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THE NEED FOR A USAF UAV CENTER OF EXCELLENCE

by

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INTRODUCTION

Necessity is the mother of invention. In 360 B.C., the philosopher Plato eloquently quoted this statement by his teacher Socrates in his writing *The Republic*. When Socrates spoke of this he was referring to the ideal state, which when faced with a need or problem, will encourage creative efforts to satisfy this need or problem¹ Throughout the last century of warfare, the necessity to defeat the enemy in a more efficient way contributed to innovations in combat tools. J.C.H. Fuller, when writing about the anatomy of battle in WWI, spoke of the effects of the tank. For the first time a soldier had, with one single tool of warfare, increased mobility, security from the negative effects of bullets, and the ability to discharge his weapons from a moving platform protected by a fixed shield.² From WWI to today's operations in Iraq, fielded forces depend heavily on the tank for protection and projection of force.

Giulio Douhet introduced *The Command of the Air* with "aeronautics opened up to men a new field of action, the field of the air. In so doing, if of necessity, [it] created a new battlefield; for wherever two meet, conflict is inevitable."³ He continued with the observation of the air arm only being vaguely understood in the beginning. Then as the soldier began to grasp the speed and freedom the airplane brought, combined with the advantages it has over fielded forces, the airplane soon became an instrument for attacking the enemy behind his own lines.⁴ The airplane, as with the tank, is an invention of necessity which has changed the face of war over the last

1. E.D. Hirsh et al., *The New Dictionary of Cultural Literacy, Third Edition*, 2002, n.p., on-line, Internet, 07 February 2006, available from <http://www.bartleby.com/59/3/necessityist.html>.

2. J.F.C. Fuller, "Strategic Paralysis as the Object of the Decisive Attack." Air Command and Staff College Strategy and War Academic Year 2006 Coursebook., 217.

3. Giulio Douhet, *The Command of the Air*. Translated by Dino Ferrari. Washington, D.C.: Office of Air Force History, 1983, 3.

4. Ibid., 4.

century. “There have been many changes in the nature and conduct of war in the twentieth century, but perhaps that which has had the greatest impact, both in revolutionizing the battlefield and in expanding the scale and scope of war, has been the advent of airpower.”⁵ This revolution in warfare has not remained stagnant over the last one hundred years.

Necessity reared its head during WWII with the requisite to accurately bomb from high altitudes. The Norden bombsight was one of the most closely guarded secrets during World War II. It was used to determine the exact moment bombs had to be dropped to hit the target accurately. It was claimed to be accurate enough to hit a 100 foot circle from an altitude of 21,000 feet (4 miles).⁶ Initially, the accuracy of bombing operations in the European theater was not as claimed by manufacturers. Modifications and experience improved accuracy of the bombsight. Later in the war B-24s, making 1,543 four minute bomb runs on Japanese targets, were able to achieve the advertised accuracy of the Norden bombsight.⁷ The advantage of over flying enemy defenses soon disappeared and necessity was once again prevalent in Southeast Asia.

The development of jet propulsion, radar tracking and self guidance systems ushered in a new threat to airmen – the surface-to-air missile (SAM). Throughout the war in Vietnam US forces played a cat and mouse game with air defense systems. As soon as U.S. pilots developed tactics to defeat the SAMs, the air defense troops would develop counter-tactics. The necessity to defeat SAMs brought about the quick development AGM-45 Shrike radar homing missile to theater. The only defense the enemy had against the Shrike was to turn off the radar which

5. John Buckley, *Air Power in the Age of Total War*. Bloomington, IN: Indiana University Press, 1999, 1.

6. “Top Secret Norden Bombsight” n.p, on-line, Internet, 07 February 2006, available from <http://www.squadron13.com/B17/Norden.htm>

7. Joe Gray Taylor, "Air Superiority in the Southwest Pacific." in *Case Studies in the Achievement of Air Superiority*, ed. Benjamin F. Cooling, (Washington, DC: Center for Air Force History, 1994), 354.

guided the SAM, making it useless. SAM effectiveness dropped dramatically. In 1965, one U.S. aircraft was shot down for every thirteen SAMs launched. With the Shrike, it now took over twice as many SAMs to shoot down one aircraft.⁸ Although technology such as the Shrike decreased, the probability of loss of aviators during fight for air superiority will always be high as long airmen fly in combat. The need to control the battlespace, provide critical support to ground troops and collect vital intelligence on the enemy's situation and intent will always exist. The necessity to accomplish these tasks and many more ushered in unmanned aerial vehicles to the warfighter.

Unmanned aerial vehicles (UAV) are not an invention of recent history. Its roots begin with aerial reconnaissance utilizing balloons on the battlefields of the Civil War. But it was the use of UAVs during the conflict over Kosovo in the 1990's which brought them to the forefront as a vehicle to accomplish intelligence, surveillance and reconnaissance (ISR). Since then, the UAV fleet has expanded exponentially. But not just for the USAF. The US Army and Marines have integrated UAVs into ground operations as well. The UAV is a tool for taking the human out of harm's way for at least for a small time period. It is this tactical advantage for ground troops which have created the necessity for an expanded UAV fleet for all services. And it is this necessity which has created problems.

During Desert Storm only five UAV systems were used in combat. Of all the new technologies introduced in this war, none played a more decisive or pivotal role in the offensive action of the conflict than the UAV.⁹ Throughout the 1990s, UAVs began to "spread their wings." In three and half years over Kosovo the RQ-1 Predator logged over 11,000 hours of

8. Ibid., 533.

9. Paul G. Fahlstrom and Thomas J. Gleason, *Introduction to UAV Systems*, (Columbia, MD: UAV Systems, INC, 1998) I-4.

flying support.¹⁰ UAVs began to make their mark in combat. As of February 2006 there were over 1,000 UAVs operating in Afghanistan and Iraqi airspaces supporting all the US military services in theater.¹¹ The demand for unmanned systems continually increases and are quickly met by the defense industry, but at a cost to a co-operative operations between the services.¹² Each service deploys UAVs in a different manner. In an effort to maximize the future of UAV power and contribution to joint operations, the USAF proposed becoming the service agent for future system development. This includes the planning, funding, and development of operational concepts of for unmanned aircraft, DoD-wide. To accompany this 2005, the USAF announced the development of its UAV Center of Excellence at Creech AFB, Nevada. Within months, the Joint Staff rejected the USAF's bid and announced a Joint Center of Excellence at Creech AFB.¹³ The USAF UAV Center of Excellence was soon discontinued, yet the need for extensive USAF subject matter expertise for the future of UAV operations continues to exist.

