explosives and remotely controlled by radios. The V1 was a German revenge weapon that carried 2,000 pounds of high explosives and an internal guidance system, attained a maximum speed of 360 mph but only managed to deliver about 25 percent of its bombs on its intended targets of Britain and Belgium.^x

On 16 June 1944, ten days after the Normandy Invasion, Germany launched 244 V1 missiles at England. A total of 144 V1 missiles crossed the English Coast with 73 impacting the London area just 22 minutes after launch.^{xi} With the reign of missiles and bomber attacks

on London, the Allies retaliated with strikes on the V1 ground launching sites forcing Germany to move the sites away from the coast. In July 1944, the German Luftwaffe designed the air-launched V1 missile to counter the threat to ground launching sites. Technological improvements in navigation, extended range and radio emitters allowed these air-launched V1s to continue their reign of terror over Great Britain for seven months. During this seven month offensive, 2,419 of 8,892 V1 missiles reached the London region killing 7,810, injuring 17,981 and interrupting work in 30,000 factories as compared with 51,509 killed 61,423 injured by conventional bombing in the United Kingdom during the whole war.^{xii} Their small size, great speed, and dispersed launch sites greatly enhanced the effectiveness of this new unmanned weapon. The V1 missile forced the Allies to develop an air defense system and proper tactics to counter this new threat.

The Germans continued development of the V1 concept and eventually fielded the German V2 rocket. The more capable V2 rocket carried one ton of high explosives, burned 8.5 tons of liquid oxygen and alcohol, traveled 300 miles at over 3,500 mph and struck 40 percent of its targets.^{xiii} Fortunately for the Allies, the V2 rocket was extremely expensive to maintain as the Allies were not able to counter this weapon.

The United States attempted to enter the unmanned aircraft arena to mitigate the massive loss of bomber and fighter pilots during the strategic bombing campaign. Initial efforts to field an unmanned aircraft included the GB-1 glide-bomb which consisted of a 2,000 pound general purpose bomb fitted with twelve foot wings, fins, a tail plane and an autopilot. The Army Air Corps glide bomb was used to strike railroads and bridges in Italy and the Burma Theater. In September 1944, unmanned aircraft missions were flown out of England with a television-radio controlled glide bomb against Germany. Although these glide

bombs proved mostly inaccurate and vulnerable to German ground fire, the Army Air Corps developed better control mechanisms ranging from TV-guided, to radio and finally an active-homing radar guidance system.^{xiv}

A true unmanned aircraft program developed by the U.S. was the Aphrodite aircraft. The Aphrodite program reconfigured B-17 aircraft with open cockpits, radio-control devices and 20,000 pounds of explosives. The Aphrodite aircraft was designed to fly by radio control to a point short of the target where the pilot primed the fuse and baled out over the English coast, leaving the unmanned aircraft to continue to the target. A series of crashes and poor targeting canceled the Aphrodite program.^{xv} However, the U.S. military saw the potential in unmanned aircraft and weapons systems as an alternative to the high number of pilots lost during the war. These early unmanned aircraft also proved very successful as shock and awe weapons. Thus, UAVs affected the U.S. defense strategy and most of the major powers in Europe. It set in motion the timeless quest for nations to protect their citizens from aerial attacks (manned or unmanned).

After World War II, military leaders from Britain and Russia focused research efforts on cruise missile technology and target drones for their highly maneuverable fighters instead of reconnaissance and attack UAVs. The British were mainly interested in stand-off weapon systems with a nuclear warhead that could be launched by their long-range bomber force. One example was called “Blue Steel”. It carried an autopilot, onboard computer, electrically operated flying controls and was launched from the belly of a bomber aircraft.^{xvi} The Soviets cruise missile program concentrated on designing systems to counter U.S. maritime assets. The AS-3 Kangaroo and AS-15 air-to-surface missile were launched from Badger bombers

and carried a nuclear or conventional warhead and is presumed to have similar guidance systems as the U.S.

The downing of Francis Gary Powers' U-2 reconnaissance plane by an SA-2 missile on 1 May 1960 mobilized the U.S. political, military, and scientific communities in a quest to save face and protect aviators from capture.^{xvii} High-altitude reconnaissance drones and photoreconnaissance satellites increased in popularity, although the resolution of the imagery was inferior to the U-2. The Air Force concentrated on developing the manned SR-71 supersonic, ultrahigh altitude reconnaissance jet instead of the newcomers to the field (UAVs). Due to fiscal limitations, only one research and development technology could be resourced. The manned SR-71 won out because it maintained a larger support base in Congress and the USAF. The USAF was biased against unmanned systems partially due to the extreme secrecy of the capability and jealousy of any machine performing a man's role, left the UAV on the losing end of the research and development resourcing pool.

The UAV simply could not compete against a military culture built upon the primacy of manned flight, caught in a military drawdown. Additionally, at this point in their development, UAVs were not technologically feasible as a reliable instrument of warfare. The absence of near real-time data downlinks, extended range command and control systems and payload capacity limited the viability of UAVs over manned flight; therefore, no practical military leader would totally abandon manned flight research and development. On 27 October 1962, the second U-2 was shot down over Cuba by a Soviet surface-to-air missile (SAM). This event once again mobilized the DOD and USAF to once again seek an unmanned reconnaissance alternative.^{xviii}

In response to the search for an unmanned reconnaissance platform, a company called Ryan Aeronautical and the USAF modified a target drone airframe in 1963. The expanded wing span increased UAV ceiling height to 62,500 feet and extended its range to 1,680 miles. An improved navigation system with an onboard programmer to correct the autopilot and improved stability to carry multiple cameras enhanced the UAV named the “Lightning Bug”. Initially, the Lightning Bug executed only preprogrammed mission profiles. It received navigation updates every seven miles from a backup system based on the elapsed time from launch. Several of the drones were lost, but overall the program had five of seven successful missions. In an attempt to improve navigation and control of the UAV, command and control (C2) of the UAV was moved to an airborne platform on board a DC-130 aircraft.^{xix}

The Lightning Bug UAV reemerged as a photoreconnaissance UAV during the Vietnam War. The reconnaissance UAV was equipped with a parachute recovery system and air launched from the DC-130 cargo plane by Air Force and Ryan Aeronautical civilian personnel. The initial missions were high-altitude, day photo sorties at altitudes above 50,000 feet, capturing high-resolution photography from politically denied territory for fighter and bombs units to strike.^{xx} It was not that the territory photographed by the Lightning Bug UAV was not too hostile for manned flight, but the UAVs were flown during U.S. government-declared pauses in air attacks against North Vietnam where the presence of manned reconnaissance platforms remained politically sensitive. Thus, UAVs collected the necessary, timely intelligence needed by the fighter and bomber commands to prosecute air operations.

When weather conditions turned sour for reconnaissance flights, the U.S. research and development community and Ryan Aeronautical designed the barometric low-altitude control system (BLACS), making unmanned mission below 1,000 feet a reality.^{xxi} The BLACS

design would later reveal detailed enemy antiaircraft artillery (AAA) sites and troop concentrations previously undiscovered by reconnaissance assets. Additionally, the Teledyne Ryan Firebee performed low-altitude reconnaissance and served as the prime battle damage assessment (BDA) platform sending back live pictures to rear command centers.^{xxii}

In the war with North Korea, the research community again answered the need for an unmanned aircraft. A new higher performance Ryan Firebee model with improved engine performance, extended range and altitude, and the ability to execute basic evasive tactics conducted ISR missions against North Korean, Chinese, and Russian targets as well as the Korean demilitarized zone (DMZ) two years after the cease-fire.^{xxiii} Another Ryan UAV, the 147TE, “Combat Dawn” ELINT model maneuvered out of the way of SA-2 missiles, intercepted signals from target transmitters 600 miles away and transmitted signals back to U.S. ground stations in real time through a relay system.^{xxiv} The survivability and reliability of the Ryan 147 series of UAVs was demonstrated by the 1,651 operational missions flown by 100 UAVs averaging 7.3 missions each.^{xxv} The need for comprehensive ELINT and electronic countermeasures (ECM) in Korea, led to the design of a capable, battle-tested line of UAVs modified for use in combat in the Middle East in the 1980s.

During the Vietnam War, Lightning Bug capabilities evolved to not only support photographic missions, but subsequent modifications also supported near real-time video transmission. Lightning Bug UAVs conducted ELINT and ECM, near real-time communications intelligence (COMINT) missions that increased the safety of manned aircraft flying over hostile areas. A psychological operations UAV program, Project Litter Bug dispensed leaflets deep into enemy territory to deliver personal messages from President Nixon urging the Vietnamese to give up the struggle.^{xxvi} Overall, the Ryan UAV family

successfully executed reconnaissance and ELINT missions, delivered crucial intelligence that saved countless American lives, while experiencing minimal losses.

