Operators of Air Force Unmanned Aircraft Systems

Breaking Paradigms*

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As the Air Force plans the integration of unmanned aircraft systems (UAS) into the fleet, it confronts a personnel system and culture designed for and inherently biased towards manned aviation. In this article, the author discusses the history of UAS personnel policy, training, and operations, highlighting the growing chasm between manned and unmanned flight and encouraging the reader to challenge paradigms.

The proposed UAS operator badge combines the historic pilot shield with space-operator wings, recognizing that only Airmen who physically take to the air earn the right to wear feathered wings. It symbolizes the role of these operators as "pilots" of unmanned aircraft yet recognizes that they control airpower from a console on the ground, as do space-operations professionals.

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My concern is that our services are still not moving aggressively in wartime to provide resources needed now on the battlefield. I've been wrestling for months to get more intelligence, surveillance, and reconnaissance assets into the theater. Because people were stuck in old ways of doing business, it's been like pulling teeth. . . . All this may require rethinking long-standing service assumptions and priorities about which missions require certified pilots and which do not.

—Secretary of Defense Robert M. Gates
Maxwell AFB, Alabama, 21 April 2008

DURING HIS VISIT to the hallowed halls of the former Air Corps Tactical School, Secretary of Defense Gates called upon Airmen to think critically about many of the challenges facing the Air Force, specifically questioning whether or not future operators of unmanned aircraft systems (UAS) need to be rated pilots. As demonstrated through years of policy debate, this difficult question still receives attention. Analysis of current personnel policy, opinions of noted aviators, and historical lessons reveals a growing chasm between manned and unmanned flight. Existing paradigms surrounding UAS operators require rethinking due to technological advances and the Air Force's cultural traditions.

In the Beginning . . .

Policies governing UAS aircrews have roots with Gen Ronald Fogleman, former chief of staff of the Air Force. In the mid-1990s, during the genesis of the Predator UAS, he formulated the original policies, which have changed little over the years. Recognizing that the Army had experienced operational problems with UASs, many Air Force people believed that these failures were in part due to the Army's treating these aircraft as "trucks." When the Air Force took over the Predator program in 1995, its senior leaders declared that they would "treat them like airplanes." According to Gen John Jumper, another former chief of staff, "The original notion of using pilots was because of the Army experience [with unmanned aerial vehicles (UAV)]. . . . If you treat it like an airplane, it will act like an airplane. . . . We were trying to get the accident rate down and get the operator-caused accidents down. We knew if we crashed a bunch of these things, that we weren't going to get [the program] either. That's why we insisted on pilots."[1]

Air Force senior leaders dedicated themselves to providing the necessary expertise to assure Predator's early success: "General Fogleman said as he sent non-volunteer instructor pilots to fly the Predator UAV, 'If this program fails, it won't be because of our pilots.' "[2] The decision at the onset to utilize navigators as UAS operators, provided they also possessed a Federal Aviation Administration commercial/instrument aircraft rating, increased the pool of aviators from which operators were selected.

Policies governing the management of UAS operators have had a brief but turbulent history, including issues such as the awarding of flying-gate credit and establishing eligibility for combat medals. The possibility of creating a separate career field for UAS operators has generated even more controversy.[3] General Jumper made the first such proposal, establishing a combat systems officer, followed a few years later by a second one—the "17XX," representing a new Air Force specialty code.[4] The latter proposal gained enough momentum that three volunteer test-case trainees entered the program, which, despite demonstrating potential, was abruptly cancelled on 13 December 2006, and the three officers received new assignments.[5] Initial indications from Gen Norton Schwartz, the current Air Force chief of staff, demonstrate a willingness to reopen the debate regarding establishment of a separate UAS career field.