In August of 2005, the DoD released the UAS Roadmap 2005. "UAS" or unmanned aircraft systems are the focus of the 25 year roadmap for unmanned aircraft. The change in terminology more clearly emphasizes the aircraft as only one component of the system.¹⁴ For the purpose of this research paper, the terms UAV and UAS can be used interchangeably. The UAS Roadmap, endorsed by the office of the Secretary of Defense and the Chairman, Joint Chief of Staff addresses the success of UAVs performing the ISR mission. The UAS Roadmap focuses on UAVs taking on more roles typically performed by manned aircraft. They include the arenas of communications relay, command and control (C2), air refueling, strike and eventually

10. Bill Holder, *Unmanned Air Vehicles* (Atglen PA: Schiffer Military/Aviation History, 2001) 20.

11. Glenn W. Goodman Jr., "Congested Airspace" *C4ISR Journal*, 09 February 2006, 18, on-line, Internet, 09 February 2006, available from <http://www.isrjournal.com/story.php?F=1379999>.

12. Adam J. Hebert, "Smashing the UAV Stovepipe," *Air Force Magazine*, February 2006, 50.

13. *Ibid*, 50.

14. Department of Defense, *Unmanned Aircraft Systems Roadmap, 2005- 2030* (Washington, D.C.: Office of the Secretary of Defense, 04 August 2005), 1.

counter-air missions.¹⁵ Many of these missions are Air Force Doctrine Document (AFDD) 1 defined roles performed by the USAF.

Based on research and utilizing the UAS Roadmap, this paper recommends the USAF should reevaluate the establishment of its UAV Center of Excellence. This paper does argue against joint operations or the development of cooperative tactics, techniques and procedures. It is a study which highlights the need for a central point of subject matter expertise as the USAF transforms many traditionally manned missions into the unmanned arena.

15. Ibid, 74.

THE HISTORY OF UAVS AND IMPACT TO COMBAT OPS

To understand the importance unmanned aerial vehicles have had on a combat force, it is critical to know its origins and current capabilities. A stone thrown by one caveman at another caveman would fit the truest sense of the definition a UAV. These vehicles, however, had little to no control once launched. For the purpose of this study the definition of a UAV will be one which generates aerodynamic lift and has some control of flight.¹ UAVs became a recognizable force as early as WWI when Charles Kettering of General Motors developed a biplane UAV for the Army Signal Corps. This aerial torpedo, known as the “Kettering Bug” was launched with preset controls to a target area. Once the target area was reached the wings detached and the unit became an aerial bomb.² It wasn’t until the 1930s when the ability to safely recover a UAV upon mission completion occurred. In 1933, the Curtiss Company modified a bi-wing N2C-2 for remote control operations, signifying the beginning of current UAV concept of operations.³ Historical events thirty years later would bring the UAV to the forefront of combat operations.

In 1 May 1960, Francis Gary Power was shot down in his U-2 while performing a reconnaissance mission over Soviet Union airspace. The political impact of this incident, led President Dwight D. Eisenhower to discontinue the U-2 flights over the USSR. This occurred 18 months before the nation’s first reconnaissance satellite would become operational and at a time when work on the higher flying and faster SR-71 had only just begun.⁴ The necessity for timely reconnaissance became evident two years later during the Cuban Missile Crisis. USAF U-2

1. Fahlstrom and Gleason, I-1.

2. Ibid, I-1.

3. Holder, 11.

4. Lt Col Richard M. Clark, *Uninhibited Combat Vehicles*, CADRE Paper No. 8 (Maxwell AFB, Alabama: Air University Press, August 2000) 21.

pilots were tasked to gather critical data on the soviet short range ballistic missile placements in Cuba. On 27 October 1962 a U-2 flown over a Cuban naval facilities by USAF Maj Rudolph Anderson was fired upon by a Soviet-built SA-2 "Guideline" surface-to-air missile. The launch was in violation of specific instructions from Soviet Premier Krushchev not to fire on US reconnaissance planes. The SAM warhead detonated in close proximity to the U-2 downing the aircraft and killing Anderson.⁵ This same type of SAM missile would plague pilots of over the skies of Vietnam in years to come. Between the time period of Powers' and Anderson's U-2 shoot downs, steps were taken to remove pilots from high risk surveillance missions. On 9 July 1960 the Air Force awarded Ryan Aeronautical a highly classified \$200,000 contract for a flight-test demonstration showing how target drones could be adapted for unmanned, remotely guided photographic surveillance missions.⁶ The Vietnam War was the first true test of UAVs in combat. The Ryan 147, or Lightning Bug, flew 3,435 surveillance sorties in Southeast Asia between 1964 and 1975, and made great contributions to the war effort as the workhorse of the Vietnam-era.⁷ The Vietnam era DoD now needed a UAV to perform high-altitude, long-range, photographic reconnaissance missions deep in enemy territory.

To meet the high-altitude UAV requirement, Ryan Aeronautical developed the Ryan 154 Compass Arrow. The 154 was designed to fly at 78,000 feet with minimum radar and heat signature, ironically similar to today's stealth technology which minimizes risk to F-117, B-2 and F-22 aircraft. Complications in production, financial burdens and the end of the Vietnam War doomed the Compass Arrow.⁸ Both Lightning Bug and Compass Arrow programs were discontinued at after the Vietnam War. This decision was result of both post war military

5. "U-2 Shot Down 27 October 1962" *National Museum of the United States Air Force*, n.p., on-line, Internet, 12 February 2006, available from <http://www.wpafb.af.mil/museum/history/coldwar/cw14.htm>.

6. Clark, 21.

7. Ibid, 22.

8. Ibid, 27.

drawdown and the perception there was no longer a need for UAVs. The necessity dissipated, but not for long.

