AU/ACSC/03-001/2003-04

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

INTEGRATING UNMANNED AERIAL VEHICLES (UAVs) WITH CURRENT COMBAT SEARCH AND RESCUE (CSAR) DOCTRINE

By

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A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

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April 2003

Distribution A: Approved for public release; distribution unlimited

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
APR 2003	**N/A**	**-**

4. TITLE AND SUBTITLE **Integrating Unmanned Aerial Vehicles (UAVs) With Current Combat Search and Rescue (CSAR) Doctrine**	5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Air University Press Maxwell AFB, AL 36112-6615**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**UU**	**33**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

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Preface

The events of September 11, 2001 brought home to the United States (U.S.) the realities of the Post Cold War World. With the realization that our Republic's armed forces are fighting a new type of enemy came a demand that the United States military defeat this new threat using every tool in our arsenal.[1] The use of United States Air Force Predator Unmanned Aerial Vehicles (UAVs) and externally carried Hellfire anti-armor missiles against selected Taliban and al Qaeda targets was the first modern-day UAVs to do so in combat.[2]

This use of UAVs in a direct combat role, as opposed to their traditional Reconnaissance, Surveillance and Target Acquisition (RSTA) role, led me to the idea of using UAVs for other non-traditional roles in combat. As an Army UH-60 Black Hawk helicopter pilot, Combat Search and Rescue (CSAR) is an integral part of our Army Aviation mission. This is also true among the other services' rotary-wing and fixed-wing communities. A common problem among all the services, particularly the Air Force, is the limited amount of resources and manpower that are devoted to the CSAR mission. Under the current force structure, exactly 105 HH-60G Pave Hawks in the Air Combat Command inventory are too few to perform the potential number of missions required to support current operations.[3]

The rescues of Lieutenant Colonel Iceal Hambleton in Vietnam and Captain Scott O'Grady in Bosnia illustrate the difficulty associated with CSAR operations on the modern battlefield. Although units like the Army's 160th Special Operations Aviation Regiment and the Air Force's 16th Special Operations Wing have platforms dedicated to the CSAR mission, Clausewitz's "Fog and Friction of War" conspire to force commanders to change entire mission plans and Air Tasking Orders (ATO) to support most CSAR operations. This change of mission is a necessary evil that commanders at

all levels, regardless of service, must undertake for "preserving the life and well-being of our Service members and civilians placed in harm's way while defending our Nation's interests."[4] The recent events in Afghanistan during Operation Anaconda highlight the potential UAVs can bring to CSAR operations. With this in mind, this paper attempts to address some potential benefits that UAVs can bring the Joint community operating on the twenty-first century battlefield.

Notes

[1] "The National Security Strategy of the United States of America, September 2002," (Washington, D.C.: U.S. Government Printing Office, 2001), Preface.

[2] Glenn W. Goodman, Jr., "Missile-Firing Drone: USAF's Armed Predator UAV Breaks New Ground," *The ISR Journal*, 2002/Issue 1, 36.

[3] "Combat Search and Rescue, Air Force Special Operations Command Eagerly Awaits USAF Chief's Decision," *The Armed Forces Journal International*, October 2002, 32.

[4] Air Force Doctrine Document 2-1.6, *Combat Search and Rescue*, 1.

Chapter 1

Introduction

0300 hours (Zulu) somewhere north of Baghdad – Major Chris Foster, call sign BACH-21, was flying a CAP mission supporting two flights of Air Guard F-16s attacking an Iraqi armor division retreating south towards Baghdad, when suddenly he had a warning on his Surface-to-Air Missile (SAM) radar indicating he was being looked at by an Iraqi radar system. BACH-21 whipped his plane over into a left SAM break. As G-forces began to press against him, he felt his aircraft shake violently and continued to roll inverted as an SA-6 slammed into his right wing. Fighting the G-forces he fumbled for the firing mechanism of his ejection seat, found it, and pulled the handles. The canopy immediately blew-off and suddenly he was alone in the air, three miles above the barren deserts of Iraq.[1] *Completely numbed by the shock of ejection and the deployment of his parachute, he made good use of the time remaining during his decent. He pulled out his PRC-112B radio and tried to establish radio contact with his wingman. He called twice and got no response from his wingman orbiting farther south to stay out of the range of the SAM batteries below. His parachute-landing fall was much softer than he anticipated as he landed on the hard Iraqi soil. Quickly securing his parachute, he made a dash for the nearest wadi and waited for the recovery he hoped would come soon. Because the PRC-112 is equipped with an Emergency Locator Transmitter (ELT), both the E-8C J-STARS (Joint Surveillance, Target Attack Radar System) aircraft operating in theater and one of the sixteen SARSATs (Search and Rescue Satellites) designed to locate ELTs would track his position.*

High above the downed pilot, a USAF RQ-1 (Predator B), equipped with an AN/APY-8 radar system was tracking Iraqi ground vehicles when the UAV (Unmanned Aerial Vehicle) operator in Turkey located BACH-21's hide sight. The Predator's optical systems quickly pinpointed his position and relayed the information to the J-STARS controllers working the situation. The J-STARS operator knew that unless BACH-21 was picked-up quickly, the local Iraqi paramilitary forces would sweep through and grab their first downed allied pilot of the war. A message was immediately relayed to the JFACC (Joint Force Air Component Commander) describing BACH-21's situation. A decision was immediately reached to utilize a new recovery technique developed by the USAF Special Operations School and UAV Battle Lab. A USMC Eagle Eye TRUS (Tilt Rotor UAV System) operating with a forward unit of the 1st Marine Division was immediately directed to BACH-21's location ninety miles to the north. Cruising at 200 knots, Eagle Eye was a low-cost, composite tilt-rotor air vehicle using extensive off-the-shelf helicopter and common hardware parts.[2] *Using a technique originally developed for U.S. Army AH-64 and OH-58D aviators, the procedure*

involved a downed pilot "hooking" himself to a mooring clevis on the UAV by means of a "D" ring secured to the pilot's survival vest. This "James Bond" recovery technique, while unusual and very risky, gave allied pilots the chance to avoid becoming a POW (Prisoner of War) and a political pawn in the war with Iraq.