Professional Opinion

Over the years, proponents of a separate career field have held strong convictions, pointing to the unique technical skills required to operate UASs as sufficient justifica-

tion. For example, Col Michael McKinney, former commander of the Predator Operations Group, supports creation of a new career field similar to the one proposed in 17XX, with young officers starting with Specialized Undergraduate Pilot Training and then branching into a UAS career. Operators would develop judgment about these aircraft over the course of their flying careers. He believes that alternative ways of building airmanship exist and that Airmen can learn to extract three-dimensional situational awareness from a two-dimensional screen.[6]

Col Stephen Wilson, a former assistant operations officer with Air Education and Training Command, who helped develop the 17XX syllabus, offers a pragmatic approach towards UAS training. Recognizing that the identification of key skills and the appropriate training of students helped develop the Specialized Undergraduate Pilot Training syllabus, he argues that a similar process could occur with UAS operators. The process should determine the skill sets required to operate UASs, design a training syllabus around those skills, and select the people best suited to carry out the mission—at that point, training would begin.[7]

Aside from recognizing a new set of skills required to fly UASs, Colonel Wilson's proposal also addresses a significant Air Force cultural issue relating to UAS personnel. Since Predator's genesis, the Air Force has struggled with finding enough high-quality volunteers to fly UASs. In order to explain some of the intricacies of Air Force culture, Colonel Wilson breaks an Air Force commander's personnel-ranking system into three tiers.[8] Tier-one individuals, whom the commander wants to keep in the weapon system, have outperformed their peers and have the most potential for future leadership roles. Falling just below them, tier twos generally have also done a good job with their mission but just do not have what it takes to earn first-tier status. Commanders encourage these personnel to serve in training command as flight instructors. Generally, people in tier three, who have done a fine job fulfilling the mission but are simply outperformed by their peers, normally find themselves pushed into UAS assignments—a tendency that establishment of a distinct UAS career path would negate. Additionally, Colonel Wilson recognizes that the increasing complexities of UAS missions demand dedicated personnel. Noting that manning UAS squadrons with predominantly first-assignment individuals has brought many challenges, he observes, "What if we proposed manning [F-16 or B-1] squadrons in this manner? We'd say you were crazy."[9] A new career field would bring continuity to the community.

Retired colonel Tom Ehrhard, who wrote an influential doctoral dissertation at Johns Hopkins University in 2001 on the development of UASs within the armed services, strongly supports designation of a new career field. He recognizes two fundamental pieces in its design. First, it must satisfy the technical requirements to operate UASs efficiently and effectively in both combat and in mixed-aircraft, controlled airspace. Second, and equally important, long-term success demands cultural integration. Any new career field must develop personnel who maintain professional credibility with the rest of the combat air force. In turn, these officers would form a constituency within the service to advocate follow-on systems. Ehrhard proposes opening a UAS career field to individuals not physically qualified to fly Air Force aircraft but capable of passing the Federal Aviation Administration's class-three physical examination—requirements more lenient than Air Force standards. This would open the career field to a new group of people not qualified to fly Air Force aircraft. Most importantly, these individuals would be highly motivated volunteers from the start.[10]

Colonel Ehrhard also recognizes the importance of maintaining flying credibility and developing airmanship, recommending the addition of a career-long aircrew enhancement program, which would direct that UAS operators maintain flight currencies in a companion aircraft such as the T-1, T-6, or T-38.[11] This would offer UAS pilots the opportunity to bolster their credibility and develop airmanship. Historically, such programs have supplemented aircrew training by providing additional flight hours through the use of T-37 or T-38 aircraft.

Pilots who fly the B-2 and U-2 have benefited from T-38 training due to the relatively small number of flight hours available in their major weapon system.