A testament to the survivability of the UAV in air-to-air engagements was demonstrated on 31 December 1968 when a reconnaissance platform tasked to gather infrared photo imagery in that Hanoi area survived an air-to-air intercept by a Mig-21 aircraft. The UAV was exiting the Haiphong Harbor when the Navy informed airborne controllers on the DC-130 that Mig-21s were closing in on the UAV. The DC-130 controllers executed evasive tactics for the UAV just as the MIGs closed to within eight miles. The UAV executed its maximum rate of climb, leaving the Migs far below and without a target. The UAV recovered safely and provided extensive night photo reconnaissance to U.S. forces.^{xxvii}

In another family of UAVs, the Ryan 147F, was modified as a dual platform for both ECM and photoreconnaissance. During a mission on 22 July 1966, the Ryan platform drew ten SAMs for accompanying fighter aircraft to destroy before the UAV was shot down.^{xxviii} This tactic, termed “scout-hunter” attack, proved effective in destroying North Vietnamese missiles. Later, UAV decoy missions were flown successfully during the B-52 Linebacker II offensive. UAV missions in Vietnam crossed the spectrum of employment in combat and secured a future for global employment. The average life of all UAVs launched in Vietnam was 3.5 missions; however, several UAVs completed forty to sixty missions.^{xxix}

The idea of using UAVs as strike platforms was investigated after the pullout from Southeast Asia. The 6514th Drone Test Squadron and Teledyne Ryan combined efforts at the Utah Dugway proving grounds to field a proof of concept UAV capable of launching an air-to-ground missile, the TV guided, AGM-65 Maverick. The UAV was called the Ryan 234 and was launched from a DC-130 aircraft at 9,000 feet. It descended to under 1,000 feet on an

attack course toward a simulated SAM site. Five miles from the target, the UAV controller identified the target, launched the Maverick missile and scored a direct hit. The craft carried a laser designator and low-light TV camera in the nose and was later modified with a low level navigation package for operation in the bad weather and terrain of Germany. Unfortunately, budget cuts and a change in Air Force focus, placed this unique UAV strike capability on the shelf.^{xxx}

The 1970s were peak years for UAV operations with an estimated \$100 million or more per year spent on designing and fielding unmanned aircraft of many types. In 1979, Tactical Air Command (TAC), who was in control of the UAV force, failed to appreciate the utility of the Ryan family of drones and retired the force.^{xxxi} The proponents of UAV platforms were unable to convince the Air Force tactical fighter community to support the program and once again, UAVs fell from the U.S. radarscope of significant military hardware.

The Israelis on the other hand, made great strides in UAV research and employment during the 1970s and those technological advantages are apparent even today. In the mid 1970s, Israel received thirty-three of the refurbished Ryan UAVs that were retired by TAC.^{xxxii} The Israeli Defense Force recognized the utility of employing these unmanned aircraft in the ongoing conflict with their neighbors, Syria and Egypt. In August 1970, Russian SAM and AAA batteries were placed by the Arabs along the West Bank of the Suez Canal. Israeli Prime Minister Golda Meir requested assistance from the U.S. to strike the sites. The Department of Defense refused to use manned aircraft, but approved a “Defense Suppression” UAV contract with Teledyne Ryan Corporation. Integrating six special purpose aircraft, Teledyne Ryan designed a UAV capable of firing a guided air-to-surface missile and transmitting video of enemy terrain and targets.^{xxxiii} The Israeli Air Force flew Teledyne

Ryan Firebees on photographic missions over Egypt and Syria delivering critical intelligence on troop, tank and aircraft locations.^{xxxiv}

In the October 1973 Yom Kippur War, UAVs were used as decoys to draw enemy SAM missile fire for the Israeli Air Force fighter and bombers to target.^{xxxv} The Israeli Air Force study of UAV usage in previous conflicts was apparent. These same tactics of scout-hunter (unmanned decoy and manned strike) were used by U.S. forces in Vietnam.

Additionally, Israel demonstrated the effectiveness of UAVs in a coordinated air strike on Syrian SAM sites in 1982. Initially, Israel used the UAV as a reconnaissance platform against Syrian SAM sites. Once those SAM sites were identified, Israeli UAV controllers designed a well-orchestrated strike. During the main raid, the first wave of UAVs served as jamming platforms. The Israeli Air Force embraced the advantages UAVs brought to the battlefield in the form of ISR as well as ECM warfare while mastering effectively the combined operations of manned and unmanned systems to accomplish military objectives.^{xxxvi}

In January 1991, a joint Israeli-U.S. designed UAV named “Pioneer” was used for over-the-horizon (OTH) targeting, reconnaissance and BDA for commanders in Desert Storm. The forty-three Pioneer UAVs flew 330 sorties, totaling over 1,000 flight hours and provided near real time reconnaissance to U.S. Army commanders conducting the envelopment of Iraqi forces.^{xxxvii} The ground forces leveraged the ISR capabilities of the Pioneer to surprise, outmaneuver and destroy enemy artillery and Iraqi forces in the Kuwaiti Theater of Operations (KTO). The Navy harnessed the unique capabilities of the Pioneer UAV to monitor the Kuwaiti coastline and the Iraqi naval facilities, spot mines in the littoral area and adjust naval gun fire. The nine systems in service made over 5,000 flights, logged nearly 12,000 flight hours, and maintained a sortie availability rate of better than 85 percent. Based

on Desert Storm successes, Pioneer was sought by other combatant commanders to conduct ISR in Somalia, Haiti and Bosnia.^{xxxviii}

A quick review of the historical highlights of UAV usage in warfare and regional conflicts clearly demonstrates the military advantages when unmanned systems are integrated into the overall scheme of maneuver and properly sequenced with manned weapon systems. The trend in UAV technology capitalizes on the lessons learned from past designs and improves engine performance and endurance while often fielding smaller, more lethal, maneuverable vehicles. A brief survey of the current U.S. UAV systems will provide a jump off point to evaluate the viability of emerging technologies to perform alternative missions to the standard UAV role.

There are currently over thirty different types of UAV either currently in service or in development. UAV size categories are simply broken down into either large, medium, or small.

Large – UAV with a gross weight above 5,000 pounds, wingspan longer than 60 feet and that operate above 25,000 feet and 250 knots. These UAVs are generally considered operational (theater) or strategic assets. These systems can self deploy or, as with Global Hawk, can operate from CONUS. UAVs with a mission to deliver ordnance in high-density threat environments will operate from remote bases to support tactical requirements.^{xxxix}

Medium – UAVs with a gross weight between 500 and 5,000 pounds, a 20-60 feet wingspan and generally operate at altitudes of 10,000-30,000 feet and below 250 knots. These UAVs primarily support tactical engagements, but may also address operational or strategic requirements such as the Predator UAV.^{xl}

Small – UAVs with a gross weight less than 500 pounds, a wingspan of 20 feet or less and that operate at altitudes below 10,000 feet and 100 knots. These UAVs generally support tactical requirements and range from man-portable up to trucked systems. Examples include the Raven, Dragon Eye, Pioneer and Shadow UAVs.^{xli}

Discussion will be limited to the medium category of UAVs which most closely match the capabilities of a manned fighter aircraft. Currently, the closest match is the Predator series of UAVs.

The Predator UAV reached its current prominent position in the ISR mission for combatant commanders through the concepts advanced by the joint UAV program office experience with previous UAV systems and intelligence gaps found during Desert Storm. The DOD Advanced Research Projects Agency (DARPA) was commissioned in 1993 by the Joint Chiefs of Staff and DOD to design and test a small number of UAV platforms, evaluating utility, concept of operations (CONOPS), cost and performance.^{xlii}

The Predator was expected to provide long-range, extended loiter, near real-time imagery, and all-weather ISR to the tactical ground commanders. Constructed of lightweight composite materials, the Predator is extremely difficult to detect with radar and almost invisible to optical, acoustic and infrared sensors, greatly enhancing its' survivability. The Predator system consists of three subsystems: an air platform with electro-optical, infrared, and synthetic aperture sensors, the ground control station and the data dissemination system which allows airborne retasking. The Predator's data dissemination system uses satellite communication (SATCOM) links to broadcast live video to commanders at the tactical, operational, and strategic level and provides a critical new capability for the battlefield commander to view operations, real-time, as they develop. This new capability was

demonstrated in December 1995 when the Predator broadcasted critical intelligence to NATO commanders identifying a violation of weapon's movement in Bosnia. This led to a successful bombing campaign and subsequent peace agreement by warring parties at the Dayton Peace Accords.^{xliii}

The Predator transitioned from an advanced demonstration (ACTD) to full production in August 1997, and has maintained a constant presence in NATO operations in Bosnia and throughout the CENTCOM AOR.^{xliv} Although Predator has encountered some limitations in high winds and precipitation, the system has performed the ISR mission beyond all expectations.