Soon the Eagle Eye was hovering a few feet above BACH-21. He quickly secured himself to one of the mooring points on the side of the UAV and held on as the Eagle Eye turned and flew to an Army Special Forces A-Team operating sixty miles to the east. At 200 knots and barely 100 feet above the ground, BACH-21's ride was exciting to say the least. Skimming over telephone and electrical wires, dodging vehicles and villages, and generally avoiding high threat areas, the Eagle Eye safely dropped the pilot off at a pick-up site near the Special Forces Team. As the Eagle Eye returned to its original mission, the Team quickly secured BACH-21 and that night loaded the pilot on board an Army MH-47E "Chinook" helicopter flown from a base in Turkey. A few hours later, CNN and other news organizations flashed the news of the BACH-21 recovery around the world and was considered a major strategic boost to the allied war effort in Iraqi.

- 9 June 2005
U.S. News and World Report

(See Appendix A for illustration)

CSAR – recovering isolated personnel – has long been a thorny issue for all the services. Commanders, from the Army and Air Force in particular, have quietly complained for years that their Special Operations Forces (SOF) were often tasked to perform CSAR in support of conventional forces, which is not one of their principal missions, but were never given sufficient resources to handle the role.[3] The Pentagon formally assigned responsibility for the mission on land to Air Combat Command (ACC) in the wake of the 1995 rescue of Air Force Captain Scott O'Grady in Bosnia, but ACC's CSAR force structure has remained too limited to meet worldwide requirements due to unstable funding.[4] CSAR has become a valuable commodity everybody from the Combatant Commander to the pilot in the air wants, but a responsibility nobody wants to assume. The U.S. Special Operations Command has a longstanding policy, as repeated in

recent annual U.S. SOF Posture Statements, that "SOF are equipped and manned to perform CSAR in support of SOF missions only. SOF performs CSAR in support of conventional forces on a case-by-case basis not to interfere with the readiness or operations of core SOF missions."[5] The issue is not a lack of dedication to perform the mission, as witnessed by the Marine rescue of Captain O'Grady, but a lack of resources. As the number of military deployments around the world increase, number of aircraft decrease, and threats evolve to deal with our stealth technology, the need for CSAR platforms will continue to increase.

One possible solution to this problem is the increased use of available platforms already in the inventories of our armed forces. The one combat platform that has actually increased in use over the last twenty years is the UAV. Both UAVs and Unmanned Aerial Combat Vehicles (UCAVs) have received and continues to receive significant attention ranging from direct use as an attack platform to increased experimentation by all the Armed Services in the 1990s and early 2000s. UAVs were successfully employed in Operations Desert Storm, Allied Force, and Enduring Freedom. The Air Force has taken important steps towards determining the feasibility of UCAVs by establishing the UAV Battle Lab. By 2000, the Air Force will have invested over $80 million alone in UAV research.[6] As part of the Secretary of Defense's Transformation Plan, the services at all levels are tasked for better and innovative ways of doing business. CSAR would be served best by the continued integration of UAVs and UCAVs into current doctrine and missions. The biggest users of UAVs across the services are the Intelligence, Surveillance, and Reconnaissance (ISR) and RSTA communities. Both communities have the best situational awareness of all the battlefield operating systems and would play

an important role in the CSAR mission. By adapting current mission roles, UAV and UCAV platforms could support and even perform many of the key CSAR tasks on the modern battlefield to include finding, fixing, supporting and recovering isolated personnel thus allowing commanders to maintain battlefield synergy with manned platforms while reassuring isolated personnel that recovery is imminent.

Notes

[1] William C. Anderson, *BAT-21: Based on the True Story of Lieutenant Colonel Iceal E. Hambleton, USAF* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1980), 4-5.

[2] Sara Waddington, *Shepard's Unmanned Vehicles: Handbook 2001* (West Sussex, England: The Shepard Press, 2001), 41.

[3] Glenn W. Goodman, Jr., "Combat Search and Rescue: Air Force Special Operations Command Eagerly Awaits USAF Chief's Decision," *Armed Forces Journal International*, October 2002, 32

[4] Ibid, 32.

[5] Ibid, 32.

[6] Lt. Col Richard M. Clark, USAF, *Uninhabited Combat Aerial Vehicles: Airpower by the People, For the People, But Not with the People*, (Maxwell Air Force Base, Ala.: Air University Press, August 2000), 38.

Chapter 2

CSAR Missions and Tasks

"Combat search and rescue (CSAR) preserves critical combat resources while denying the enemy a potential intelligence source. It is a key element in sustaining the morale, cohesion, and ultimately, the operational performance of friendly forces."