The final set of perspectives comes from three highly respected Air Force leaders, all of whom support (in some fashion) creation of a new UAS career field. General Jumper, who encourages implementation of the combat-systems-officer concept, recognizes the importance of putting the Air Force's UAS operators in aircraft so that they can more easily understand flight.[12] His ultimate concern involves the building of "credentialed warriors" who must fully understand how best to employ airpower and internalize the ramifications of their actions. Regarding UAS operators, he notes that "the Nintendo mentality is a detached mentality. This stuff is real. I'm taking real lives. I'm shooting real weapons. And I have to be really responsible for my actions."[13] General Jumper's concept of the combat systems officer moves away from using pilots but remains focused on the development of airmanship. Former Air Force chief of staff Gen Michael Ryan recognizes the ever-increasing levels of UAS autonomous operations and recommends reevaluating pilots' roles in them: "We shouldn't have pilots stick-and-ruddering UAVs."[14] The Air Force should keep pilots in the operational decision-making process, but emerging automated flight-control systems such as autotakeoff and autoland should permit removing them from the controls. Finally, according to Gen Richard Hawley, former commander of Air Combat Command, "I've spent time in a [UAS] control van. You don't need 500 hours of F-16 time to know how to fly a Predator. You do need to understand something about winds, weather, and the environment in which the Predator operates."[15] He recommends that the Air Force evaluate a "much truncated" program of Specialized Undergraduate Pilot Training followed by a career in UAS operations, air-battle management, and command and control. To those who argue against his proposal for a separate career path, he points out, "When I started UPT [Undergraduate Pilot Training], I was just another guy off the street. . . . When I left UPT, all I had were stick-and-rudder skills and some knowledge about weather. . . . I knew just enough to stay safe. . . . I developed airmanship over the years."[16]

Training and Operations for Unmanned Aircraft Systems

The last decade of UAS operations has refined training practices and operational procedures in the Predator, Reaper, and Global Hawk communities. Events within each have produced many lessons learned. Facing an insatiable demand for intelligence, surveillance, and reconnaissance, the Predator community has streamlined training practices to the extreme. Even in its brief history, Reaper has had its training practices shaped in a similar manner. Discussions with Global Hawk professionals identified distinct differences between skill sets used by traditional pilots and those used regularly by UAS operators. Global Hawk operators also recognized the ability to relax independent decision-making requirements, given the ability to "bring additional people into your cockpit" to help solve problems.

The last decade has identified many differences between manned and unmanned aviation in the Air Force, thus justifying noteworthy changes to training programs. The tremendous demand for Predator coverage has forced maximum operational efficiencies. To assure availability of a full complement of personnel for contingency operations, the squadrons have carefully evaluated their training programs and made important changes. Comparing such programs to those of traditionally crewed aircraft, one finds at least two noteworthy differences. First, the operational Predator and Reaper squadrons, 99 percent of whose operations are real-world contingencies, do not carve time out of their flying-hour program to meet training requirements. Second, uninterrupted contingency operations question the relevance of many of the currencies typically maintained by pilots. Elimination of takeoff and landing currencies, for instance, has caused significant changes to the Predator training syllabus.

Unending demand for Predator support, coupled with limited personnel availability, has prompted operational squadrons to eliminate continuation-training sorties. The need for personnel to fly contingency missions is so great and the supply of Predator crews so small that any effort directed away from contingency operations reduces the squadron's capacity to provide intelligence, surveillance, and reconnaissance.[17] The lack of continuation training may appear unimportant in light of the fact that most Predator flying occurs on autopilot while the aircraft collects video. However, a closer look at the types of missions flown by the 15th Reconnaissance Squadron reveals that, in addition to video collection, it flies some of the most demanding missions available. The squadron's Predators routinely conduct close air support, air interdiction, support of special forces, and killer scout missions.[18] In comparison, pilots of A-10s and F-16s maintain carefully regulated currencies and training requirements for such challenging events. Should the training of UAS operators follow suit, or is the cost of taking them off the combat-flying schedule too great?

Reaper challenges old training paradigms to an even greater extent. Its operators must employ a host of weapons, including Hellfire missiles and laser-guided bombs, in a multitude of possible scenarios. Additionally, they must collect streaming video around the clock in support of intelligence requirements. Such conflicting requirements as maintaining important training currencies and supporting contingency operations will only grow stronger as Reaper's capabilities increase.

In 2003 a significant change to Predator operations occurred with the advent of remote split operations, a concept permitting a majority of the squadron to directly support theater operations from a central location by means of networked command and control. Careful observation reveals that this capability significantly affected training. Formerly, Predator crews deployed essentially as a squadron to support contingency operations, performing every aspect of the mission in-theater, from takeoff, to mission execution, to landing. With the establishment of remote split operations, however, it quickly became apparent that operators flying the Predator from the mission control element back at Nellis AFB, Nevada, would not have to perform takeoffs or landings—flown only as line-of-sight operations (not through beyond-line-of-sight satellite communication) by personnel forward-deployed in-theater. Therefore, only the crew of the launch-and-recovery element needed takeoff and landing skills. Individuals selected to deploy forward would receive the necessary training in takeoff and landing just prior to their deployment. Many people considered this the most challenging part of Predator initial training; indeed, it occupied almost one-third of the entire syllabus.[19] Eliminating takeoff and landing from this document increased the availability of Predator operators, thereby adding to the number of combat air patrols flown in support of the war fighter.