Since inception in World War II, UAVs were hastily constructed to satisfy a military requirement where the environment was either too hostile or politically undesirable for manned flight operations. In order to survive in a complicated, combat environment, UAVs experienced in-the-field modifications and on-the-job testing as a matter of routine operations, and thrived under these conditions. Warfare in Vietnam and other countries in Southeast Asia presented difficulties for air operations. The dispersion and large number of enemy forces required a highly responsive, survivable and adaptable reconnaissance platform to locate, identify and transmit valuable intelligence information to tactical and operational commanders. The unmanned aerial vehicle proved the ideal platform for Southeast Asia operations. Unfortunately, as peace broke out and the immediate threat of armed conflict waned, budget cuts forced UAV development to take second stage to higher priority manned fighter programs. UAV resources shifted mainly to target drones.

Operation Desert Storm saw a reemergence of UAV technology and employment as an ISR platform at the same time that DOD was restructuring to save research and

development costs through joint acquisition programs. This complementary set of circumstances ushered in the second heyday for UAV design, testing, development and funding. With a new generation of advanced technology available to UAV developers, the accelerated design of airframe materials, precise navigation packages, pinpoint target sensors, and increased payload capacity, the expansion of UAV missions is limited only by doctrine and the imagination.

CHAPTER 3

OPERATIONAL CAS REQUIREMENTS

The CENTCOM AOR is the only AOR with a standing CAS requirement for ongoing combat operations in Iraq and Afghanistan in support of OIF and OEF and the GWOT.

Currently, these requirements are being sourced with a mix of traditional strike aircraft from all the services and coordinated through the CFACC and CFLCC. The Air Force provides a mix of fighter and bomber aircraft that include the F-15E, F-16, A-10, B-52 and B-1. The Navy has an aircraft carrier in the Persian Gulf that provides F-14 and F/A-18s. The Marines' aircraft include the A/V-8 and the F/A-18 and Cobra attack helicopter. The Army's CAS assets include the Apache and other armed helicopters. This enormous arsenal of airpower is deployed in theater, 365 days a year, and is tasked 24 hours a day, 7 days a week to support the ground commander's needs.

CAS requirements for any plan will be based on the perceived threat and need for air support during ground operations. However, current joint doctrine provides little guidance for the development of specific CAS requirements and leaves most of it up to the discretion of the ground commander.^{xlv} After the CAS requirements have been identified, the request will then be passed from the land component to the air component to be sourced. The air component must then attempt to satisfy the requirements. A few assumptions must be made to keep this paper at an unclassified level:

- Current ground operations remained focused on counter insurgency (CI) missions
- Airspace remains permissive and low risk to air operations

- Baghdad is the only standing 24/7 on call CAS requirement in OIF
- Kabul is the only standing 24/7 on call CAS requirement in OEF

To simplify illustration and comparison, the definition of on call CAS (XCAS) is a strike aircraft capable of delivering precision munitions that must be overhead and in communication with the ground commander with 10 minutes of the request. The timeliness of support is critical to supporting ongoing ground operations. For both preplanned and immediate (emergency) CAS missions, the ground component will normally wait until it becomes obvious that their organic fire support assets will not achieve the desired effect. This is not normally a deliberate attempt to avoid using CAS assets, but just a fact that the organic assets are physically capable of responding quicker to the situation. Therefore, by the time a call is actually made for CAS, the situation on the ground has deteriorated and time is of the essence. Once the aircraft is on station and in contact with the ground commander the desired effects of the air support becomes critical.

CAS effects in support of counter terrorism (CT) and counter insurgency (CI) operations can be both kinetic and non-kinetic in nature. Common CAS effects that are requested by the ground commander include “Non-traditional” ISR (NTISR), a “Show of Force”, warning shots and traditional targets for destruction.

NTISR is a relatively new tasking that evolved out of ONW and OSW. ISR requirements have traditionally exceeded ISR asset availability. With the proliferation of target pods on strike aircraft and long orbit times over enemy land, air component commanders developed tactics, techniques and procedures (TTPs) for strike aircraft to utilize their target pods to fulfill basic reconnaissance requirements. The capability of the target

pod is extremely limited compared to dedicated ISR assets, but simple functions such as enemy presence or activity at a location can be monitored. Possible NTISR taskings include:

- Road reconnaissance in front of a friendly convoy
- Monitoring suspected enemy locations for activity
- Following suspected insurgents
- Searching for possible roadside bomb activity
- Force protection – searching base perimeters for suspicious activity

A major limitation to tasking a strike aircraft with NTISR is the low resolution of the target pod and the ability to positively ID (PID) a potential target. Target pods were initially developed during the Vietnam War to employ LGBs. Simply put, a target pod is comprised of an infrared or electro-optical sensor paired with a high powered laser that projects a video image into the cockpit. The image displayed in the cockpit was designed to be of high enough quality to detect buildings, bridges and other large objects or vehicles for the targeting with LGBs. It was not designed to detect or track objects as small as people. Current NTISR tasks could want the strike aircraft to not only track individual people, but they might also request to know if the person is carrying a weapon such as a gun, mortar or rocket tube (the preferred weapons of the current enemy). If anything suspicious was found during any of these taskings, other assets would have to be deployed to investigate. A fighter aircraft at medium altitude would not be able to PID the activity to the degree needed to act autonomously. Because of the low resolution of the target pod, the fighter would have to fly at a much lower altitude to get close enough to the potential target to be able to PID the activity to satisfy the Rules of Engagement (ROE). This is not desirable because the jet noise at the lower altitude would alert the target of the fighter's presence and scare them away.

A Show of Force is a non-kinetic tasking designed to deter or disrupt enemy activity. It is normally conducted by a fighter aircraft making a significantly visual, high speed, low altitude pass near the objective. A Show of Force might be requested to disrupt a local protest or to deter them from becoming violent or to remind the intended target that air cover is present and capable of delivering a massive amount of firepower.

A Warning Shot tasking is a step up in escalation from a Show of Force. It has the same desired effect, but is normally only used when a show of force has been ineffective at deterring or disrupting the enemy activity. Normally the smallest type of weapon is employed in an uninhabited area within visual sight of the enemy. The desired effect is the same as in a police action with a firearm. If the warning shot fails to achieve the desired effect, the next step might be a kinetic kill if the Rules of Engagement (ROE) have been met.

A kinetic strike during CAS operations is the most dangerous tasking due to the inherent close proximity of friendly troops. While joint doctrine does not specify exactly what range define “close” air support, it is currently interpreted as within the range of enemy weapons. When calling for a kinetic strike, a thorough understanding of individual weapons and their effects is absolutely critical. While supporting CT or CI missions, collateral damage (CD) is normally a significant factor that must be carefully considered. Missions are often conducted in urban areas, inside of villages, cities, or culturally sensitive sites. Any unnecessary damage or loss of life to non-combatants can do more damage to the overall campaign than the benefits of a successful strike. Such issues have driven the development of smaller precision weapons for use in CAS. Typical CAS precision weapons include:

- GBU-12 – 500 lb LGB

- GBU-38 – 500 lb JDAM
- AGM-65 Maverick – 125 lb missile
- AGM-114 Hellfire – 100 lb missile
- 20-30mm bullets - Strafe
- Small Diameter Bomb (SDB) – 250 lb JDAM (currently under development)

(A much wider range of weapons is available for CAS operations but it requires pre-coordination between the ground planners and the strike assets supporting the operation.)

Each of these weapons has pro's and con's related to CAS weapons effects and are important for consideration in planning.

<u>WEAPON</u>	<u>PROS</u>	<u>CONS</u>
GBU-12	<ul style="list-style-type: none"> • Laser Guided (Ground or Air) 	<ul style="list-style-type: none"> • Effected by bad weather • Requires talk-on • Cannot be carried on helicopters
GBU-38	<ul style="list-style-type: none"> • All-weather 	<ul style="list-style-type: none"> • Requires precise coordinates • Cannot be carried on helicopters
SDB	<ul style="list-style-type: none"> • All-weather • Smallest CD JDAM 	<ul style="list-style-type: none"> • Requires precise coordinates • Cannot be carried on helicopters
AGM-65	<ul style="list-style-type: none"> • Small CD 	<ul style="list-style-type: none"> • Flight profile affects attack axis • Cannot be carried on helicopters
AGM-114	<ul style="list-style-type: none"> • Smallest CD missile 	<ul style="list-style-type: none"> • Flight profile affects attack axis • Cannot be carried on strike aircraft
Strafe	<ul style="list-style-type: none"> • Smallest overall CD 	<ul style="list-style-type: none"> • Most difficult to employ by strike

		aircraft
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Figure 1.