UAVs over the last century have been a tool of demand. In WWII, flying bombs were developed by the US Army and Navy only to be scrapped at the conclusion of the war. The shoot downs of Powers and Anderson provided a tremendous need for modern UAVs. Vietnam, during its time, generated the greatest need for UAVs. But by 1979 all Air Force UAV programs, as well as the emergent unmanned combat aerial vehicle (UCAV), were terminated. Unlike manned aircraft, which received constant dollars in war and peace, unmanned aircraft received little or no attention when there was no immediate requirement for them.⁹ Between the Vietnam War and Desert Storm, interest in UAV development remained with defense contractors. The US Army, Navy and Marines are responsible for ushering the UAV back into combat operations.

Much has been written about the immergence and impacts manned aircraft like the F-117 and E-8 Joint Stars made during Operation Desert Storm. But it was the UAV which had a higher impact to all services. During the conflict the majority of US manned tactical reconnaissance assets were committed to action throughout the theater, allowing UAVs to emerge as a “must have” capability. Pioneer UAVs were launched from battleships to support naval shore bombardment operations. This same joint use UAV was also used for target designation, damage assessment, and reconnaissance by the Marines. Meanwhile, the Army used the Pointer micro-UAVs, but poor weather and high winds made it less effective than the Pioneer. Here are several examples of UAV effectiveness in Desert Storm:

One account described how “UAVs were used to map Iraqi minefields and bunkers, thus allowing the Marines to slip through and around these defenses in darkness, capture key command sites without warning, and speed the advance into

9. Ibid, 41.

Kuwait City by as much as two days.” The attack on the Iraqi-held Kuwaiti airport provides another illustration of the utility of UAVs. During that encounter “a live Pioneer UAV picture showed a battalion of Iraqi tanks poised on the north end of the airfield for a counterattack. The armored force was broken up by naval gunfire and air attacks before it could strike the advancing Marines.” In one instance Iraqi soldiers surrendered to a Marine Pioneer during battle in Kuwait.¹⁰

Desert Storm was a launching pad for UAV integration in future US military concepts of operations (CONOPS). The RQ-1 Predator would soon become a surveillance workhorse for combatant commanders. Making a brief appearance over Bosnia, the Predator proved its worth over the skies of Kosovo. Predators were tasked with collecting intelligence, searching for targets, and keeping cameras aimed at Kosovar-Albanian refugees. This designated “star” of Operation Allied Force flew over areas deemed too dangerous for manned aircraft. The UAVs forced Serb forces into hiding with persistent surveillance. If the Serbs moved from their positions, they were spotted and reported.¹¹ UAV performance over Kosovo surpassed all expected outcomes.

The need for UAVs when preparing for combat operations would no longer be a tool derived from necessity. UAVs, and the advantage they bring to the fight, would soon be a necessity of combatant commanders and ground troops alike. The next section will provide an analysis of the current impact UAVs offer combat operations in Iraq and Afghanistan. More importantly it will bring to the forefront the growing dependency of UAVs for mission accomplishment.

10. Ibid, 43.

11. Richard J. Newman, “The Little Predator That Could,” *Air Force Magazine*, March 2002, 52, 12 February 2006, available from <http://www.afa.org/magazine/march2002/0302predator.pdf>.

THE GROWING DEPENDANCY ON UAVS

President Bush, in a 2001 statement delivered to cadets at the Citadel, touched on a growing dependency to UAVs. In it he stated, “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. Before the war, Predator had skeptics, because it did not fit the old ways [of reconnaissance]. Now it is clear [to combatant commanders] the military does not have enough unmanned vehicles. We are entering an era in which unmanned vehicles of all kinds will take on greater importance.”¹ In a February 2003 Office of the Secretary of Defense (OSD) UAV Planning Force report the four services had a total of 163 UAVs.² In less than three years the chief of Central Command Air Forces, Lt Gen Walter Buchanan III, told reporters there were over 1,000 UAVs operating in the CENTCOM area of responsibility. A majority of these aircraft are operating below 3,000 feet³. In an OSD report on annual flying hours, the Army flew 33 percent more hours than the USAF.⁴ The explosion in ground troop usage can be contributed to the need for immediate surveillance support. The solution is the backpack UAV.

The Army’s Raven and Marine Corps’ Dragon Eye are the UAVs of choice. Both are backpack-portable, fixed-wing drones weighing between 4 and 5 pounds and operate at a ceiling altitude of 1,000 feet. These UAVs have been a boon to low-level troop commanders, according

1. United States Government Accountability Office, *Unmanned Aircraft Systems: DOD Needs to More Effectively Promote Interoperability and Improve Performance Assessments*, GAO-06-49 (Washington, D.C.: Government Printing Office, December 2005) 7.

2. Ibid, 9.

3. Hebert, 52.

4. Ibid, 53.

to reports from the field. For the first time field commanders have an organic capability for conducting short-range aerial observation over the next hill or a few blocks away in cities. They have made such an impact to ground operations, the Army directed an emergency purchase of 400 Ravens, enough for one Raven in each company.⁵ Dependency on UAV application is becoming widespread in the US Army. In 2003 the Raven systems suffered setbacks due to sandstorms forcing the Army to fall back on the older Shadow systems. Despite the setbacks, Army users in Iraq have been extremely supportive of the system. Maj Gen Raymond T. Modern, Commander of the 4th Infantry Div. (ID), asked Army headquarters for more Shadows. Additionally he requested the acceleration of fielding a third system. This system was not planned on being operational for another two years. Demand has overshadowed supply. In an August 2003 memo, Odierno wrote Shadow "has become an absolute must for [brigade combat team] commanders in locating, identifying and ultimately defeating [high-value targets] in their brigade area of operations." This demand resulted in two additional Army units equipped with Shadows to be deployed to Iraq for combat operations.⁶ The Army is not alone in UAV dependency.