The idea of eliminating training in takeoff and landing from the Predator schoolhouse syllabus did not sit well with some people. Lt Col James Gear, commander of the 11th Reconnaissance Squadron, initially opposed the idea because "that's where you learned how to fly the airplane. That's where you learned the stick-and-rudder skills."[20] Later, however, he came to realize that a majority of the time spent flying the Predator occurred in a mission control element on autopilot: "The bottom line is we've been successful *not* teaching people how to take off and land. . . . You've got to approach everything with UAVs and get over your paradigms."[21] In the 11th Reconnaissance Squadron, the possibility exists that an instructor pilot not qualified to land the aircraft could fly a training mission over Nevada and experience engine problems. Recognizing the risk, Colonel Gear discussed it with leaders of the 432nd Operations Group. He accepted the possibility that if engine failure occurred, the Predator operator would either call down the hallway and direct qualified personnel to take the controls as soon as possible—or might elect to try to land the aircraft himself, "giving it a shot." He recognized that in some cases, "giving it a shot" might be an acceptable answer in UAS operations.[22]

Years of Predator operations have helped identify pertinent skills. According to Brig Gen Charles Lyon, "Less than 50 percent of Predator pilots' skills rely on stick and rudder—most has to do with the operational experience that rated aircrews have from previously flying airplanes and operating in the environment."[23] As Predator becomes more automated with the addition of capabilities such as autotakeoff and autoland, the requirement for stick-and-rudder skills will further decrease. Maj Thomas Meeks, a former Predator operator, believes that "it makes sense to separate technical skills from judgment skills in UAVs."[24] Pilots of traditional aircraft must necessarily develop their stick-and-rudder skills simultaneously with judgment and airmanship (because they must always remain physically airborne to do so), but Predator operators can refine their judgment and airmanship independently of their technical skills. For the most part, the computer handles most of the stick-and-rudder challenges. Major Meeks adds that "pilots bring an initial appreciation for the medium of air, the integration of multiple air assets, and a basic understanding of the employment of airpower."[25] Time spent in the Predator continues to develop many basic airmanship skills, including how best to integrate the platform into the airspace, support troops on the ground, and ensure safe recovery of the vehicle. Development of this type of judgment can occur largely independently of stick-and-rudder skills due to the advent of more sophisticated autopilot functions. Although some similarities exist, the skills required of a Predator operator differ from those of a pilot—which differ from those of a Global Hawk operator.

The Global Hawk community has also wrestled with the task of properly determining training requirements. In a recent interview, Lt Col Christopher Jella, commander of the 18th Reconnaissance Squadron, highlighted many challenges to Global Hawk operations. The long duration of missions and high altitudes (in excess of 50,000 feet) prevent Global Hawk operators from developing skills typically associated with Airmen: interacting with air traffic controllers, transiting controlled airspace, and taking off and landing the aircraft. A typical mission of 24 hours requires only 30 minutes of interaction with controllers as the aircraft transits from the surface to 18,000 feet and back.[26] Given the rotating eight-hour shifts and mission lengths of 24 hours, Global Hawk operators typically deal with controllers only once every two months.[27] Instead, a significant amount of time spent on missions involves optimizing collection efforts. During these "ad hoc taskings," operators balance last-minute collection requests against previous taskings. Working within the chain of command, they constantly revise the collection plan to maximize results of each mission.