The GBU-38 (Figure 1) JDAM category of weapons has become the medium size CAS weapon of choice for several reasons. It is generally considered to be as accurate if not potentially more accurate than a laser guided bomb. The accuracy of the JDAM is normally limited more to the source of the coordinates given to the bomb than in the bombs ability to fly to those coordinates. For pre-planned targets, great care is taken by intelligence targeting professionals to derive extremely precise or “mensurated” coordinates using sophisticated, high-resolution imagery computers. For dynamic or time-sensitive targets (TST) that do not allow for detailed planning, target coordinates may be derived by a ground controller using a wide variety of methods ranging from a tactical map, a handheld GPS, laser rangefinder, or even a tactical laptop imagery computer. The flight profile of the weapon normally originates from above 10,000 and flies to a near vertical impact angle to the target which minimizes the blast and fragmentation to surrounding buildings and reduces the potential for CD. JDAMs are not normally affected by weather. LGBs, precision missiles and gun strafe require the weapon or pilot to be able to visually acquire the target. As seen in the opening days of OIF, sandstorms, clouds, and environmental issues can wreak havoc in CAS assets being able to support ground operations. JDAMs are the closest CAS assets have to an “all-weather” capability.

For force structure planning purposes it is important to know that many of these precision weapons were developed in different services and are not necessarily compatible with every CAS asset. For instance, as noted in Figure 1, helicopters can not carry the GBU-12 LGB or any of the JDAMs. Fighter aircraft can not carry the AGM-114 Hellfire missile

which was traditionally an attack helicopter weapon. Bomber aircraft do not have a gun and therefore can not strafe. Many of these issues drive planning issues when conducting CAS planning and force requirements.

There is one type of strike asset that has been maturing in its capabilities over the past few years and can now satisfy the ground commander's requirements for CAS **AND** ISR all in one platform. That platform is the UAV.

CHAPTER 4

CURRENT FORCE STRUCTURE PLANNING

Once mission requirements have been determined for a particular operation, it now becomes the responsibility of the Joint Forces Air Component Commander (JFACC) to resource the necessary assets to accomplish the mission. Planning issues will be limited to ongoing joint operations in Iraq and Afghanistan. For a thorough understanding of the battle space, this chapter will discuss the current air order of battle for friendly forces in the CENTCOM AOR at an unclassified level. The JFACC is responsible for coordinating, synchronizing and deconflicting air assets from all the different services and coalition partners in the AOR. For OIF and OEF, the Army, Air Force, Navy, and Marines all have air assets in theatre in support of the land component commander's CAS requirements.

AIR FORCES

United States Air Force's CAS assets in the CENTCOM AOR are primarily based in Iraq and Afghanistan proper with a contingent of additional assets stationed in Qatar and Diego Garcia. The USAF maintains the 379th Air Expeditionary Wing (AEW) at Al Udeid AB, Qatar, the 40th AEW in Diego Garcia, the 332nd AEW at Balad AB, Iraq, and the 455th AEW at Bagram AB, Afghanistan.^{xlvi} Exact numbers of assets at any given time is classified by CENTCOM an assumption will be made that a typical fighter squadron will deploy to the AOR with 12 jets and a bomber squadron will deploy with eight. The current rotation for Air Force personnel in the CENTCOM AOR (as of the writing of this paper) is 120 days.

Qatar is home to the 379th AEW and approximately one squadron of USAF fighter jets that support both OIF and OEF.^{xlvi} An OIF mission from Qatar to Baghdad is approximately 700 miles, requires two hours of flight time each way and an air-to-air refueling before and after the on-station CAS requirement tasked in the daily Air Tasking Order (ATO). For an OEF mission from Qatar to Afghanistan, the trip is almost 1400 miles each way and requires multiple air-to-air refuelings. Traveling these long distances on a daily basis puts an extra strain on the airframes, aircrews and limited amount of tanker support in the AOR.

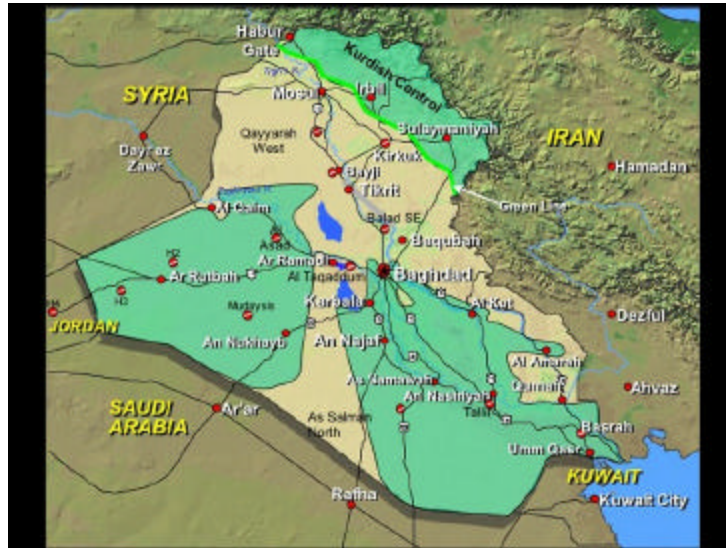


Figure 2

The 40th AEW is located on the British island of Diego Garcia and home to a squadron of bombers that rotates between B-52s and B-1s depending on the Air Expeditionary Forces (AEF) schedule.^{xlvi} Diego Garcia is located approximately 2,800 miles from Afghanistan and requires approximately three hours of transit time each way. Even with the massive ranges of bomber aircraft, the missions flown from Diego Garcia in support of OEF still require multiple air-to-air refuelings.

Balad AB, Iraq (Figure 2) is now the temporary home of the 332nd AEW which is host to two fighter squadrons and two Predator UAV squadrons.^{xlix} Balad AB is ideally located just north of Baghdad by 40 miles. Fighters flying out of Balad AB have just a 5 minute transit time to any tasking in the Baghdad area. Fighters from Balad normally do not require air-to-air refueling for their daily tasking unless their mission becomes extended.



Figure 3

Bagram AB, Afghanistan (Figure 3) is the temporary home of the 455th AEW and the primary hub of all air operations in Afghanistan. It is home to a squadron of A-10 attack jets and a squadron of Predator UAVs.¹ A-10s flying out of Bagram are just 50 miles from the mountain region along the Pakistan boarder and also do not require air-to-air refueling on a normal basis.

NAVAL FORCES

The United States Naval CAS assets in the CENTCOM AOR currently consist of one air craft carrier strike group and its associated support ships.^{li} An aircraft carrier will normally consist of approximately 50 F/A-18 strike aircraft and will sail throughout the Persian Gulf region. For supporting the CFACC daily ATO, a single carrier is normally only available for a 12 hour period due to its limited number of flight deck crews. An aircraft carrier normally sails with only a single flight deck crew. While they have the capability to surge for short periods of time, eventually the flight deck crew will need to stand down operations due to fatigue. Two aircraft carriers are required for 24 hour operations and a third will be required if sustained 24 hour operations are required. The carrier will normally position itself far enough off the coastline to minimize risk which will increase the distance the jets must travel to the target area. Assuming an offshore distance of 100 miles, Navy fighter jets must travel over 400 miles to reach their CAS tasking over Baghdad and require multiple air-to-air refuelings. Navy personnel normally deploy for a six month cruise to the AOR.

MARINE CORPS FORCES

The United States Marine Corps currently has a Marine Expeditionary Force (MEF) deployed in Iraq along with a Marine Air Wing (MAW) at Al Asad AB (Figure 2).^{lii} The MAW at Al Asad currently has two squadrons of fighter and attack jets. Al Asad AB is just 55 miles, less than 10 minutes from Al Ramadi, their primary Area of Operations (AO) inside

of Iraq. Jets flying out of Al Asad do not require air-to-air refueling unless their mission gets extended past their planned recovery time. Marines are deployed to the AOR on a six month rotational basis.

ARMY FORCES

Army aviation in the current operating environment of OIF and OEF are under the operational control of the Combined Forces Land Component Commander (CFLCC) and do not fall under the air component. Due to this fact, land component assets will not be directly compared against air component assets and the proposal for transformation.

To summarize the available CAS assets currently in the CENTCOM AOR, there are theoretically 12 fighters in Qatar, eight bombers in Diego Garcia, 12 fighters in Bagram, 24 fighters in Balad, 24 fighters in Al Asad, and 50 fighters on the aircraft carrier in the gulf. This is a total of 130 CAS capable strike aircraft in the CENTCOM AOR for both OIF and OEF.

Requirements for CAS can change on a daily basis and will fall into one of two categories, pre-planned or immediate. Pre-planned CAS has been requested in time to be added to the daily ATO and coordinated between the ground commander and the specific CAS assets. Immediate CAS is an unknown quantity and must be weighed against the potential risk. The CFLCC and CFACC must come to an agreement on how many CAS assets will be available at any given time for immediate CAS requests. This is by far, the most challenging aspect of force structure planning for CAS operations. In addition to the

number of assets available for immediate CAS is the requirement for multiple orbits or “stacks”. In a large AO, the ground commander may require multiple stacks in different geographic locations to ensure a timely response to any immediate calls for CAS.