Between January 2004 and June 2005, the Marines submitted 170 urgent needs requests. Among the top 15 requests the Marine Corps Combat Development Center (MCCDC) filled were high and ultra high frequency tactical radios, vehicle hardening to provide protection and increase survivability for operators of thin-skinned wheeled vehicles against improvised explosive devices (IEDs) and Dragon Eye UAVs for intelligence gathering and situational

5. Goodman, Jr., 18.

6. Robert Wall, "Iraq-Bound Army plans to field a new UAV and buy additional Hunters, Shadow-200s," *Aviation Week & Space Technology*, 22 September 2002, n.p., Internet, 15 February 2006, available from <http://proquest.umi.com/pqdwweb?did=411204001&sid=2&Fmt=3&clientId=417&RQT=309&VName=PQD>

awareness capability at the company level.⁷ The newest UAV to fill this need is the ScanEagle. ScanEagle features a unique takeoff and landing system requiring no runway. It is actually "launched" using a wedge catapult system, and it's retrieved from flight using a "Skyhook" system (the UAV catches a rope which hangs from a 50-foot pole). It can silently fly at around 1,000-2,500 feet above a battle space without affecting operations. Most importantly, ScanEagle has the ability to respond to 'short-fuse' tasking, locate and track large and small targets despite concealment efforts, transmit real-time data and video to those in the field, including other UAVs, and operate under the weather when necessary.⁸ The Navy is "on-board" with the ScanEagle as well. "In April 2005, Boeing received a \$14.5 million contract from the U.S. Navy for UAV services in support of Operation Iraqi Freedom and the Global War on Terror. Boeing will provide ScanEagle unmanned aerial vehicles, communication links and ground equipment to support the Navy's requirements. The service plans to use ScanEagle during Naval Expeditionary Strike Group (ESG) missions to provide persistent intelligence, surveillance and reconnaissance (ISR) coverage and to increase oil platform security in the Persian Gulf. The UAVs supporting ESG will be ship-launched and recovered."⁹

As UAVs continue to provide a tactical advantage to the warfighter, the services will continue to demand more and more from them. As the number and types of unmanned aerial system increase in combat so does potential to impose conflict in tactics, techniques and procedures. Systems, which were designed to take humans out of threatening situations, are now presenting new challenges and potential dangers to the warfighter.

7. Geoff Fenn, "Vehicle Armor and Radios Top Marines' List of Urgent Needs in Iraq," *C4I News*, 23 June 2005, n.p., Internet, 15 February 2006, available from <http://proquest.umi.com/pqdweb?did=857993641&sid=4&Fmt=3&clientId=417&RQT=309&VName=PQD>

8. Mark J. Pescatore, "Come spy with me -- UAV offers a bird's eye view of the battlefield," *Government Video*, 01 January 2005, n.p., on-line, Internet, 16 February 2006, available from <http://proquest.umi.com/pqdweb?did=789875441&sid=5&Fmt=3&clientId=417&RQT=309&VName=PQD>.

9. "Boeing ScanEagle UAV Completes Sea Trials Aboard U.S. Navy Ship", *Boeing*, 06 July 2005, n.p., Internet, 16 February 2006, available from http://www.boeing.com/phantom/news/2005/q3/nr_050706s.html.

NECESSITY BREEDS PROBLEMS

There is little doubt the UAV has made positive impacts to the warrior. But the demand for more UAVs is beginning to come at a price. One growing area of concern is shrinking airspace. Aircraft collision avoidance is as simple as keeping two aircraft out of the same piece of airspace at the same time. The two ideal methods for avoiding collisions are time (sharing an airspace but using routing time to deconflict) and restriction (allowing only one aircraft at a time). Manned aircraft have the additional element of the human eyesight and the ability to “see and avoid” other aircraft in the event the time and restriction system does not work. The addition of UAVs inability to “see and avoid” into the flight environment pose a danger to airmen. Collisions between UAVs and helicopters have already occurred. U.S. Air Force Lt. Gen. Buchanan III, told the Defense News Media Group’s Joint Warfare Conference “we have more than 1,000 UAVs operating in the airspace flying at all altitudes with a majority of them fly below 3,000 feet. So far, we have been fortunate. We’ve hit some helicopters, but we haven’t hurt anybody yet. I fear the day when it’s going to happen.” He continued with, “what I worry about is the day when I have a C-130 down low with a cargo load full of soldiers, and a UAV — it won’t have to be a big one — comes right through the cockpit windshield.”¹

Airspace is not the only shrinking medium in combat operations. UAVs provide real time ISR information to the warfighter. Unmanned aircraft operators use the electromagnetic spectrum to maintain contact with the UAV to control its flight, fire its weapons if armed, and receive information collected by the sensor payloads. This information is passed over data links between the units and users. Many of today’s UAVs utilize commercial off-the-shelf link

1. Goodman, Jr., 18 [All information the same as in the preceding note.]

equipment offered at reduced costs and shorter development periods for the DoD.²

Unfortunately, this reduced cost is accompanied by lower priority radio frequency spectrum allotment. And this allotment is quickly shrinking. As the spectrum is increasingly constrained, there is the potential to undermine joint operations by requiring delays an unmanned aircraft flight or, if the problem worsens, mission cancellation.³ Numerous weapons also use the electromagnetic spectrum along with UAVs. They can interfere with each other if operating on the same frequency at the same time. For example, insufficient bandwidth limits U.S. forces' ability to download video and radar images via satellite from more than one aircraft at a time. As a result, data transmission and relay are delayed, undermining U.S. forces' ability to engage time-critical targets and possibly permitting targets to escape, unless alternative information sources are available on a timely basis.⁴

The vast number of UAVs in theater pose a coordination problem as well. Like their manned counterparts, unmanned aircraft need to coordinate effects as well. For example, one tactic for defeating the improvised explosive devise (IED) is by jamming the frequency it operates on. If a jammer is added to an unmanned aircraft, it may meet one service's requirements very well but have "significant detrimental effects to somebody else—because the [jamming] hadn't been coordinated," observed Dyke Weatherington, Deputy Director of DoD's UAS planning task force at the Pentagon. "Electronic fratricide" can occur when the jammer used to defeat the IED also disrupts the radios of the troops they are protecting.⁵

These are just a few of the problems UAVs have created on the battlefield. In an effort to resolve these and future issues, the DoD created a Joint UAV Center of Excellence at Creech

2. Department of Defense, 129.

3. United States Government Accountability Office, 14.

4. Ibid, 14.

5. Hebert, 53.

AFB, Nevada. This decision to develop a Joint UAV COE came at a cost to the USAF: the closure of the USAF UAV COE.