Global Hawk's high level of automation has introduced new challenges to the development of proper training regimens for operators. Unlike Predator, Global Hawk already uses autotakeoff and autoland capabilities instead of stick and rudder. The pilot simply monitors aircraft operations to make the system execute as directed, a concept that challenges traditional thinking about airmanship development—or even the definition of airmanship. Global Hawk pilots rely on their previous experience with major weapon systems for a great deal of their judgment. The longer their assignment to Global Hawk, the more their airmanship skills fade because the missions typically do not engage those skills.[28] According to Colonel Jella, "After a year, it's actually that our experience level is backwards—the experienced guys are the brand-new ones coming in, with airmanship and situational awareness, and they become complacent after a period."[29] Mission profiles send aircraft primarily on preplanned routes carefully monitored by the pilots. One of the greatest challenges to flying Global Hawk, unlike flying traditionally crewed aircraft, is the requirement to know the preplanned procedures for a lost-communications link, which change throughout the flight profile and require constant situational awareness. Because automated procedures and advanced autopilot controls govern basic aircraft control, the Global Hawk operator's airmanship skills rarely come into play during routine missions. Thus, when anomalies do occur, they can be hair-raising.

Although normal operations may not significantly test a pilot's airmanship, the nature of Global Hawk operations requires pilots to draw upon every ounce of airmanship they have ever developed to handle such anomalies. Compared to pilots of traditional aircraft, individuals flying Global Hawks from halfway around the world must deal with a host of additional issues when maintenance problems occur. First, assessment of the situation is more difficult since pilots cannot "feel" how the aircraft is handling. They know only the information transmitted into the ground-control station, having just their instruments at their disposal. Something as simple as air turbulence can easily be mistaken for a flight-control anomaly.[30] Next, due to the long duration of missions, no single pilot can bring continuity to a complete mission. Although pilots conduct a thorough debrief as they swap out the controls, it is impossible to completely capture the aircraft's performance across an entire mission. Brig Gen H. D. Polumbo, commander of the 9th Reconnaissance Wing, believes that "when dealing with an emergency aircraft that is operating thousands of miles away at 60,000 feet and dealing with malfunctioning critical aircraft systems . . . you had better have a great deal of airmanship in your pocket to ensure the safe recovery of the aircraft."[31] Critical, unanswered questions remain: How does the Air Force delineate the differences between manned and unmanned aviation? Can airmanship be developed solely through the remote operation of aircraft?

The final issue uncovered within the Global Hawk community relates to the development of pilots' decision-making abilities. Unmanned aviation has the unique capability to access additional expertise; that is, individuals at the controls of Global Hawk can always either call for assistance on the telephone or, in most cases, even physically bring an expert into the control center with them. Doing so, however, can create a problem in the long run. Calling on higher-level commanders to weigh in on important decisions allows us to spoon-feed young pilots through difficult decisions. Due to the physical location of the pilot, the casual observer can often have just about as much information on the situation as the pilot. During requests for help, no longer can the pilot chastise individuals on the ground, accusing them of having no idea about what is happening in the cockpit. Everyone involved can build situational awareness from the same set of information displays. Colonel Jella points out that the issue is discussed at length in seminars on the management of crew resources and that

> [squadron leaders have] to understand that they don't need the experience—the aircraft commander does. . . . So look at the situation, comprehend it, give the pilot your inputs, and walk away from the situation. . . . It's essential for the pilot's experience as a decision maker, the development of their logic trains, and their problem-solving skills, that squadron leadership does not spoon-feed pilots through decision-making processes.[32]

These examples, pulled from the operational environment of Predator, Reaper, and Global Hawk, highlight the divergence of unmanned and manned aviation. Of even greater importance to any discussion of the professional development of future UAS operators is the Air Force's proud history of manned flight.

Cultural Considerations

An investigation of perceptions of UAS assignments unveils several important issues. As an institution, the Air Force has developed cultural norms regarding pilots and their development as leaders. In turn, pilots themselves have developed career expectations as professional Air Force aviators. The introduction of UASs into the inventory contests many of these norms.