For comparison purposes of this study, the assumption is made that only one CAS stack is required over Baghdad in Iraq and one stack is required near the Pakistan border in Afghanistan. A stack will normally be filled 24 hours day, seven days a week by a flight of two fighter jets (or a single bomber). The length of period that each pair must stay in the stack is determined by the available number of jets for that daily ATO period. The current ATO ranges from 48 to 58 daily CAS sorties according to CENTCOM’s daily press release.^{liii} This would equate to 12, two hour periods for the CFACC to allocate assets to in both OIF and OEF. Even at 58 CAS sorties in a day, that is just 45% of available assets in theater. That utilization rate is far below the desired rate of 66% by squadron commanders.^{liv} During long deployments, commanders have a requirement to keep aircrew flying to maintain their perishable combat skills. This requirement is satisfied by a variety of methods, depending on the service and location. Some squadrons are able to fly non-combat training sorties after the daily ATO has been filled. Navy aircraft in the middle of the Persian Gulf can fly training sorties near the carrier with no risk of a combat incident. Squadrons in Afghanistan and the Marines at Al Asad can also fly training sorties because of the high level of security in the area surrounding their bases. Squadrons at Balad AB are not allowed to fly training missions because of the continued threat of terrorist activities near the base. The squadron in Qatar is currently not allowed to fly local training missions because of an agreement with the host nation. All of these factors pose significant aircrew proficiency issues for the CFACC.

In an attempt to maintain a high utilization rate and aircrew proficiency across all the squadrons in the AOR, additional missions were created for tasking in the ATO. NTISR missions became a daily tasking in the ATO following the end of major combat operations in OIF in 2003. Aircrews were tasked to fly along hundreds of miles of roads, pipelines, and power lines to search for suspicious activity. Even though the aircrew are poorly equipped and trained for these reconnaissance missions, they continue to be tasked in an effort to keep the aircrew flying and utilization rates as high as possible. This tasking is flawed for two reasons. First, as stated previously, the resolution required to satisfy this type of ISR mission does not exist in the current generation of target pods found on the aircraft deployed to the AOR. Second, ROE and CONOPS are not in place to effectively stop any hostile activity if they could be identified. The purpose of the NTISR tasking is to detect and deter hostile actions against critical Iraqi infrastructure. Even if a hostile act could be detected, the only option the aircrew could take would be an attempt to deter further action by a Show of Force. Should that fail, the only option would be to call for a Quick Reaction Force (QRF) from the land component to investigate the activity which would normally arrive too late to prevent the hostile act from taking place. A kinetic strike is not an option in this situation because of collateral damage concerns. This mission is much better served by armed UAVs because of their dedicated ISR, high resolution sensors that can PID targets and satisfy the ROE, and their ability to conduct precision kinetic strikes with the smallest available PGM to minimize the potential for collateral damage.

UAVs in the CENTOM AOR have seen a tremendous growth in tasking and requirements. Initially, UAVs flew a single orbit in an ISR role. The requirements have now grown to eight different orbits and are programmed to increase to 12 orbits by the end of the

year and they are providing a strike capability as well.^{lv} There is currently only one main operating base in both Iraq and Afghanistan and they are both within short transit times to their orbit locations. Due to the ground commander's requirements for ISR and CAS, they are normally co-located with the strike aircraft in their stacks. In fact, one of the main concerns with UAVs in co-located orbits with fighters is the high potential for a mid-air collision. Deconfliction, therefore, has become a major issue in tactical joint TTPs.

Current UAV force planning has many similar considerations as manned fighter aircraft. The operational level ISR UAVs discussed in chapter two are deployed as a system. For example, a typical Predator UAV system will include four aircraft and support equipment and personnel. The system is comprised of four aircraft specifically to satisfy a single 24/7 orbit requirement.^{lvi} Air Combat Command's UAV CONOP has assumed an operational goal of 95 percent or better reliability for continuous coverage of a single target with a system of four vehicles. This was based on a RAND simulation that ran 100 scenarios to determine the most efficient use of UAVs for a continuous 24/7 ISR requirement. The RAND study concluded that a system of four UAVs, an orbit duration of at least 16 hours and a four hour or less transit time were required to meet or exceed the 95% reliability requirement desired by ACC.^{lvii} Given this baseline information the CFACC could plan for a UAV system per orbit requirement desired by the CFLCC.

For CT and CI missions, ISR and CAS assets are critical CFACC capabilities in support of the CFLCC. In support of the GWOT, maximizing these limited assets will be a key factor in sustaining our nation's airpower capability over the duration of the long war.

CHAPTER FIVE

LONG TERM EFFECTS OF CONTINUED OPERATIONS

The CENTCOM air component has been conducting continuous combat operations since the beginning of Operation Desert Shield in 1990. After the end of Operation Desert Storm in 1991, the air component remained engaged in combat in the skies over Iraq supporting Operation Northern and Southern Watch. Those operations continued until they became Operation Iraqi Freedom which continues today. In addition to combat operations over Iraq, America's air forces have been engaged in combat operations in Bosnia, Kosovo, Serbia and Afghanistan in the past decade alone. Almost 16 years of continuous combat air operations has taken its toll on our nation's airpower capability. Aircraft across the services are reaching and exceeding their projected service life faster than they can be replaced. Projected shortfalls are being addressed by service life extension programs to provide a band-aid fix until the next generation of aircraft can be developed and procured.

General Moseley, the current Air Force Chief of Staff, commented on the aging fleet in a recent press conference. He said, "we have to replace about 180 airplanes a year, I think, in order to maintain and decrease the age [of our aircraft]. We are actually replacing on the order of 80."^{lviii} General Moseley admitted that for the first time in history he might have to retire aircraft solely because of their age and that "the Air Force we had planned on a few years ago may not come to fruition".^{lix} The Air Force is not alone in their dilemma to maintain the force. The other services all face similar issues with their aviation assets as well. The simple fact is, the platforms are being tasked by the combatant commanders at a higher rate than ever predicted.

Air Force Lt Col Pete Gersten, an F-16 squadron commander currently deployed to Balad AB, Iraq, said “back home, an F-16 squadron might fly 6,000 hours a year. Here, squadrons average 3,000 hours a month”.^{lx} With an average of 12 jets per squadron deployed to Iraq that could mean as many as 250 hours per aircraft each month. During a single four month deployment to Iraq, each aircraft might consume as much as 1,000 hours of its service life during the deployment. That may not seem like much until you consider that several fighter aircraft were designed with a 4,000 hour expected service life.

The F-15 was designed in the 1960s and first entered service in 1970. It was designed with a 4,000 hour service life to last over the span of 20 years with an expected annual usage of 200 hours per year. It was originally planned to be retired by 1990. The F-16 entered service in 1979 and was designed with the same service life assumptions as the F-15. The Navy and Marine Corps F/A-18 entered service in 1983 and were designed for a service life of 6,000 hours over 20 years and was planned to be retired by 2003.^{lxi} All of these aircraft types are still in service today and have had to go through extensive and expensive service life extension programs (SLEP).

A total of 355 of the Navy’s F/A-18 jets are scheduled to be refurbished over a 12 year period at a cost of \$878 million just to keep the navy workhorse flying.^{lxii} Funding for these critical upgrades is tight. The Navy has only committed funds to repair 57 of the 355 planes in its current five-year budget.^{lxiii} That still leaves 298 planes that need to be refurbished. The Navy has also had to commit almost \$9 billion to purchase new F/A-18s to extend the fleet until its planned replacement arrives, the Joint Strike Fighter.^{lxiv}

The average age of Air Force aircraft is 27 years old and they’re not getting any younger.^{lxv} A decade ago, purchases of fighter/attack aircraft plunged dramatically and have

stayed low ever since, depriving the fleet of needed replacements. As a result, the fighter aircraft average age has soared. In the period 1985-91, on average the Air Force bought 201 fighter and attack aircraft per year. The end of the Cold War, together with the Clinton Administration defense policies, brought radical change. Fighter procurement during the past decade averaged only 16 aircraft per year. In 1995, USAF didn't buy any at all. (Figure 4)^{lxvi}

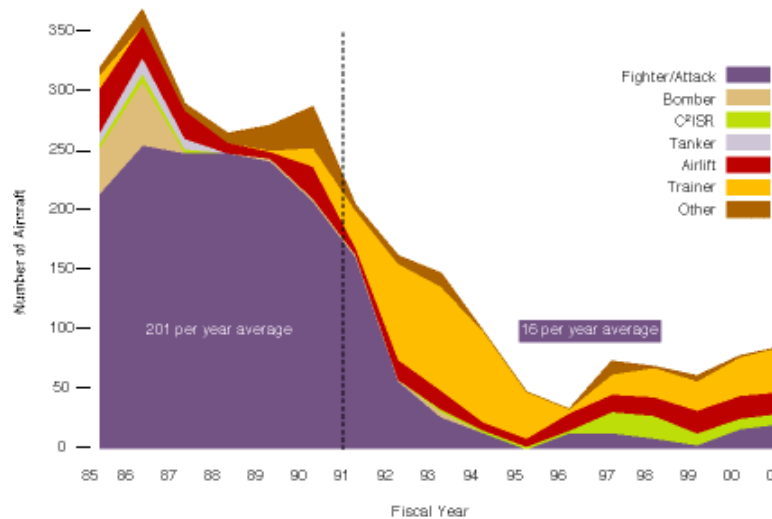


Figure 4.