- Major General Lance L. Smith, USAF[1]

Background

The importance of a timely rescue of isolated personnel highlights the fact that today's United States (US) military must be sensitive to political and social pressures to keep friendly casualties to a minimum. The loss or capture of a single airman can have a tremendous impact on an entire military operation.[2] Since Vietnam, military and political leaders have come to view U.S. Prisoners of War (POWs) as a potential liability to combat operations. The experience of allied airmen in Vietnam, a US Navy pilot in Lebanon and an Army aviator in Somalia highlight to potential risk of conducting operations in hostile environments. Because of shrinking force structures and decreasing military budgets, leaders must find ways to "do more with less" in the current operational environment.[3] The US armed forces have turned to UAVs as a means of dealing with the limitations imposed on our armed forces. UAVs are increasingly becoming the weapon of choice for a variety of missions from ISR to surgical strikes on al Qaida terrorists leaders.[4] The one area seemingly overlooked by the majority of the UAV community is its role in the realm of CSAR.

Since the beginning of military aviation, commanders have spent a great deal of resources and time dealing with the issue of isolated personnel recovery. Not only are

these personnel a valuable resource, but also their political value (both psychologically and militarily) is a major concern to commanders on the battlefield and leaders at home. At the tactical level, the recovery of isolated personnel ensures highly trained personnel are returned to their unit. On a operational level, the recovery of isolated personnel ensures sensitive information is not compromised. At the strategic level, the successful recovery of isolated personnel can have a major impact on the both the political and public morale support for the nation's efforts. In peacetime, military commanders have a variety of options available to deal with the recovery of isolated personnel ranging from the Civil Air Patrol to local host nation support. Combat presents a new range of challenges and problems for search and rescue operations. Compounding the immediate needs of locating and recovering the airman is the added complexity of enemy forces. The race between a USMC recovery team to rescue and Serbian forces to capture USAF Captain Scott O'Grady provides a stark example of this problem. U.S. military CSAR doctrine is rooted in three basic manuals: Joint Publication (JP) 3-50.2 *Doctrine for Joint Combat Search and Rescue,* JP-3-50.21 *Joint Tactics, Techniques and Procedures for Combat Search and Rescue, and* Air Force Doctrine Document (AFDD) 2-1.6 *Combat Search and Rescue.* The majority of combat systems used to execute this doctrine are specialized rotary-wing and fixed-wing platforms like the HC-130, HH-60, MH-47, MH-53, and OA-10s to name a few. The majority of these platforms belong to the Special Operations communities of the services. However, like everywhere in today's military, the Special Operations forces perform a variety of missions simultaneously.

The history and success of US military CSAR operations has always been tied to the development of the technology available to rescue forces. The first CSAR operations,

conducted with seaplanes, parachutes, and ground-teams, progressed in the latter stages of World War Two to rotary-winged aircraft. The leap from airplanes to helicopters provided would be rescue forces with greater flexibility. The same can be said of UAVs in the twenty-first century. The current fleets of UAVs, whose missions include ISR, RSTA, and tactical weapon platforms, have the potential to provide CSAR forces with greater flexibility without degrading the Joint Forces Air Component Commander (JFACC's) primary reconnaissance and strike capabilities. Both fixed and rotary winged and tilt-rotor platforms can provide CSAR forces with the ability to find, fix, support, and recover downed aviators from the modern battlefield.

Defined

Joint Forces CSAR is a specific task performed by rescue forces to recover isolated personnel during major theater war or military operations other than war (MOOTW). Accomplished with a mix of dedicated and augmenting assets, CSAR is an element of personnel recovery (PR). PR is the umbrella term for operations focusing on recovering captured, missing, or isolated personnel from danger.[5]

The Air Force combat rescue philosophy is based on maintaining a capability to recover aircrews and other isolated personnel.[6] The CSAR doctrine assumes these forces will be prepared to recover personnel where they, like other combat forces, will be placed at risk. Successful Air Force CSAR enhances the Joint Forces Commander's combat capability in three ways:

- Tactically CSAR operations return key personnel to friendly control, allowing them to fight again.
- Operationally the presence of a robust and viable CSAR force increases the morale, with a resultant increase in operational performance

- Strategically CSAR operations often influenced the course of national and International politics by denying adversaries the opportunity to exploit the intelligence and propaganda value of captured personnel.[6]

Currently the services maintain a variety of aircraft dedicated to personnel recovery operations in hostile environments. These combat configured aircraft operate where low observability is required using low-level navigation and threat avoidance procedures, onboard electronic defensive systems and pararescue specialists (PJs) designed to provide the critical link between the rescue platform and the isolated personnel.[7] When organic search and rescue assets are unable to recover isolated personnel due to a high threat environment or sensitive political considerations a JFACC can create a Combat Search and Rescue Task Force (CSARTF). This task force significantly enhances the employment of CSAR assets by providing an On-scene Commander, Forward Air Controllers, Air Refueling Aircraft, ISR Platforms, Special Operations Forces, and additional fixed and rotary winged assets. The size of this task force can range from a single or two-ship helicopter operation to more than forty aircraft working in concert (See Appendix B).[8] Because of the complex nature of this type of operation, Command and Control (C^2) arrangements must be clearly defined and require a great deal of flexibility from supporting units. Additionally, the secondary effects on the JFACC's Air Tasking Order (ATO) are numerous and have a major impact on its ability to provide tactical and strategic air support to the Combatant Commander's operations.

Operations

Joint rescue forces will receive notification of isolated personnel via the theater or joint force C^2 structure. A rescue could involve an aircrew bailout over hostile territory,

crash landing, ditching at sea, floundering naval vessels, or ground forces cut off from friendly lines. A typical rescue involves five General Stages of CSAR: Awareness and Notification, Situation Assessment, Mission Planning, Execution, and Mission Conclusion.[9] Because of the nature of CSAR, it is one of the most time-sensitive of combat operations. After four hours on the ground, the chance that a survivor in combat will be successfully rescued is historically less than twenty-percent.[10] The well known rescues of Lieutenant Colonel Iceal Hambleton and Captain Scott O'Grady illustrate the importance of a quick and timely rescue of isolated personnel. The successful and timely rescue of both pilots demonstrates how a well-executed CSAR plan can deprive an enemy of vital military intelligence and political leverage.