THE USAF LOSES AN OPPORTUNITY

The Greek mythological legend of Pandora's Box tells the story of a woman created by the gods to punish the acts of the titan Prometheus (Greek for "foresight"). Prometheus warned his brother, Epimetheus ("hindsight") not to take any gifts from the gods. When Pandora arrived he fell in love with her. Epimetheus was warned to not open the box, which was Pandora's dowry. Epimetheus told Pandora never to open the box she had received, however, Pandora's curiosity got the better of her and she opened it, releasing all the misfortunes of mankind along with hope.¹ UAVs have not become the "Pandora's Box" of the DoD, but they bear a certain similarity. Unmanned operations have brought hope to soldier, delivering near-real time data for decisions which can defeat the enemy swiftly while keeping troops out of harm's way. It is a tool which has been unleashed and is creating challenges in the battlespace. Hindsight did not prevent some of the problems described in the previous section, but foresight can help resolve those and prevent future problems.

In the beginning of FY05, the USAF made an effort to resolve the growing UAV problems. The Air Force proposed to make the USAF "executive agent" to take the lead in coordinating various UAV efforts. The benefits UAVs were bringing to combat have led other services to pursue their own unmanned aircraft plans. This has created "stovepipe" or narrowly defined effects. These "stovepipes" were coming together in the crowded airspace over Iraq. Joint concepts of operation were lacking, as plans were individually developed for each service-bred system.² In the Air Force's view, creating an executive agent for UAVs would streamline the way UAVs were acquired and managed, unifying and thus strengthening the whole

1. *Wikipedia, the Free Encyclopedia*, on-line, Internet., 16 February 2006, s.v. "Pandora," available from http://en.wikipedia.org/wiki/Pandora%27s_box.

2. Hebert, 53.

apparatus. It would also foster common operational concepts and procedures. The Air Force believed it had the best claim to this role due to its air operations expertise. Officials proposing agent service reminded the Pentagon the Air Force has the mission of controlling the air and longer experience with UAVs.³ To show commitment to the effort Major General Stephen Goldfein, the Air Warfare Center commander at Nellis AFB, announced in a telephone news conference the USAF would develop a UAV Center of Excellence at Indian Springs Auxiliary Field (later designated Creech AFB, Nevada). He emphasized “the UAV Center of Excellence will coordinate UAV activities at the tactical, operational, and strategic levels, working to provide a common structure for UAV command and control systems.”⁴ While recognizing the values of UAVs to the USAF and the DoD as a whole, he continued with “I think that it's most appropriate and prudent to recognize not only the value of what we do have, but where we're going. The idea would be then to have one place, one center, which would in turn carry us forward with not only what we do have but what we will be acquiring as we move on.”⁵ The vision of the center was the future. During the interview General Goldfein fielded several questions about the relationship the center will have with sister services, the UAV Battlelab and the responsibilities it will have if the USAF is designated as the agent service for UAVs. These topics provided foresight into the role the USAF would need to take in UAV operations and will be discussed later in this paper.

The bid for “agent service” status did not go unnoticed by other services, particularly the US Army. In an Aviation Week & Space Technology article Army officials expressed concerns about turning stewardship of the service's unmanned aircraft over to the Air Force, particularly if

3. Robert S. Dudley, “Where Do UAVs Go From Here?” *Air Force Magazine*, July 2005, 2.

4. “Air Force stands up UAV Center of Excellence,” *Air Force Link*, 17 March 2005, n.p., on-line, Internet, 12 February 2006, available from <http://www.af.mil/news/story.asp?storyID=123010065>.

5. Ibid, n.p.

it disturbs plans to streamline combat ground forces and develop the next-generation Future Combat System (FCS). Lt. Gen. John Curran, chief of the Army's Training and Doctrine Command expressed concern over how relinquishing control of UAVs may affect the Army's plan to become lighter and more adaptable. With the USAF as the executive agent for UAVs, it is assumed the Army will have to provide with clarity, nonnegotiable requirements to the USAF and gain its support.⁶ Coordination and acceptance of needs were not the only issues placing a wedge between the services on the issue of UAV stewardship. The defense budget came into play as well.

During the USAF's executive agent bid, the Quadrennial Defense Review (QDR) was in coordination with a projected February 2006 release. USAF officials believed a decision on UAV leadership would, by extension, impact the framework of the QDR. If the UAV issue was resolved quickly, it would likely smooth the QDR process and address the Air Force's plans for UAV standards directly.⁷ Army officials point to the USAF's long-term plan to reduce its fighter and attack aircraft force by 25 percent over the next two decades with limited regard to how it will affect the ability to provide timely ground-delivered responsive fires. Army and Marine officials questioned the analysis behind the cuts and point out the speed with which decisions are made and enforced.⁸ This concern contributed to the hesitation to allow a single service management over the UAV fleet.

In July 2005, the Pentagon rejected the USAF bid for agent service status for UAVs and announced the establishment of a Joint UAV COE. The Air Force UAV COE, established at Creech, stood down in order to support the joint center. The Air Force retained its UAV

6. David A. Fulgham and Amy Butler, "Drawing a Line in the Air," *Aviation Week & Space Technology*, 27, on-line, Internet, 12 February 2006, available from <http://proquest.umi.com/pqdweb?did=808678251&sid=6&Fmt=3&clientId=417&RQT=309&VName=PQD>.

7. Ibid, 27.

8. Ibid, 27.

Battlelab, with the direction to coordinate activities at the tactical, operational and strategic levels. "The Air Force is supporting the standup of the (joint center) and elected to stand down its own center to emphasize the importance of this Joint Initiative," said Colonel William DelGrego, Chief of Air Force Concepts, Strategy and Wargaming division.⁹

With this decision, the USAF relinquished a center, which could have made a significant impact to the future of AFDD-1 defined operational functions within the UAV arena.