Not only is the current crop of tactical fighters getting older, but they have a lot of stressful hours on them. Unlike their bomber counterparts, a percentage of the flight hours are spent pushing the envelope of the airframe's performance capability at high "G" loads. Making 9G turns during aerial combat maneuvers is not conducive to a long service life. As the airframes get older, they also require more maintenance support to keep them flying.

In an attempt to prolong the life of many of these airframes, the services have placed flight restrictions on training profiles to limit the amount of stress on the airframe. Over two thousand planes in the Air Force are operating under restrictions of one type or another due to

their age.^{lxvii} The worst effect of these restrictions is that the services will end up with an entire generation of pilots that have not been able to train to the full potential of the aircraft they are flying. Should that nation need to call upon those skills in a future scenario, they could find themselves lacking in the ability to push the aircraft to the edge of “the envelope”. This is critical because it is often just a thin sliver along the edge of that envelope that gives the U.S. the tactical edge over an adversary.

Tactical considerations aside, one can not argue that a SLEP is cheaper in the short term for extending airpower capability vs. the expensive development of a new platform. However, since the senior military leadership has decided to pursue this path, we must ensure that when our nation’s airpower is called to combat, it is employed in the most efficient ways possible to sustain critical national assets as long as possible.

A second effect of the long term combat operations over the past 16 years is that they have changed expectations and assumptions about the nature of future combat operations, the force structure and skill sets required for them. In the major combat operations over the past 16 years, the U.S. military and air component have enjoyed an overwhelming technical and numerical superiority over its enemies. An analogy could be made to that of a world champion boxer who has fought unranked opponents for so long that he has forgotten how to train to beat a #1 ranked, world-class contender. The air component has been able to dominate so convincingly since Desert Storm we now have an entire generation of military members that have come to assume, and take for granted, the ease at which the air component is expected to dominate the enemy.

Major combat exercises have changed their focus to reflect these assumptions. Less and less emphasis is placed on fighting and winning an air war. More and more emphasis is

placed on air-to-ground operations and support to the land component under the blanket assumption that air supremacy is easily achieved and sustainable. In a recent exercise at the Joint Forces Staff College, a seminar group was tasked to develop multiple Courses of Action (COAs) to defend a country from external military aggression. The threatening country's air force consisted of technically less capable aircraft, yet far exceeded coalition forces in pure numbers. In each of the COAs developed by the students, the enemy air threat was greatly dismissed because of the assumed superiority of U.S. air forces. While individual U.S. fighter and bomber aircraft capabilities are still superior to any other country in the world, they still must be correctly employed on the operational level to maintain the dominance that has become expected of them.

In this scenario, the enemy air force was capable of generating up to 600 sorties a day and would employ in multiple large packages of up to 30 aircraft each. This scenario is completely feasible if an enemy has an air force and is willing to commit those forces to combat. As feasible as this scenario is, no current U.S. exercise trains to this large of a threat. It is just assumed that no rational military commander would commit his inferior air force against such overwhelming technological odds. The sheer capability of mass airpower is being overlooked. Even the Air Force's most advanced, stealthy, super maneuverable fighter, the F-22A Raptor can only physically kill a finite number of enemy planes per sortie before it would run out of missiles and bullets. Given this limit, it would still not be impossible to overwhelm a smaller force of even our most advanced fighters. As a worst case example, one student COA in this exercise proposed that one squadron of F-16s (24 aircraft) would be capable of maintaining air superiority over the entire friendly country during the enemy's

initial 600 sortie per day onslaught. One could argue quite easily that this force structure wouldn't be enough. A more thorough understanding of airpower capabilities is required.

Given an assumption to ease planning that enemy air packages would attack along a common lane, air planners would start with a basic unit of an 8-ship formation of air superiority fighters to defend against a 30-ship package. At almost 4:1 odds, even our most experienced and proficient pilots would find this scenario extremely challenging due to our lack of training with this large of a threat. Given an optimistic assumption of good missile utilization, tactics and fuel consumption, the 8-ship should be expected to be able to repel the enemy package. However, they would most likely have exhausted their supply of missiles and would need to return to base to rearm and refuel. This would require a second 8-ship to take over air defense of the country. Intel for the scenario had briefed that the enemy was capable of generating up to nine of these waves of aircraft during initial combat operations. Fully armed and fueled 8-ships on station and ready to counter these large packages will quickly drive up air component requirements for forces to realistically be able to counter such a threat. Taking into consideration fuel requirements, transit time, basing locations, turn around times, maintenance readiness rates, and other air component planning considerations, the number of fighters could easily rise to eight squadrons to support the 24/7 mission essential task of air superiority throughout the Joint Operating Area (JOA). A far cry from the one squadron proposed in the student COA. Now granted, this was a joint academic environment with many students who had little exposure to air component planning, but the perceptions of airpower are still valid.

The U.S. military must be careful that it never assumes away an enemy capability and their will and potential to use it. While U.S. may continue to enjoy a technological advantage

over potential adversaries for the foreseeable future, it must be careful that it does not allow itself to become a victim of its own success. Its current enemies have proven themselves resourceful enough to engage the U.S. in 4th generation asymmetric warfare and are taking advantage of a style of war that the U. S. is not accustomed, structured or trained to fight well. America's air component must remain just as flexible and well trained to handle any threat, whether it is insurgent operations in Iraq or a massive air war against a country with the will and capability to fight.

CHAPTER SIX

NEW UAV CAPABILITIES

“Joint air capabilities must be reoriented to favor, where appropriate, systems that have far greater range and persistence; larger and more flexible payloads for surveillance or strike; and the ability to penetrate and sustain operations in denied areas.”

- 2006 QDR

There is a new UAV on the block and it has the potential to fundamentally change the way the air component supports the ground commander in the GWOT. The new UAV is called the MQ-9, better known as the Predator B. The Predator UAV, now called Predator A, is relatively well known due to its combat successes since the Bosnian conflict in the 1990s. Its real-time video capabilities brought ISR to the masses and helped revolutionize Time-Sensitive-Targeting (TST).

During Operation Allied Force (OAF) in 1999, the Predator-A saw combat again in Kosovo and Serbia. The enemy quickly realized that it must remain mobile to survive against the precision weapons of the U.S. and coalition air forces. The limiting factor in destroying these mobile targets was the time it took from identification from an ISR asset, such as the Predator, to engagement by a strike asset such as a fighter or bomber aircraft. This time period varied from a few minutes to several hours depending on the status of available forces. Several targets escaped engagement due to lack of strike assets nearby. This drove a requirement to arm the Predator UAV with a precision weapon capable of destroying up to a

tank size target. An armed version of the Predator was developed and officially designated the MQ-1. Since the Predator was originally designed to only carry ISR sensors, it was extremely weight limited on the weapons payload it could carry. The MQ-1 could only carry a total of two weapons, one under each wing to employ against targets of opportunity. The Hellfire air-to-ground missile became the weapon of choice for the MQ-1 due to its light weight and precision capability.

The MQ-1 has had several combat successes in Afghanistan, Yemen, and Iraq. Its unique ability to loiter for up to 24 hours over a target area, PID a target with its ISR sensors, and quickly engage and destroy a hostile target with precision weapons has earned it high praise throughout the U.S. military and government. These successes have driven the next generation of development in UAVs, the MQ-9.

Even with the tactical successes of the MQ-1, it does have its limitations. Since it was not originally designed to carry weapons, the added weight of the weapons costs the system in performance. It can not fly as high or for as long with the additional weight making it more susceptible to detection by enemy forces. Also, it can not carry a variety of precision weapons and is limited in tactical options by only carrying the Hellfire missile. Therefore, the MQ-9 was designed to solve these issues.

The MQ-9 is really the first of its kind in UAV capabilities because it is the first UAV to have a primary mission of “Hunter-Killer”. This is in stark contrast to every other UAV in existence today whose primary mission is ISR. This fact is often overlooked and has yet to be fully appreciated by planners in the DOD. The MQ-1 can only carry 2 Hellfire missiles.^{lxviii} The MQ-9 can carry 16 in a single configuration or a mix and match of different types of precision weapons up to a maximum payload of 3,000 pounds.^{lxix} This is an equivalent

payload to that of an F-16 operating in Iraq today. The MQ-9 is capable of carrying the Hellfire missile, a variety of JDAM, LGBs as well as a mix of state-of-the-art ISR packages.^{lxx} This payload capability, combined with the traditional high resolution, ISR capabilities of the original Predator UAV will give the ground commander a dramatic increase in persistent surveillance and strike capability at a fraction of the cost of conventional strike assets.