Awareness and Notification

Threat and tactical conditions permitting, isolated personnel normally attempt to establish radio contact with a wingman, escort aircraft, Airborne Warning and Control System (AWACS) and other aircraft in the immediate vicinity.[11] The procedures for notification are normally outlined in the Special Instructions (SPINS) portion of the ATO or unit Standard Operating Procedures (SOPs). Because most CSAR recovery operations take place in high threat environments, radio transmissions are usually just long enough to allow for a direction finding (DF) plot to be taken.

Situation Assessment

Once an actual CSAR situation is confirmed, the Joint Search and Rescue Center (JSRC) assumes CSAR responsibilities in theater, unless the mission strictly involves Air Force personnel only or the JSRC has tasked the Air Force RCC with the mission coordinator responsibilities.[12] The mission coordinator then notifies the appropriate

CSAR assets. Mission, Enemy, Time, Terrain, and Troops (METT-T) determine the response times and types of assets to be deployed. The enemy or threat is the most critical piece of CSAR planning. As such, real time intelligence data is the critical element in determining the enemy threat level. One such situation existed when a Navy SEAL, Chief Petty Officer Neil C. Roberts, was shot out of an Army MH-47 Helicopter during Operation Anaconda in Afghanistan. A USAF Predator UAV provided real-time intelligence of Roberts' evasion, capture, and execution to the Joint Force Commander on the ground in Bagram.[13] The threat defines the enemy's ability to detect and engage CSAR forces. The threat is carefully evaluated by the JSRC or RCC to determine the types of CSAR forces deployed.[14] In most Army and Marine rotary-wing operations, this procedure is streamlined to the point where "self-recovery" by a wingman is possible under most conditions.[15] Even among the AH-64, AH-1, and OH-58 communities, recovery of a downed wingman is possible, although not preferred, through the use of special harnesses which allow a pilot to be carried on the outside of the aircraft. If "self-recovery" is possible, the owning unit handles the remaining general stages of CSAR internally.[16]

Mission Planning

As information of a potential CSAR mission is made available to the units tasked to support the recovery operation, alert status, warning orders (WARORDs) and fragmentary orders (FRAGOs) are passed to unit planning cells, air operations centers (AOCs) and tactical operations centers (TOCs). During this phase planners consider the capabilities of the host nation, other Services, functional components, and multinational forces during all phases of CSAR mission planning.[17] In an ideal world, deliberate

planning allows CSAR Commanders to move aircraft to forward operating bases, establish Forward Area Refueling Points (FARPS), and plan for possible deception plans to assist recovery missions. CSAR planning is only useful if the isolated personnel is located and authenticated prior to recovery. Several methods exist to determine location that include: C2 aircraft, UAVs, satellites, and Human Intelligence (HUMINT).

Execution

Since the shoot down of two Army Special Operations UH-60L "Black Hawk" Helicopters and subsequent rescue mission in Mogadishu, Somalia in 1993, CSAR planners have placed a great deal of emphasis on preventing the reoccurrence of CSAR forces becoming the rescued; rather than the rescuers. The Execution phase involves four steps that prevent the CSAR forces from becoming targets, while performing their duties successfully: Search Operations, Authentication, Support to isolated Personnel, and Recovery.[18]

The Search portion of the "Combat Search and Rescue" is extremely limited due to the hostile threats in the immediate vicinity of the isolated personnel.[19] For this reason searches are usually confined to electronic search operations. In previous conflicts, up to and including Operation Allied Force, the majority of isolated personnel were quickly located. It was the actual Personnel Recovery (PR) phase that challenged CSAR forces. Isolated personnel will normally not be recovered until their identity has been positively confirmed.[20]

Authentication is the primary means of ensuring proper identification. The need for proper authentication ensures that CSAR forces do not become victims of enemy entrapment. This was an overriding concern of Allied Commanders during Operation

Allied Force during the rescue of Captain O'Grady. CSAR planners were dubious about sending a rescue force in-country until it was determined that O'Grady was not being held under duress and being asked to key his radio so that a rescue team would be ambushed.[21] Once the authentication of isolated personnel is complete, the next step is to provide support to such personnel until an effective recovery is complete. Under current doctrinal plans PJs or Special Operations Teams are inserted to support isolated personnel until a suitable extraction is possible. Once isolated personnel are authenticated and a suitable extraction site is located, the actual recovery can occur. The recovery can take many forms ranging from rotary-wing aircraft, small vessels in coastal waters, Special Operations Teams, or other friendly forces. Regardless of the method, this step is highly dangerous and exposes both the isolated personnel and rescue forces to hostile fires. Commanders at all levels weigh the possibility of recovering isolated personnel and the psychological impact of this awareness of efforts against the potential loss of additional resources and the impact of possibly diverting resources from ongoing combat operations.[22]

Mission Conclusion

Following the conclusion of any CSAR operation, regardless of outcome, a careful analysis of the mission must be conducted for the benefit of future operations. Successful penetration of enemy threats, recovery techniques, and Survival, Evasion, Resistance and Escape (SERE) techniques must be reviewed for use in future operations. The successful CSAR operation will impact the tactical, operational, and strategic outcome of any future conflict.

Notes

[1] Air Force Doctrine Document (AFDD) 2-1.6, *Combat Search and Rescue*, 15 July 2000, i.