9. "Joint UAV Center of Excellence at Creech," *Air Force Link*, 11 July 2005, n.p., on-line, Internet, 12 February 2006, available from <http://www.af.mil/news/story.asp?storyID=123011008>.

RECOMMENDATION: THE NEED FOR A USAF UAV COE

Necessity is presented in this research paper as a driving factor for the development of UAVs in assisting airmen, soldiers and marines in combat operations. For members of the USAF, UAVs provide a mean to accomplish aerial missions deemed too dangerous for airmen. This necessity to minimize battlefield casualties will place UAVs further on the forefront of future combat operations. However, safeguarding troops is only one benefit UAVs provide. *UAS Roadmap 2005-2030* details three attributes which make UAVs preferable to manned aircraft. UAVs are “better suited for ‘dull, dirty, or dangerous’ missions than manned aircraft. This presupposes man is (or should be) the limiting factor in performing certain airborne roles. Although any flight can be dull or dangerous at times, man continues to fly such missions, whether because of tradition or as a substitute for technology inadequacies.”¹ Current USAF controlled UAVs, like the Predator and the Global Hawk, have the ability to fly for over 24 hours unrefueled. In comparison, manned E-3s in Operation ENDURING FREEDOM averaged only 14 hours while requiring an aerial refueling. Reconnaissance is by now a well established mission of UAVs. Combatant commanders (COCOMS) have recognized advantages UAVs bring to fielded forces and are beginning to express demands beyond the reconnaissance role.

The Demand for UAVS is Voiced by Senior Leadership

Annually, each COCOM submits an Integrated Prioritized List (IPL) of shortfalls in each perspective warfighting theater. At the direction of the Secretary of Defense, the latest IPLs (for FY06-11) changed focus from identifying programmatic challenges to capability gaps and tied

1. Department of Defense, 15.

these gaps to the five QDR (Quadrennial Defense Review) defined “operational risk” categories: battlespace awareness, command and control, focused logistics, force application, and force protection. Of the 50 capability gaps specified in this IPL, 27 (or 54 percent of the IPLs submitted) were capabilities currently, or have the potential to be addressed by unmanned systems. Four of the shortfalls specifically identified unmanned platforms as a desired solution.² This desire for enhanced UAV capabilities does not stop at the COCOM level.

In February 2006, the DoD released the QDR Report. This document is not designed to be a programmatic or budget document; instead, it reflects the thinking of the senior civilian and military leaders of the DoD. Secretary of Defense Donald Rumsfeld introduces the QDR with “in the pages that follow, the Department’s senior leadership sets out where the Department of Defense currently is and the direction we believe it needs to go in fulfilling our responsibilities to the American People.”³ One major QDR decision is to nearly double UAV coverage capacity by accelerating the acquisition of Predator and Global Hawk UAVs. An April 2006 *C4ISR Journal* analysis of the QDR and its impact on UAV development stated “in addition to requesting \$1.7 billion in 2007 for UAV development and procurement, the Pentagon has laid out plans to spend \$11.6 billion through fiscal 2011, including the purchase of 322 air vehicles. This will increase available missions by 75 percent and expand persistent surveillance.”⁴ In a Pentagon QDR briefing in February 2006, Vice Adm. Evan Chanik, Director of Force Structure, Resources and Assessment for the Joint Staff, fielded a question on where the Pentagon was looking in the area of the “long-war point of view.” He responded, “one of the things which came out loud and

2. Department of Defense, 41.

3. United States Secretary of Defense, *Quadrennial Defense Review Report, February 6, 2006*, (Washington D.C.: Government Printing Office), 5.

4. Karen Walker, “Striking it Rich,” *C4ISR*, April 2006, 18.

clear to us was [the need for] persistent ISR.”⁵ The short-term or five year outlook for UAVs is battlefield awareness. The long-term future of UAVs will expand beyond awareness into force application.

The Long-Term Impact of UAVs on USAF Missions

In their surveillance and reconnaissance role, UAVs perform one of the key operational functions of the USAF. AFDD 1, *Air Force Basic Doctrine*, defines operational functions as one tied to achieving specific effects. These effects should contribute directly to desired military and political outcomes. Commanders and planners must have a clear understanding of national security and campaign objectives. They must have knowledge of those actions necessary to create effects which cumulatively result in the desired end state.⁶ The 17 key operational functions identified by AFDD 1 are:

Strategic Attack	Air Refueling
Counterair	Spacelift
Counterspace	Special Operations
Counterland	Intelligence
Countersea	Surveillance and Reconnaissance
Information Operations (IO)	Combat Search and Rescue (CSAR)
Combat Support	Navigation and Positioning
Command and Control (C2)	Weather Services
Airlift ⁷	

Section 6.0 of the UAS Roadmap 2005-2030 identifies two major “families of missions.” One emphasizes payload capacity and persistence, while the other stresses autonomy, survivability, and weapons employment. Both will drive UAS design and development over the

5. Under Secretary of Defense for Policy Ryan Henry and Vice Adm. Evan Chanik, address to media on release of 2006 QDR, Washington D.C., 3 February, 2006, n.p. on-line, Internet, 30 March 06, available from <http://www.defenselink.mil/transcripts/2006/tr20060203-12424.html>.

6. Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, 17 November 2003, 38.

7. Ibid, 39.

next 25 years.⁸ Figure 1 is a visual depiction of the two “families” (payload with persistence and weapons delivery), the current aircraft performing the identified mission and the road for introduction on unmanned aircraft into operations.

Figure 1
UAS Missions Roadmap

MISSION	CURRENT AIRCRAFT	INTRODUCTION OF UA INTO OPERATIONS					
Payload with Persistence		2005	2010	2015	2020	2025	2030
Communication Relay	ABCCC, TACAMO, ARIA Commando Solo		(e.g., AJCN)				
SIGINT Collection	Rivet Joint, ARIES II Senior Scout, Guardrail		(e.g., Global Hawk)				
Maritime Patrol	P-3		(e.g., BAMS)				
Aerial Refueling	KC-135, KC-10, KC-130						
Surveillance/ Battle Management	AWACS, JSTARS						
Airlift	C-5, C-17, C-130						
Weapon Delivery							
SEAD	EA-6B		(e.g., J-UCAS)				
Penetrating Strike	F-117		(e.g., J-UCAS)				
Integrated Strike/SEAD	EA-6B, F-16, F-117			(e.g., J-UCAS)			
Counter Air	F-14, F-15, F-16						
Integrated Strike/SEAD/ Counter Air	F/A-18, F/A-22						

Sources: Department of Defense, *Unmanned Aircraft Systems Roadmap, 2005- 2030* (Washington, D.C.: Office of the Secretary of Defense, 04 August 2005).