It costs about \$4,000 an hour on average to operate a manned fighter according to Air Force figures from 2001. That's about ten times as much as the cost of operating a Predator UAV. Larger fighters such as the F-15E or bombers such as the B-1 or B-52 can cost between \$10,000 and \$20,000 an hour to operate.^{lxxi} Considering the multiple orbits of fighter and bomber jets operating in the AOR 24 hours a day, 7 days a week, 365 days a year, for the past 16 years, this has become a rather large bill. Not only are operating costs of UAVs a fraction of that of conventional fighters, but the training costs of the pilots or operators could be drastically less as well. Currently the Air Force takes rated pilots out of other aircraft to operate a UAV for a tour of three to four years and then they return to their previous aircraft. This is an expensive method to resource operators for the UAV fleet. The skill sets required to operate a UAV are vastly simplified from that of flying a modern day fighter jet. The proposed training system specifically for UAV operators eliminates the unnecessary flight training, saving thousands of dollars per student.^{lxxii} (Figure 5) If approved, as the fleet of UAVs grow throughout the DOD, the cost savings in training will be substantial. Eventually, the cost savings alone will force UAVs into a larger role in combat operations.

		<u>TRAINING COSTS</u>		
<u>B-52 PILOT</u>			<u>PROPOSED UAV PLAN</u>	
SUPT	\$392,000		IFT	\$5,500
B-52 IQT	\$292,000		INST RATING	\$6,500
			SIM CHECK	\$1,000
TOTAL	\$684,000		TOTAL	\$13,000

Figure 5.

Two capabilities have enabled the MQ-9 to become a truly joint asset and ideal for use in the GWOT, the Remote Operations Video Enhanced Receiver (ROVER) and SATCOM data links and radio relays. The MQ-9 as with the MQ-1 is controlled from mission ground stations that can be stationed anywhere in the world. The Air Force currently operates its ground stations in Nevada. Through SATCOM data links, they are able to control the Predators from anywhere in the world. Control of the UAV is not enough though; they must also be able to communicate with friendly forces on the ground. Radio relays, through the UAV and into the data link allows ground forces to communicate with UAV controllers who may be thousands of miles away. The ROVER kit allows the ground commander to see real-time video of exactly what the UAV sensor is seeing. The video along with direct communication with the UAV controllers allows for an extremely quick targeting cycle without any of the ambiguities currently experienced by traditional strike assets.

With traditional manned strike aircraft without the ROVER capability, a lengthy process of verifying a target can occur. When a call by the ground commander is made for

CAS support, aircraft arrive on station with little to no situational awareness. A verbal process called the “talk-on” proceeds until both the Joint Terminal Air Controller (JTAC) and the aircrew are positive they are describing the same target. In an urban environment, where many buildings look exactly the same, this process can be extremely difficult and time consuming. Though tedious, the need to avoid Collateral Damage (CD) and potentially harming friendly and civilian forces is critical. This process could take anywhere from less than a minute to 30 minutes or more depending on the situation. The ROVER capability virtually eliminates this process. With this type of capability currently available and under production, one would think it would be a major part of combatant commander’s requirements for the GWOT.

In fact, it is, to a degree. Each COCOM submits a prioritized Integrated Priority List (IPL) of shortfalls for that theater’s warfighting capabilities. At the Secretary of Defense’s direction, the latest IPLs for FLY06-11 changed their focus from identifying programmatic challenges to capability gaps.^{lxxiii} Fifty capability gaps were identified in the FY06-11 IPLs. Twenty-seven of those gaps are currently or could potentially be addressed by UAVs. Five of the nine COCOM’s number one priority was a requirement gap that a UAV could potentially fill.^{lxxiv} The disconnect comes in the sourcing of these requirements. It is up to the Pentagon, the Joint Staff and the Services to decide how to best fill those requirements. Up until now, they have decided to satisfy the COCOM’s requirements with traditional strike assets. This has been mainly due to lack of capacity and capability in the UAV fleet, but that has been rapidly changing.

The Office of the Secretary of Defense (OSD) published their Unmanned Aerial Systems Roadmap, 2005-2030 in late 2005. They rank the top three priorities from the

COCOMs for UAVs as reconnaissance, precision target location and designation, and weaponization/strike. Although ISR has been the predominant mission for UAVs to date, the MQ-1 has proven the concept in combat that a UAV can be a solution for the COCOM's top requirements. UAVs should be the preferred solution over manned counterparts when the requirements involve long dwell times over a target area. This is the key capability in persistent ISR and strike that manned aircraft do poorly. A typical manned fighter can only stay over a target area for 1 to 2 hours before needing more fuel. A UAV can stay on station for up to 24 hours or more to give the ground commander and uninterrupted view of the battle-space. OSD has identified several other operational issues in regards to UAVs operations in support of the GWOT that need addressing:

1. The low density/high demand nature of the limited UAV force and the operational demands placed on it create a conflict in priorities between employing UAVs in its two key roles, sensing and shooting.^{lxxv} Both the limited number of weapons carried and the coordination time required to obtain permission to employ them subtracted from UAV availability to pursue mobile targets. Both issues of weapons and C2 have already been addressed in this study. The newer MQ-9 can carry up to eight times the number of weapons on current systems. The C2 coordination time is solved by the ROVER kit as a direct link to the ground commander.
2. Weather posed a major constraint on UA operations.^{lxxvi} The increased performance characteristics of the MQ-9 over the MQ-1 have addressed the weather limitations of earlier UAVs. The MQ-9 has a single engine turbo-prop engine with a 45,000ft ceiling. This is 20,000 higher than its earlier version and allows it to fly above most weather conditions while still providing a precision weapon capability.

3. The limited number of frequencies available in the AOR restricted the number of UAVs a ground system could control at a time.^{lxxvii} New data compression technologies have been implemented that haven proven sufficient to control up to four UAVs per system.

The number one operational goal identified by OSD in the UAV Roadmap is to acquire more multi-mission (ISR and strike) capable UAVs, each capable of employing a greater number and variety of weapons.^{lxxviii} This is in stark contradiction to its own statement that there are currently only plans to purchase a total of 60 such vehicles.^{lxxix} In contrast to 183 F-22s and almost 1800 Joint Strike Fighters, there appears to be a disconnect between the COCOM's current requirements, available capabilities, and the Pentagon's long term force structure planning to support the GWOT.

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATIONS

“I still don’t think we’re giving enough priority to UAVs.”

- Senator John McCain

Senator McCain’s comments were to a group of Air Force leaders at an Armed Services Committee hearing on 3 March 2006 after a briefing by the Air Force Chief of Staff on Air Force readiness issues. Secretary of the Air Force Michael Wynne replied, “it’s one of the big issues we’re debating right now.” All of the Services had a chance to voice their strategy for integrating UAVs into their future force structures and they all came up short.^{lxxx} While they each admitted that UAVs will play a vital role in future capabilities, none of them identified exactly how they planned on capitalizing on these new capabilities. Even the new OSD UAV Roadmap document just published at the end of 2005 identified the gap in strategic planning by the Services and defined the document’s purpose to “stimulate the planning process for the U.S. military”.

Airpower gives the United States an asymmetric advantage over every nation on Earth. This advantage is not created by technology but by highly trained men and women. UAVs must play a larger role in our future and it is up to joint planners to ensure that UAVs are employed to their fullest extent. U.S. forces must not forget that we face thinking enemies and that a peer competitor will eventually challenge our dominance. Cooperation and unity of

effort will be essential to the successful integration of UAVs into our force structure. UAVs are a critical part of our future force and will be an essential force multiplier. They greatly enhance the air component's capabilities in CT and CI missions in support of the GWOT as they bring the right mix of persistent ISR and strike to the battlefield.

The current air component force structure does not support a long term strategy for supporting the GWOT. As identified in previous chapters, it is based on Cold War era assets and conventional "inside the box" thinking. It does not take into consideration emerging technologies, transformational concepts, or global mission requirements. Fully integrating current UAV capabilities into the long term joint force structure planning will address and satisfy all of those requirements.

It is the recommendation of this author that the following force structure be implemented into the joint air component planning structure to satisfy the CFLCC's requirements for ISR and CAS to address the long term aircraft and aircrew issues identified earlier in this study. The primary unit of measure for planning will be the ISR orbit requested by the CFLCC. Currently in the CENTCOM AOR there is a requirement for eight ISR orbits. A new asset structure for sourcing each ISR orbit is required. The new formation for each orbit should include one MQ-1 UAV and one MQ-9 UAV system. These two assets would be seamlessly integrated at a common mission ground station. The UAV formation would be backed up by a squadron of fighter jets on alert status at a centrally located Forward Operation Base (FOB). This basic building block of reconnaissance and strike assets will satisfy the combatant commander's requirements for ISR, CAS and TST missions and can be scaled to support operations throughout the AOR and GWOT. The benefits of this proposed force structure would be reaped across all services.