[2] Lt. Col Richard M. Clark, USAF. *Uninhabited Combat Aerial Vehicles: Airpower by the People, For the People, But Not with People* (Maxwell Air Force Base, Ala.: Air University Press, 2000), 1.

[3] Vince Crawley, and Amy Savitak "UAV Strike Raises Moral Questions: CIA Attack on al-Qaida Leader Surprises Pentagon, Brings Up Ethical Concerns," *Air Force Times*, 18 November 2002, 16.

[4] AFDD 2-1.6, 2.

[5] Ibid, 2.

[6] Ibid, 2.

[7] Ibid, 12.

[8] S. Paul Dev, President, D-STAR Engineering Corp., interviewed by the author, 11 December 2002.

[9] Ibid, 18.

[10] Ibid, 18.

[11] Ibid, 17.

[12] Ibid, 18.

[13] Richard T. Cooper, Geoffrey Mohan, and Rone Tempest, "Fierce Fight in Afghan Valley Tests U.S. Soldiers and Strategy" *LA Times*, 2002, 2. www.pjsinnam.com, on-line, Xupiter, 14 December 2002.

[14] AFDD 2-1.6, 18.

[15] Field Manual (FM) 1-100, *Army Aviation Operations*, 21 February 1997, 2-8.

[16] Chief Warrant Officer Two Hunter Durham, Aviation Life Support and Equipment Shop, 3rd Squadron, 4th Cavalry Regiment, 25th Aviation Brigade, Wheeler Army Airfield, Hawaii., interviewed by author, 28 December 2002.

[17] AFDD 2-1.6, 19.

[18] Ibid, 20-21.

[19] Ibid, 20.

[20] Ibid, 21

[21] Mary Pat Kelly, "*Good to Go" The Rescue of Capt. Scott O'Grady, USAF, From Bosnia* (Annapolis, Md.: Naval Institute Press, 1996), 122.

[22] AFDD 2-1.6, 22.

Chapter 3

UAV Capabilities and Missions

> *"Considering the likelihood that we will fight on someone else's turf in the future, we cannot afford to get to the playing field only to find that the weather won't let space-based national systems or high-altitude manned reconnaissance flights see the enemy or that the political situation or combat threat is too high to risk manned platforms over enemy territory. The inherent capabilities of UAVs fill the voids left by other systems."*
>
> - Lieutenant Colonel. Dana A. Longino, USAF[1]

Background

In the 1960s and 70s, the Air Force engaged in the quest for UAV technology to address solutions to the problems of "doing more with less" and reducing the risk to pilots and aircrews. Towards the end of the War in Vietnam the Air Force looked at using UCAVs to strike enemy targets and for the suppression of enemy air defenses (SEAD). The concept never fully reached fruition, and UCAVs never achieved operational capability. The idea was finally abandoned in the late 1970s.[2] Although UAVs were used successfully in Vietnam, it wasn't until the Second Gulf War that a general awareness of UAVs emerge. The U.S. Army, U.S. Navy, and U.S. Marines successfully used UAVs to contribute to their tactical successes in the Gulf and The War on Terrorism saw the first use of UAVs as an attack platform against soft targets.[3] The spectrum that UAVs are used now support an entire range of Battlefield Operating Systems (BOS) including intelligence; maneuver; fire support; air defense; mobility and combat service support; and C^2.[4]

Intelligence, Surveillance, and Reconnaissance

The biggest user of UAVs is the Intelligence community. Intelligence is defined as the product resulting from the collection, processing, integration, analysis, evaluation

and interpretation of available information concerning an object or person. Surveillance is the systematic observation of the object or person in question and Reconnaissance is the actual mission undertaken to conduct said surveillance.[5] Both the CIA and military have made extensive use of UAVs in ISR operations. The beginnings of ISR UAVs started in the early 1960s with the Air Force's Big Safari program.[6] The first UAVs deployed under this program were the Ryan AQM-34 Lighting Bug drones. The drones were designed from off-the-shelf BQM-34 target drones.[7] From 1964 to 1975, the AQM-34s flew over 3,500 missions in Southeast Asia photographing SAM sites, Soviet aircraft in North Vietnam, and a significant number of POW camps including the famous Hanoi Hilton. Returning POWs considered the low-altitude UAV flights a real morale booster.[8] Following the Vietnam War, interest in UAVs waned due to funding issues and a real "pro-pilot" bias on the part of Air Force leadership.[9] The late 1980s saw a resurgent interest in UAVs following the development of better computer hard and software and a need for more cost effective platforms to replace an aging fleet of manned reconnaissance aircraft. The Second Gulf War and Bosnia saw a greater use of UAVs in the ISR role due to political and military necessity. Not only did UAVs provide longer station time than a manned platform, but for the first time reduced the risk of a downed pilot becoming a political tool for the other side.[10] The Pioneer, Predator, and Global Hawk UAVs allowed commanders for the first time the ability to have continuous surveillance over Named Areas of Interest (NAIs) and Decision Points (DPs). More importantly, the real-time intelligence could be transmitted across the battlefield and as far back as the President if necessary. During Operation Enduring Freedom, UAVs flew over 683 missions or

96,000 combat hours and provided Allied forces more than 17,000 images.[11] The UAV has become, in twenty years, an indispensable tool of the IRS mission.