Pilots love to fly. A passage from Mark Wells's book *Courage and Air Warfare* captures the emotional bond between pilots and flight:

> The visual and kinesthetic sensations could seem almost intoxicating.
>
> The rest was wonder, a joy compounded of exhilaration, a limitless sense of freedom and reach to the very limits of the sky. How many pilots have shared this sensation which defies adequate description! The instant of knowing that the skies truly are yours in which to fly and soar, to

> glide and swoop, is truly a moment of sweetness incomparable to any other.[33]

Air Force pilots may love to fly, but they also pursue a career in aviation for societal status: "From the earliest days of aviation, airmen have been regarded as members of an elite group."[34] Today's Air Force subculture supports this perception. Pilots must undergo rigorous physical examinations and pass a demanding, year-long training regimen to earn their wings. Put simply, pilots are a select group of specialists. The advent of "unmanned flying" requires Airmen to give up the opportunity to fly, to relinquish their membership in the fraternity of pilots. For some, the opportunity to fly means even more to them than their professional military service.[35] Lt Col James Dawkins nicely sums up the cultural considerations regarding unmanned operations:

> The culture of the Air Force flying community itself added to feelings of inadequacy [in relation to UAV careers]. It is a culture where operators identify themselves with their respective airframes more so than their occupation. If you ask an aviator what he does in the Air Force, he is likely to answer with "I'm a bomber pilot" or "I'm a Viper (F-16) pilot." Some even consider themselves pilots first and Air Force officers second. But ask a Predator pilot what he flies and he's likely to say "I'm a former Viper (Eagle, C-5, B-1) pilot, but I fly Predators now."[36]

We cannot overlook the cultural perceptions of unmanned systems. Since its beginning, the Air Force has taken pride in its chivalrous nature, raising warfare out of the trenches of World War I. The personal connection between man and airplane resembles in some ways the relationship between the cavalry's man and horse. Carl Builder observes that, "when other means such as unmanned aircraft, guided missiles, and spacecraft became available, it was the aviators who revealed, by deeds more than words, that their real affection was for their airplanes and not for the concept of air power."[37] Certainly, tensions exist between young Air Force pilots who dream of slipping the surly bonds of Earth and those assigned to sit in Predator ground-control stations. The result? A continuous stream of pilots cycling through the Predator schoolhouse, completing an operational tour, and then immediately returning to their major weapon system—a cycle that has failed to fulfill the demand for Predator crews.

People who joined the service to become pilots would rather fly airplanes than UASs. The last 10 years of the Predator operators' assignment history demonstrate Air Force pilots' desire to stay in cockpits instead of ground-control stations. Pilots choose cockpits first, leaving tier-three personnel to fill the remaining UAS billets. The Air Force needs to aggressively target motivated people who will voluntarily pursue careers in UASs. A separate career field of volunteers would solve many of the challenges currently facing the UAS community. Morale and dedication to the development of unmanned aircraft would increase if, in the future, people came into the Air Force with the expectation of flying them.[38]

Implications

Over the years, a clearly defined set of technical skills and cultural associations has combined to forge the image of Air Force pilots, who must understand the physiological stresses of flight, the medium of air, and, of course, the airplane. They harbor an independent spirit, permitting them to make decisions from their often-isolated cockpits. Along with the technical aspects of being a pilot, a cultural association also accompanies the title. Pilots must pass strict physical standards and complete years of rigorous training. Associated with flying are inherent risks to life and limb. The title "pilot" thus brings cultural status.

A majority of pilots' traits do not apply to UAS operators, who require many skills not normally associated with pilots. Operators do not need to understand the physiological stresses of flight. They must know airplanes but also must understand much more than that in order to conduct unmanned operations safely. UAS operators should have a firm appreciation of the vulnerability and flexibility of the link between the ground-control station and the aircraft. Unlike a crewed airplane, an

unmanned one depends on security of particular parts of the electromagnetic spectrum for basic aircraft control.

Most importantly, cultural perceptions of pilots and UAS operators differ significantly. The fraternity of pilots shares a love of flight, enjoys a perception as an elite group of risk takers, and holds a particular social status within the Air Force. UAS operators, who do not share these traits, must build their own culture. Any reference to a "UAS pilot" only blurs what should be a clear distinction between two separate professions, each steeped in its own particular cultural norms. Clearly, a negative cultural stigma attaches to UAS operators, but as the community continues to prove itself in combat operations around the globe, operators will prove their worth and gain the respect of the rest of the war-fighting community. References to them as pilots cause only tension and confusion.