When the 17 AFDD 1 identified key operational functions are compared to the two “families”, all but five (navigation and positioning, spacelift, weather services, combat support, and counterspace) can be influenced by UA operations over the next 25 years. As recently as 24

8. Department of Defense, 71.

March 2006 the USAF recognized the need to focus on UAV long term development when it released the *U.S. Air Force Remotely Piloted Aircraft and Unmanned Aerial Vehicle Strategic Vision*. Air Force leadership released this vision document to provide high-level guidance to service development and integration of unmanned aircraft for the next 25 years.⁹ This vision identifies the requirement to work with sister Services, USSOCOM, and OSD in developing rules of engagement, and tactics, techniques, and procedures for autonomous operation, to include weapon delivery.¹⁰ Yet, it does not identify the means to coordinate this effort.

Center of Excellence Defined

As mentioned, in July 2005 the Pentagon announced the establishment of a Joint UAV COE and the standing down of the USAF UAV COE. The Joint UAV COE was charged with coordinating UAV activities at the tactical, operational, and strategic levels, while working to provide a common structure for UAV command and control systems.¹¹ The decision to stand down the USAF COE occurred less than six months after its establishment. Because the COE was short lived, its ability to provide support to the Air Force mission and its key operational functions had never developed. But, what exactly is the expected role of a center of excellence?

The term “center of excellence” is not a common definition found in military dictum. It is difficult to find any reference to the term in any joint pub or air force document, yet several Air Force organizations claim the status of Centers of Excellence. Encarta, the digital multimedia encyclopedia published by Microsoft Corporation, describes COE as “a place where

9. “Air Forces Releases UAV Strategic Vision,” *Air Force Link*, 24 March 2006, n.p., on-line, Internet, 30 March 2006, available from <http://www.af.mil/news/story.asp?id=123017981>.

10. Ibid, n.p.

11. “Air Force stands up UAV Center of Excellence”, np.

the highest standards of achievement are aimed for in a particular sphere of activity.”¹² In the civilian sector a COE is described as a formalized, documented relationship between two parties or a recognized leader in a program. The declaration of COE status in the USAF is not as formal.

USAF COEs parallel the two definitions above. For example, the Air Force Center for Environmental Excellence provides Air Force leaders with the comprehensive expertise and professional services necessary to protect, preserve, restore, develop and sustain the nation's environmental and installation resources.¹³ While the Negotiation Center of Excellence at Air University spearheads the development and application of negotiation, collaboration and problem-solving skills throughout the Air Force. The center is the result of an innovative partnership between Air University and the Air Force General Counsel.¹⁴ For the purpose of this research paper, a USAF COE is defined as a “place where the highest standards of achievement are targeted and demonstrated as the standard among common use agencies in an effort to better Air Force missions.” The vision of a USAF COE should be to provide subject matter expertise and assist USAF decision makers in the development of long range strategy in a particular sphere of activity. The US Army demonstrated this trait in July 2005 when it announced the development of the Army UAV COE.

The US Army Takes the COE Lead

Soon after the announcement of the Joint UAV COE, the U.S. Army Aviation Center at

12. *MSN Encarta Encyclopedia*, on-line, Internet., 16 February 2006, s.v. “center of excellence,” available from http://encarta.msn.com/dictionary_1861694214/center_of_excellence.html.

13. *The Air Force Center of Environmental Excellence*, Internet., 15 February 2006 available from <http://www.afcee.brooks.af.mil/>.

14. Master Sgt. Mitch Gettle, “Negotiation Center of Excellence established.” *Air Force Link*, 28 September 2005, n.p., on-line, Internet, 12 February 2006, available from <http://www.af.mil/news/story.asp?storyID=123011968>.

Fort Rucker, Alabama. was designated the location for the Army Unmanned Aerial Vehicle Center of Excellence. Brig. Gen. Jeffrey Schloesser, director of the Army Aviation Task Force at the Pentagon stressed the importance of uniting 12 Army installations performing UAV operations. “We realized that we needed an integrating hub for all these installations which have a UAV component. This will also create one Army voice to be able to represent UAVs at headquarters, to the joint centers of excellence, and to the joint structure.”¹⁵ With the impact UAVs could have on the Air Force mission over the next 25 years, the USAF, like the Army, needs to develop a single voice.

Developing a Single Air Force Voice

Accompanying the establishment of the Joint UAV COE at Creech AFB was an announcement the Air Force would retain its UAV Battlelab. The Battlelab will continue to coordinate UAV activities at the tactical, operational, and strategic levels.¹⁶ But, are either of these organizations best for leading the USAF’s charge into unmanned operations? Adam Hebert described the roles and responsibilities of the Joint UAV COE and USAF UAV Battlelab in his Air Force Magazine article, *Smashing the UAV Stovepipe*. In it, he noted, “the Air Force’s UAV Battlelab remains focused on its traditional mission of developing quick solutions to combat requirements. The Battlelab is heavily involved in war on terrorism needs, either by figuring out solutions to demonstrated needs or by seeing new technology and applying it to existing problems.” Meanwhile, the “Joint UAV center is [directed to handle] coordination and ‘non-materiel’ solutions to unmanned aircraft issues.”¹⁷ Hebert asked a critical question in this

15. Carrie David, “Army UAV Center of Excellence to be at Rucker,” *The Military Family Network*, 15 July 2005, n.p. on-line, Internet, 3 April 2006, available from <http://www.emilitary.org/article.php?aid=3515>.

16. “Joint UAV Center of Excellence at Creech,” n.p.