Maneuver

The original maneuver use of UAVs dates back to World War One and was as a Flying Bomb envisioned carrying a 1000-pound bomb load.[12] Although the war ended before this concept could become operational, the seeds of the UAV were planted. Both the US Army and Navy dabbled in the use of unmanned strike vehicles, but the Navy was the only service to use an UAV operationally in World War Two.[13] The German armed forces had better success with their unmanned programs, which included the Fritz-X, JU-88 "Mistral" and V-1 flying bombs.[14] In the early 1970s Air Force planners developed a number of early UCAV programs as a response to the SAM threat posed to manned aircraft in Europe and the Middle East. The Israelis used the new technology in 1973, dropping bombs and missiles during the October War.[15] It was not until Operation Enduring Freedom that UAVs return to the maneuver battlefield. Predator UAVs, loaned by the Air Force to the CIA paramilitary forces during the war, fired Hellfire anti-armor missiles carried externally against selected Taliban and al Qaeda targets in both Afghanistan and Yemen.[16] The Predator's attack capability is a novel extension of U.S. airpower; it marks a departure from the UAVs established role as a reconnaissance platform to an attack role that might take hours to coordinate based on the UAV's real-time data.[17] Air Force Chief of Staff General John Jumper championed development of the armed Predator when he ran the Air Forces' Air Combat Command. Jumper said, "If we could put a small weapon on this thing, we could do the entire cycle – find a target, kill it, and assess [BDA after the strike] – from the same vehicle."[18]

Fire Support

The role of UAVs and fire support is a natural extension of the Forward Observer (FO). The need to find and engage targets not directly in the line of site of the gun tube has long been the realm of the FO, Fire Support Officer, or Platoon Leader. In the 1980s and 1990s the U.S. Army and U.S. Marine Corps experimented with UAVs in a Fire Support role. The Army's new RSTA Squadrons, part of the Interim Brigade Combat Team (IBCT), utilized the Shadow UAV as a targeting and BDA platform.[19] The UAV contributes to the commander's dominate situational awareness allowing him to maneuver to posts of positional advantage.[20] Some tactical unmanned aerial vehicles have both the power and payload capacity to carry a laser target designator. That device aims a laser at a target, such as a tank, so another platform can attack it with a precision munition. The Army has conducted at least four successful tests in which a Hunter UAV mounted with a laser designated a target, and another aircraft, such as a Kiowa Warrior helicopter, launched a Hellfire missile and destroyed the target.[21]

Air Defense

The use of UAVs in a Defensive Counter Air (DCA) role is a relatively new concept that has yet to be tested on an operational scale. However, a UAV or UCAV carrying Stinger or Sidewinder Air-to-Air missiles is not far off. During the 2002 Shepard's UAV USA conference, Dyke Weatherington, Department of Defense Unmanned Aerial Vehicles Division and Major General Robert Chedister, USAF, Commander of the Air Armament Center, spoke of the potential uses of UAVs carrying air-launched missiles in a DCA role over critical friendly centers of gravity. Additionally, the Defense Advanced Research Projects Agency (DARPA) is exploring

the technological aspects of UCAVs that may lead to a replacement or supplement to the F/A-22 Fighter in an Offensive Counter Air role in the post 2010 time frame.[22]

Mobility and Combat Service Support

While the idea of unmanned transport aircraft is still years away, the idea has merit. A number of technological barriers still exit. According to Eric Schmitt, Chief Executive Officer of Google, Inc.,

> "Even though the technology to take off, cruise, and land automatically already exists, no licensed air carrier (commercial or private) by 2030 will be able to fly without at least one pilot - in the pilot seat - supervising the whole process. On takeoff, the training and timing for handling emergencies such as engine failure are not going to be transferable to autopilots and machines. On landing, automated airplanes would have to sequence in with many older airplanes piloted by humans. Towers and air-traffic controllers love to change everything at the last minute, and adding the ability to make changes by computer while simultaneously using voice is not realistic. Finally, the FAA changes so slowly that if pilotless travel like this were at all possible, the adoption and certification would take at least 50 years."[23]

Never-the-less, the Army, in particular, is looking at Unmanned Aerial Delivery Gliders to provide support to Army Paratroopers and other units operating behind enemy lines.[24] The next logical step would be powered flight with troops once certain psychological limitations among the passengers are over come. This limitation is not to be taken lightly. An informal survey of Army aviators and Air Force pilots indicate that many would prefer to attempt to escape and evade rather than strap themselves to a UAV in a hostile environment.[25] A possible solution to this reluctance is an integration of UAV recovery techniques into current Air Force, Army, and Navy SERE Doctrine. The services already utilize or have utilized a number of "unique" recovery techniques to include the Fulton Surface-to-Air Recovery System (made famous in the movie *The*

Green Berets),[25] Stability Operations (STABO),[26] and the current outboard bench techniques used by the Army's 160th Special Operations Aviation Regiment's OH-6 aircraft.[27] Integration of UAV CSAR operations into current doctrine would not require a completely new mindset regarding isolated personnel recovery and once integrated by the special operations communities would become more readily acceptable to the rest of the services.

Command and Control

Like ISR, C^2 has been the biggest user of UAVs in the past twenty-years. UAVs now allow commanders complete "situational awareness" and "situational understanding" on a level not seen before in warfare.[26] Regardless of the environment, air, land, sea, UAVs are a key C2 enabler for tactical, operational and strategic decision making. UAVs are clearly becoming the commander's "dominate eye," allowing him to shape the battlefield to ensure mission success.[27]

Notes

[1] Lt Col Dana A. Longino, USAF, *Role of Unmanned Aerial Vehicles in Future Armed Conflict Scenarios* (Maxwell Air Force Base, Ala.: Air University Press, December 1994), 34.

[2] Lt Col Richard M. Clark, USAF, *Uninhabited Combat Aerial Vehicles, Airpower by the People, For the People, But Not with the People* (Maxwell Air Force Base, Ala.: Air University Press, August 2000), 2.