Independence—one of the hallmark traits of military aviators, is challenged by the connectivity of UASs. Gen Billy Mitchell said, "In the actual fighting of the aircraft, moral qualities are required that were never before demanded of men. In the first place, they are all alone. No man stands at their shoulder to support them."[39] Military aviation required an independence by war fighters never seen before in the battlespace. The connectivity of unmanned systems introduces a new concept to the independent aviator—the fact that UAS operators are never alone—and sets these systems apart from aircraft. On the one hand, sorties by fighter aircraft rely in large measure on the decision-making capabilities of select, highly trained aircrew members, each of whom must receive training to perform the mission successfully, from preflight to landing. On the other hand, as evidenced by Predator operations, UASs can rely on the skills of distinctly separate crews, separated by thousands of miles and sharing only a communications network and an aircraft. The difficult question becomes how to balance skill specialization with the general development of important decision-making skills and judgment—in short, *airmanship*. Computers and automated processes will continue to assume more of the responsibilities associated with pilots. The integration of automated and human-regulated processes depends upon careful evaluation of the command-and-control procedures that govern unmanned operations.

The challenge becomes identifying basic skills required of the evolving UAS operator. Emerging UAS technologies will likely make unmanned flight even more distinctive. As computers continue to assume greater responsibility for basic aircraft control, we must seek to define the responsibility of the "human in the loop." Ultimately, "flying" unmanned craft will boil down to developing processes for the effective command and control of effects delivered through the air.

A Look towards the Future

The extreme dedication to operations in Iraq and Afghanistan has pushed aside a fundamental discussion. As highlighted by Colonel Ehrhard, "The Air Force needs to reevaluate how it defines *airmanship*."[40] Instead of redefining the term, the service has made a default assumption that pilots who have at least a single operational tour possess the necessary level of airmanship to operate UASs safely.[41] However, examples from the Predator, Reaper, and Global Hawk communities already demonstrate important divergences from manned aviation. UAS operator skills and those of traditional pilots differ. New UAS capabilities, greater automation, and a wider span of mission types will bring this discussion increasingly to the forefront. The Air Force needs to formally evaluate UAS training requirements for an individual who has absolutely no aviation background, and then build an appropriate training syllabus.

Deep-seated cultural issues concerning professional Air Force pilots further complicate the discussion. The act of awkwardly forcing chivalrous young pilots out of their cockpits and into ground-control stations produces suboptimal results. Pilots are left performing jobs that do not generate the same level of satisfaction as flying. In the long run, this hurts the development of UASs because of the in-

ability to retain valuable operational experience. The Air Force's UAS personnel policy has led to an overworked community of professionals dedicated to supporting the global war on terror but eager to return to their previous jobs. Policies that focus on training nonrated, volunteer UAS crews would help provide enough people for today's fight while preparing for tomorrow's.

The Air Force's institutional push towards cyberspace offers an opportunity to combine old with new. A new UAS operator career field could nicely bridge the gap between old perceptions of Airmen (people who fly airplanes) and new ones (Airmen conducting operations in air, space, and cyberspace). Old principles of airmanship, combined with nuances of the new cyber medium, merge within the UAS community. Potentially, the UAS operator represents the new Airman. Just as the Airman of the 1920s relied on technology to take to the skies like no other war fighter of the day, so does the Airman of the twenty-first century rely on technology to create effects while remaining grounded. Determining the best doctrine, organization, and training policies to employ unmanned aircraft will continue to confront the Air Force; empowering a specific, newly defined career field offers the best way of overcoming such challenges. Proud traditions and cultural norms help define our service's greatness. They also have the potential to hinder its advance. In line with Secretary Gates's remarks, Gen Thomas White, a former Air Force chief of staff, warns that "the senior Air Force officer's dedication to the airplane is deeply ingrained and rightly so, but we must never permit this to result in a battleship attitude. We cannot afford to ignore the basic precept that all truths change with time."[42] ❑