17. Ibid, n.p.

article: “Will the new arrangement be sufficient to meet the military’s—and the Air Force’s—burgeoning needs in this area?” The answer derived from numerous interviews with those involved in the effort written is “yes, the arrangement should work.”¹⁸ However, is “should” a strong enough commitment to the challenges the USAF face and is the UAV Battlelab the right organization to lead this challenge?

While the USAF UAV Battlelab, co-located with the Joint UAV COE at Creech AFB, is a logical first choice to guide the Air Force effort, there may be several downfalls in the choice. The first is the focus of effort. The Battlelab mission is to analyze “UAV problems and then go to industry, academia, and service and national labs system for solutions”, according to Colonel Larry Felder, the unit’s commander who assisted with the development the Air Force’s original Battlelab concept.¹⁹ The Battlelab is in the business of “rapidly identifying and demonstrating innovative concepts which exploit the unique characteristics of UAS to meet the warfighters’ needs.” At its farthest stretch, the process of the organization only looks five years out.²⁰ The second downfall of the units is its chain of command. The Battlelab, charged with assisting the Joint UAV COE in coordinating UAV activities at the tactical, operational, and strategic levels reports to the Air Warfare Center (AWC) at Nellis, AFB. The ACW reports to Air Combat Command. With this chain of command, the “voice” of Air Force UAV development is at least three levels below command leadership. The USAF needs an organization with a more unencumbered reporting “line” to leadership when developing the strategic applications of UAVs. This will ensure the visions of UAVs impact to the Air Force mission, established by the Air Force Chief of Staff, are developed properly.

18. Ibid, n.p.

19. Master Sgt. Charles Ramey, “UAV Battlelab stands up at Indian Springs”, *Air Force Link*, 23 June 2004, n.p. on-line, Internet, 5 April 2006, available from <http://www.af.mil/news/story.asp?storyID=123008027>.

20. Maj. Kevin J. Kniskern, USAF UAV Battlelab, interviewed by author, 15 January 2006.

The USAF Needs a UAV COE

The USAF should follow the lead of the US Army and once again develop a UAV COE. It needs an organization which will focus on long term (beyond five years) strategy for introducing unmanned vehicles into the Air Force mission. The Joint UAV COE has an important role in integrating the services in UAV operations. “The joint center was created—at least in part—because the military services employ unmanned aircraft differently.”²¹ The US Army developed a UAV COE to provide a unified position on employment of UAVs to enhance the Army mission. In the initial push of forces to Baghdad in Operation Iraqi Freedom, the Army experienced a lack of UAV support when the limited Predators in theater were tasked for USAF use.²² This lack of assistance is a contributing factor to the vast number of UAVs dedicated strictly to Army and Marine use in Iraq today. A USAF UAV COE can minimize the potential for this situation in the future.

Along with the responsibility of guiding the USAF through the transition of unmanned operations, a USAF UAV COE should work closely with the Army UAV COE in ensuring UAVs fulfill the needs of all battlefield participants. The goal will be to assist and enhance the Joint UAV COE in the integration of service UAV operations: not to work independent of the Joint COE. This same effort should be applied to any future UAV COE the Navy and/or Marine Corps choose to establish.

Finally, the mission of the USAF UAV COE should not concentrate strictly on the Air Force mission. The center should maximize “opportunities to partner with other services on joint programs, echoing congressional requests that the services avoid separately developing -- and funding -- nearly identical systems.” During a conference at the American Enterprise Institute,

21. Hebert, 51.

22. Greg Grant, “Preventing Another ‘Peach’,” *C4ISR*, 25 September 2005, n.p., on-line, Internet, 10 January 2006, available from <http://www.c4isrjournal.com/story.php?F=1144130>.

General T. Michael Moseley, USAF Chief of Staff, expressed his willingness to share the effects of USAF system with other services. If the mission is accomplished, "it doesn't bother me at all to spray paint 'U.S. Navy' on one side, and 'U.S. Air Force' down the other side of an Global Hawk," General Moseley stated.²³

23. Megan Scully, "Air Force chief vows crackdown on cost overruns," *GovExec.com*, 12 October 2005, n.p., online, Internet, 10 January 2006, available from <http://www.govexec.com/dailyfed/1005/101205cdpm1.htm>.

CONCLUSION

Unmanned aerial vehicles are an invention of warfare born of necessity. The introduction of surface to air missiles in combat ushered in a need to protect pilots over enemy territory.

UAVs provided a solution. Soon the ability to apply UAVs to force protection went beyond the battle in the skies. Soldiers and marines alike soon reaped the benefits of UAVs and the ability to build battlefield awareness. Demand for this weapon of combat grew.

Like a houseplant, UAVs soon out began to outgrow their containment area. UAVs, while still providing an incredible tactical advantage to the soldier, were becoming a potential threat to manned aircraft in a shrinking airspace. The Air Force attempted to step in, vying to be the agent service for UAV operations. The Air Force wanted the responsibility to streamline the acquisition and development of UAV operations for all services. This attempt was defeated and cost the Air Force its UAV COE.

Today, reconnaissance is an established and highly successful mission of UAVs. Military leadership, from the Department of Defense through the Chiefs of Staff, has recognized this success. Their UAV vision is a more robust unmanned armada, absorbing more and more military missions across the services. Many of these mission fall under USAF responsibilities.

The USAF needs to reconsider establishing a UAV COE. It lost more than a COE when the Joint UAV COE replaced it at Creech AFB. It lost its primary “voice” in the transition of its key operational functions into the unmanned arena. More importantly, it lost a key ability to partner UAV operations with other services. To develop systems not just for airmen or soldiers, but for the armed forces as a whole.

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Glossary

C2	Command and Control
COCOMS	Combatant Commanders
COE	Center of Excellence
CONOPS	Concept of Operations
DoD	Department of Defense
ESG	Expeditionary Strike Group
FCS	Future Combat System
ID	Infantry Division
IED	Improvised Explosive Device
ISR	Intelligence, Surveillance, Reconnaissance
MCCDC	Marine Corps Combat Development Center
OSD	Office of the Secretary of Defense
QDR	Quadrennial Defense Review
SAM	Surface to Air Missile
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
UCAV	Unmanned Combat Aerial Vehicle
USAF	United States Air Force