[3] Glenn W. Goodman, Jr, "Missile-Firing Drone, USAF's Armed Predator UAV Breaks New Ground," The *ISR Journal*, 2002, 36.

[4] Field Manual (FM) 3-0, *Operations*, June 2001, 5-15.

[5] Air Force Doctrine Document (AFDD) 2-5.2, *Intelligence, Surveillance, and Reconnaissance Operations*, 21 April 1999, 1-2.

[6] Longino, 2.

[7] Ibid, 3.

[8] Ibid, 3.

[9] Clark, 30.

[10] Ibid 35-36.

[11] Dyke D. Weatherington, Deputy, Department of Defense, Unmanned Aerial Vehicles, Planning Task Force, address to the Shepard's UAV USA Conference, Washington, D.C., 11 December 2002.

[12] Clark, 7.

[13] Ibid, 10-11.

[14] David Donald, ed., *Warplanes of the Luftwaffe* (London: Aerospace Publishing, Ltd., 1999), 41, 54, and 176.

[15] Clark, 24.

[16] Goodman, 36.

[17] Ibid, 36.

[18] Ibid, 36.

[19] Major Brad C. Dostal, Military Analyst, Center from Army Lessons Learned, "Enhancing Situational Understanding through the Employment of Unmanned Aerial Vehicles," *CALL Newsletter*, July 2001, 71.

[20] Ibid, 72.

[21] "Programs and Missions for Unmanned Aerial Vehicles," *Options for Enhancing the Department of Defense's Unmanned Aerial Vehicle Programs*, September 1998, n.p., on-line, Internet, 14 December 2002, available from http://www.fas.org/man/congress/1998/cbo-uav3.htm.

[22] Clark, 37.

[23] Eric Schmitt, "Commercial airline passengers will routinely fly in pilot-less planes by 2030," *Wired Magazine*, May 2002, 3, on-line, Internet, 10 December 2002, available from http://www.wired.com/wired/archive/10.05/longbets.html?pg=3.

[24] Nancy Harrington and Edward Doucette, "Army After Next and Precision Airdrop," *ALOG*, January-February 1999, n.p., on-line, Internet, 17 December 2002, available from http://www.almc.army.mil/ALOG/issues/JanFeb99/MS388.htm.

[25] "USAF Air Rescue Service," *United States Air Force Museum, Wright-Patterson AFB, Dayton, OH*, 3 March 2003, n.p., on-line, Internet, 3 March 2003, available from http://www.wpafb.af.mil/museum.

[26] Appendix 15 (STABO Operations), *Annex A to E Company, 135th Aviation Standard Operating Procedures*, 1 February 1996, A-15-1–A-15-24, on-line, Internet, 3 March 2003, available from http://safety.army.mil/pages/training/trainingdiv.htm.

[27] "Operation Acid Gambit, The Rescue of Kurt Muse," *Special Operations.Com*, 2000, n.p., on-line, Internet, 3 March 2003, available from http://www.specialoperations.com/Operations/Just_Cause/Acid_Gambit/default2.html

[28] Chief Warrant Officer Two Hunter Durham, Aviation Life Support and Equipment Shop, 3rd Squadron, 4th Cavalry Regiment, 25th Aviation Brigade, Wheeler Army Airfield, Hawaii., interviewed by author, 28 December 2002.

[29] Dostal, 71.

[30] Ibid, 82.

Chapter 4

Recommendations for CSAR/UAV Integration

"In order to fully exploit the potential of UAVs, the Air Force must think of them as new and complete systems with new combinations of advantages and disadvantages, rather than as vehicles with a single outstanding characteristic or as a slight variant of an existing vehicle."

- SAF/PA 96-1204, *UAV Technologies and Combat Operations,* Executive Summary[1]

Background

In order to quantify the UAVs potential technologies in the CSAR role, several designs were analyzed during this study (See Appendix C). Additionally, the four steps of CSAR Execution, Search Operations, Authentication, Support to Isolated Personnel, and Recovery, were examined to determine which platform would best suit the operational needs for a recovery mission.

Available Platform Requirements

Because of budget and research and development (R&D) constraints, this study examined available, "off the shelf" platforms for CSAR missions. In keeping with the trend toward "multi-role" aircraft, UAVs should have similar requirements to allow for the flexibility and versatility that is an important tenet of air power.[2] A CSAR mission platform requires a minimum number of functions to successfully support the four CSAR phases. These functions include:

- Precise platform navigation via GPS-aided inertial navigation systems (INS).
- Infrared and RF countermeasures (IRCM/RFCM) for survivability in close in-threat exposures; these include flares and chaff, active IRCM, and towed decoys as determined by survivability analyses.
- Weapons interface, including utilities and guidance.

- Radar and Optical sensors for tracking.
- Hard points for airdrop containers.
- Mooring points for personnel extractions (minimum 200lbs payload).
- Communications package that allows for both linear and non-linear communications.[3]

While this list is by no means complete, a comparison of available UAVs that possess these capabilities is provided in Appendix C.

Search Operations

Because search operations in a CSAR environment are usually conducted in high threat areas, the use of manned aircraft is extremely limited. UAVs, due to their low visibility, acoustic, and infrared signatures and long station time would actually increase the available station time necessary to conduct an isolated personnel search. UAVs would be perfectly suited for both electronic and visual searches. The current ISR/RSTA sensor packages, like the AN/APY-8 SAR/GMTI Radar Systems for example, can easily switch from targeting personnel and equipment to locating isolated personnel on the battlefield.[4]

Authentication

The ability to authenticate isolated personnel is a necessary force protection measure during any CSAR operation. UAVs can provide both a visual and electronic authentication link to rescue forces. The near-real time images and radio links assist rescue forces in determining whether or not an isolated personnel is held under duress. Additionally, UAVs play a key role by providing greater situational awareness for both the rescue forces and the isolated personnel.