For supporting the GWOT, under a UAV dominant force structure, the number of FOBs could be greatly reduced. Currently there are multiple air bases in Iraq whose primary purpose is to support the air component requirements for OIF. These air bases could be consolidated into one central FOB which would greatly reduce logistics and support costs. This would also reduce the number of deployed personnel in country which would help lower the U.S. footprint in Iraq. This force structure would allow for five fighter squadrons in the CENTCOM AOR to redeploy back to their home units or to support requirements elsewhere. This effort could directly fall in line with the strategic long term objectives of maintaining as small as possible footprint in Iraq or other foreign countries.

This structure could also eliminate the need for the Navy to provide an aircraft carrier in support of OIF operations and free it up for tasking elsewhere. The limited carrier assets could be better distributed to other regions in support of other ongoing operations. Navy strike assets could be easily integrated into a joint rotational cycle to fill a deployment cycle at the consolidated FOB. This CONOP has been recently tested by the Navy in 2005 when they deployed F/A-18 aircraft to Al Asad AB, Iraq to fill OIF ATO taskings.^{lxxxi}

C2 of these operational UAVs should be retained with the air component at the Combined Air Operations Center (CAOC). As CFACC owned UAVs replace Marine organic strike assets a great deal of trust must exist for this relationship to function. Currently in Iraq the Marines have their own designated AO for both land and air operations. This has created a great deal of friction between the MEF and air component when CFACC controlled assets need to operate in the Marine AO. Under the current arrangement, a CFACC owned asset can not enter the Marine AO until time consuming coordination occurs between the Marines, the land component and the air component. This is a direct conflict with the joint philosophy of

unity of command for air assets in the AOR and keeps the force structure at a higher level than necessary. With a streamlined C2 structure in place, ground commanders should be confident that there will be no delays in their calls for CAS due to C2, coordination between components, deconfliction or any other administrative issues.

Even with the most efficient C2 and administrative procedures in place, the ground commander must still be satisfied that the capabilities proposed in this study will satisfy his CAS requirements. The number and placements of the orbits by the CFLCC will ensure that assets are airborne and available within the desired timeline for CAS support. Through the already established immediate CAS requested TTPs and with the ROVER ground kit, the ground commander will already or quickly have the ISR sensor picture or video of the CAS or ISR target in question. This capability in itself is a marked improvement over having to do a verbal talk-on with a manned fighter aircraft. If a slight correction is required with the ISR sensor, the terminology will be based on the common reference of the same video available to both the ground commander through the ROVER kit and the UAV operators at their ground station. Once the target is confirmed, the ground commander will still retain control of fires and effects through existing Joint CAS doctrine. No changes need to be made to TTPs just because the delivery platform is unmanned. The ground commander will actually have more options available to him because of the makeup of the MQ-1 and MQ-9 formation. With the weapons payload capabilities of the two platforms, the options for weapons effects will be greater than that of a manned fighter formation. Once the desired weapons effects are determined by the ground commander, there will be no delay in execution just because the delivery platform is unmanned.

If the ground situation continues or additional effects are required beyond the capabilities of the UAV, the squadron of fighters on ground alert could be quickly scrambled to support the operation. This CONOP is already in place, the only difference would be the alert fighters would be replacing a UAV formation instead of a manned formation. The procedures would remain exactly the same and the difference to the ground commander is transparent. This force structure will meet the standing ISR and CAS requirements identified by the CFLCC and is robust enough to handle multiple immediate CAS requests throughout the AO. The benefits are obviously extensive in force structure savings, allowing up to five fighter squadrons to be freed up from CENTCOM CAS taskings to return to the Global Force Management (GFM) pool of assets. This more efficient use of our nation's aging airpower assets is critical not only for its reduction in annual flying hours against its projected service life but also in its ability to free up aircrews for more diversified combat training.

A similar analogy can be made of America's Special Operations Forces (SOF). Since 9/11, the nation's limited SOF capability has been fully engaged in the GWOT. So much so, that SOF teams have been tasked to accomplish missions outside their normal area of expertise. For example, Navy SEAL teams deployed to Afghanistan to conduct CT missions in support of OEF to relieve other traditionally land based SOF. As SOF requirements continue to grow in the long term GWOT, the DOD has decided to supplement the nation's SOF with new capabilities from the Marines. The 2006 QDR calls for the establishment of a Marine Corps Special Operations Command (MARSOC) composed of 2,600 Marines and Navy personnel to train foreign military units and conduct direct action and special reconnaissance.^{lxxxii} This new SOF capability will help relieve more specialized SOF units that have been heavily tasked in the GWOT. As SOF teams such as the Navy SEALs remain

engaged in combat operations in Afghanistan, their maritime skill sets for their traditional missions deteriorate. Should a situation arise that requires those very specialized skill sets of the Navy SEALs, the nation might find itself in a weaker position due to the reduced readiness in those mission areas. As MARSOC and other SOF assets become available, they will free up SEAL teams and other limited SOF assets to get back to their traditional missions and skill sets that they were originally designed to accomplish. This analogy applies directly to the nation's airpower assets. This is not to suggest that manned strike aircraft be removed from CAS missions because another mission is more important. The proposed UAV integration into the force structure planning is just a Course of Action (COA) optimized for a more efficient use of airpower than what currently exists today.

Adoption of this COA will allow for more strike assets to remain available and better trained for the global missions they could be tasked for as part of the new adaptive planning process and global force management concepts. Under the new adaptive planning process, plans from every COCOM become living plans that are continually updated with available capabilities pulled from a global pool of assets managed by the global force management board and Joint Forces Command (JFCOM). This concept has broken down traditional regional areas of expertise driven by the COCOM's Joint Services Capabilities Plan (JSCP). This document allowed units to train to specific requirements identified in apportionment tables listed in the JSCP and their associated plans. This is no longer valid. With the proliferation of precision weapons, multi-role platforms, and global force management, strike aircraft must be ready to execute under a "Go anywhere, Do anything" mentality.

For example, bomber aircraft that had been preparing for a deployment to the CENTCOM AOR with a CAS centric mission and accompanying training program could find

themselves deploying to Guam in the PACOM AOR with a radically different mission. While some skill sets are common between the two, others are vastly different and require dedicated training in to remain proficient. Attacking deeply buried targets in the mountainous regions of North Korea after ingressing through a highly sophisticated integrated air defense system requires a vastly different skill set than orbiting over an area in Iraq for hours on end while waiting for a CAS tasking into an urban environment. Regardless of how vastly different the skill sets are in the different missions, the nation's leaders have come to expect nothing short of perfection from its nation's airpower. As long as they continue to have such high expectations for airpower, everything must be done to allow for the maximum training opportunities for units under the global force management umbrella to ensure the nation's airpower dominance for the future.

“The QDR properly focuses on the War on Terrorism as our first priority. We will enhance our expeditionary combat power and shape the Services to be lighter, yet more lethal, more sustainable and more agile. Integrating advanced capabilities to improve joint war fighting is at the heart of the QDR effort. The recommendations of this report address the current fight and the full range of missions prescribed in the National Defense Strategy, while hedging against an uncertain future.”

- General Peter Pace, Chairman of the Joint Chiefs of Staff

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ABOUT THE AUTHOR

Major Daren Sorenson graduated from Air Force R.O.T.C in 1993. His first assignment was at the National Security Agency where he served as an Aircraft and Weapons system analyst from 1994 to 1997. From there, he was selected to attend Undergraduate Pilot Training at Laughlin AFB, Texas where he graduated at the top of his class. Major Sorenson selected the F-15E Strike Eagle and served his first operational assignment at Royal Air Force Base Lakenheath, England from 1999 to 2002. During this assignment, Major Sorenson participated in Operation Allied Force, Operation Northern Watch and Operation Southern Watch. At the end of his first operational tour, Major Sorenson was selected to attend the USAF Weapons Instructor Course, commonly known as “Weapons School”, at Nellis AFB, Nevada.

Post Weapons School graduation, Major Sorenson was assigned to Seymour Johnson AFB, NC for his second operational tour. During his tour in North Carolina, Major Sorenson participated in Operation Enduring Freedom and Operation Iraqi Freedom I & II. He served in North Carolina from 2002 to 2005.

Major Sorenson has accumulated over 2,000 hours of flight time, with over 1,700 hours in the F-15E. He has over 100 combat sorties over Iraq and has employed a total of 120 precision guided weapons against hostile targets throughout the CENTCOM AOR. Major Sorenson has been awarded the Distinguished Flying Cross and six Air Medals during his five combat deployments.