Notes

1. Gen John P. Jumper, former Air Force chief of staff, interview by the author, 20 December 2006.
2. Thomas Ehrhard, "Unmanned Aerial Vehicles in the United States Armed Services: A Comparative Study of Weapon System Innovation" (PhD diss., Johns Hopkins University, 2001), 593.
3. Although this article focuses on the UAS operator, it should not detract from the importance of properly training enlisted UAS sensor operators. Their contribution to the accomplishment of the mission is equally important, and their struggle for recognition no less significant.
4. Gen John P. Jumper, chief of staff, US Air Force, "Chief's Sight Picture," 10 March 2003.
5. Lt Gen Carrol H. Chandler, deputy chief of staff, Air, Space, and Information Operations, Plans, and Requirements, Headquarters US Air Force, Washington, DC, memorandum for record, 13 December 2006. The program selected three candidates from a pool of volunteer applicants: 2nd Lt Leslie McPeak, Capt Thomas Bean, and Capt Oswald Bonilla.
6. Col Michael McKinney, director, Air Force Operations and Training, interview by the author, 18 December 2006.
7. Col Stephen Wilson, former assistant operations officer, Air Education and Training Command, interview by the author, 6 December 2006.
8. Ibid.
9. Ibid.
10. Col Thomas Ehrhard, USAF, retired, Senior Fellow, Center for Strategic and Budgetary Assessments, interview by the author, 20 December 2006.
11. Ibid.
12. Jumper, interview.
13. Ibid.
14. Gen Michael E. Ryan, former Air Force chief of staff, interview by the author, 19 December 2006.
15. Gen Richard Hawley, former commander, Air Combat Command, interview by the author, 3 January 2007.
16. Ibid.
17. Lt Col John Harris, former commander, 15th Reconnaissance Squadron, interview by the author, 26 January 2007.
18. Lt Col Christopher Plamp, commander, 15th Reconnaissance Squadron, interview by the author, 23 January 2007.
19. Maj Thomas Meeks, former Predator operator, 15th Reconnaissance Squadron, interview by the author, 20 January 2007.
20. Lt Col James Gear, commander, 11th Reconnaissance Squadron, interview by the author, 25 January 2007.
21. Ibid.
22. Ibid.
23. Brig Gen Charles Lyon, former commander, 57th Operations Group, interview by the author, 19 December 2006.
24. Meeks, interview.
25. Ibid.
26. Lt Col Christopher Jella, commander, 18th Reconnaissance Squadron, interview by the author, 22 January 2007.
27. Ibid.
28. Ibid.

29. Ibid.

30. Brig Gen H. D. Polumbo, commander, 9th Reconnaissance Wing, interview by the author, 22 January 2007.

31. Ibid.

32. Jella, interview.

33. Mark K. Wells, *Courage and Air Warfare: The Allied Aircrew Experience in the Second World War* (Portland, OR: Frank Cass, 1995), 92.

34. Ibid., 4.

35. James R. FitzSimonds and Thomas G. Mahnken, "Military Officer Attitudes toward the Adoption of Unmanned Systems" (paper presented at the Annual Meeting of the International Studies Association, San Diego, CA, 22 March 2006).

36. Lt Col James C. Dawkins, "Unmanned Combat Aerial Vehicles: Examining the Political, Moral, and Social Implications" (master's thesis, School of Advanced Air and Space Studies, Air University, Maxwell AFB, AL, 2005), 42.

37. Carl H. Builder, *The Icarus Syndrome: The Role of Air Power Theory in the Evolution and Fate of the U.S. Air Force* (New Brunswick, NJ: Transaction Publishers, 1994), 32.

38. Current Air Force initiatives to manage UAS operators include two nonvolunteer programs: Tactical Aircrew Management Initiative 21 and a no-permanent-change-of-station policy from Creech AFB, NV. Each highlights the institutional problems related to attracting and maintaining sufficient numbers of Predator operators. Both are short-term solutions with little long-term effect.

39. William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power—Economic and Military* (1925; repr., Mineola, NY: Dover Publications, 1988), 163.

40. Ehrhard, interview.

41. UAS personnel policy is rapidly changing. Senior leadership recently made the decision to directly assign graduates of Specialized Undergraduate Pilot Training to Predator UASs. Also, a recently initiated experimental "Beta" program takes nonpilots directly into the UAS community.

42. Quoted in Builder, *Icarus Syndrome*, 175.