Support to Isolated Personnel

Regardless of the type of recovery method used, isolated personnel may still require some type of logistical support prior to rescue. Because the threat may be great, UAVs may provide the best platform for aerial delivery of supplies to isolated personnel.[5] Hard points exist on most UAVs to allow air-dropped container delivery of a variety of classes of supplies and water.[6] These containers could be dropped with some precision using GPS and INS systems. Air drops could be employed with existing UAV missions to avoid compromising isolated personnel on the battlefield.

Recovery

UAVs and UCAVs could support CSAR aircraft involved in recovering isolated personnel, providing a variety of capabilities to include: SEAD, direct fires, surveillance, counter measures and communications relay in isolated areas. The use of UAVs would reduce the number of fixed-winged aircraft required to support a CSAR operation. UAVs could even provide decoys to confuse and harass enemy forces during a CSAR recovery. Additionally, certain rotary-wing and tilt-rotor UAVs have the potential to actually recover isolated personnel using mooring or hard points and harnesses (Appendix D). This method, while potentially effective, would only be employed in an emergency when there is a imminent danger of capture or death. The events surrounding the death of Chief Petty Officer Roberts in Afghanistan highlight the possible use of a UAV platform in such a situation.[7]

Notes

[1] SAF/PA 96-1204 *UAV Technologies and Combat Operations*, 1996, Executive Summary, on-line, Internet, 17 December 2002, available from http://www.au.af.mil/au/awc/awcgate/sab-uav/chap10.pdf.

[2] Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, September 1998, 22-23.

[3] SAF/PA 96-1204 *UAV Technologies and Combat Operations*, 8-5; Major Brad C. Dostal, Military Analyst, Center from Army Lessons Learned, "Enhancing Situational Understanding through the Employment of Unmanned Aerial Vehicles," *CALL Newsletter*, July 2001,79; and Jay Willmott, BAI Aerosystems, Inc., interviewed by author, 11-12 December 2002.

[4] Jon Lathrop, General Atomics Inc., interviewed by author, 12 December 2002.

[5] Jay Willmontt, 11 December 2002.

[6] Ibid, 11 December 2002.

[7] Richard T. Cooper, Geoffrey Mohan, and Rone Tempest, "Fierce Fight in Afghan Valley Tests U.S. Soldiers and Strategy" *LA Times*, 2002, 2. www.pjsinnam.com, on-line, Xupiter, 14 December 2002.

Chapter 5

Conclusions

> *"If U.S. defense planners are to succeed in institutionalizing any revolution in air and space technology that may now lie within their grasp, they will be aided greatly by remembering General George S. Patton's warning about how easily people can fool themselves into to believing that wars can be won by some wonderful invention rather than by hard fighting and superior leadership."*
>
> - *The Transformation of American Air Power*
> Benjamin S. Lambeth

The Department of Defense (DoD) has witnessed the birth of a new generation of UAVs – one embraced by the forward thinking leadership of DoD leaders. Continued high-level interest and involvement is essential during the incubation period.[2] A 1996 Air Force Scientific Advisory Board Study on *UAV Technologies and Combat Operations* projects that CSAR/UAV integration could begin as early as 2015.[3] The transformation of UAVs from ISR/RSTA platforms to multiple use aircraft will greatly increase funding and visibility of UAVs. CSAR is but one of the essential needs that can be filled by UAVs and UCAVs. With the number of UAVs committed to IRS and RSTA missions increasing, secondary missions like CSAR could and should be added to the mission task list. UAVs not only offer the ability to find and track isolated personnel, but can provide a link between the personnel and the rescue forces.

A number of suitable UAV platforms under development present CSAR planners with unlimited opportunities to search, authenticate, support and recover isolated personnel from the battlefield. The UAV of choice for CSAR operations should possess not only the ability to conduct ISR and Attack operations, it should also have the flexibility to perform other CSAR missions. As with the F/A-22, V-22 and RAH-66,

future air combat platforms will be tasked to provide a number of support roles on the twenty-first century battlefield. Because these platforms will perform multi-role tactical, operational and strategic missions, the implication means that few platforms will actually be bought or built. This means a greater reliance in the future on UAVs to perform traditional manned mission like CSAR.

Given the U.S. military's desire to reduce casualties on the battlefield, every resource should be utilized to meet this goal.[4] The ISR and Special Operations communities should work hand-in-hand to develop more flexible UAV platforms for the twenty-first century battlefields and beyond. The DoD needs to take the lead on such development. In my judgment, CSAR and force protection are directly linked. It makes good sense to combine the current UAV infrastructure and with CSAR doctrine. In fact, many of the find, fix, and tracking missions which are key reconnaissance, surveillance, and targeting roles fall under both the ISR and CSAR mission tasks. UAVs can provide an excellent platform to bridge the gap between information and operations on the battlefield.

Notes

[1] Benjamin S. Lambeth, *The Transformation of American Air Power* (Ithaca, N.Y., The RAND Corp. 2000), 320.

[2] SAF/PA 96-1204 *UAV Technologies and Combat Operations*, 1996, 10-2, on-line, Internet, 17 December 2002, available from http://www.au.af.mil/au/awc/awcgate/sab-uav/chap10.pdf

[3] Ibid, Table 10-1.

[4] Benjamin S. Lambeth, "Air Power 536, Constant Transformation: Air Power Thought and Practice," lecture, Air Command and Staff College, Maxwell Air Force Base, Ala., 17 December 2002

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