Drones and the

U.S. Government

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About the Editor

Michael Erbschloe has worked for over 30 years performing analysis of the economics of information technology, public policy relating to technology, and utilizing technology in reengineering organization processes. He has authored several books on social and management issues of information technology that were published by McGraw Hill and other major publishers. He has also taught at several universities and developed technology-related curriculum. His career has focused on several interrelated areas:

- Technology strategy, analysis, and forecasting
- Teaching and curriculum development
- Writing books and articles
- Publishing and editing
- Public policy analysis and program evaluation

Books by Michael Erbschloe

Social Media Warfare: Equal Weapons for All (Auerbach Publications)
Walling Out the Insiders: Controlling Access to Improve Organizational Security (Auerbach Publications)
Physical Security for IT (Elsevier Science)
Trojans, Worms, and Spyware (Butterworth-Heinemann)
Implementing Homeland Security in Enterprise IT (Digital Press)
Guide to Disaster Recovery (Course Technology)
Socially Responsible IT Management (Digital Press)
Information Warfare: How to Survive Cyber Attacks (McGraw Hill)
The Executive's Guide to Privacy Management (McGraw Hill)
Net Privacy: A Guide to Developing & Implementing an e-business Privacy Plan (McGraw Hill)

Introduction

On February 15, 2015, President Obama issued the Presidential Memorandum "Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems." The Presidential Memorandum stated: "As UAS are integrated into the National Air Space (NAS), the Federal Government will take steps to ensure that the integration takes into account not only our economic competitiveness and public safety, but also the privacy, civil rights, and civil liberties concerns these systems may raise." The Presidential Memorandum establishes a "multi-stakeholder engagement process to develop and communicate best practices for privacy, accountability, and transparency issues regarding commercial and private UAS use in the NAS." The process will include stakeholders from industry, civil society, and academia, and will be initiated by the Department of Commerce, through National Telecommunications & Information Administration (NTIA), and in consultation with other interested agencies.

NTIA's role in the multi-stakeholder process is to provide a forum for discussion and consensus-building among stakeholders. When stakeholders disagree, NTIA's role is to help the parties reach clarity on what their positions are and whether there are options for compromise toward consensus, rather than substituting its own judgment. Furthermore, this stakeholder group is not an advisory committee, as neither NTIA nor any other Federal agency or office will seek consensus advice or recommendations on policy issues from participants in this multi-stakeholder process. Public stakeholder meetings will be webcast, and there will be an opportunity for stakeholders viewing the webcast to participate remotely in the meetings through a moderated conference bridge.

On March 5, 2015, NTIA sought public comment regarding privacy, accountability, and transparency issues concerning UAS. Individuals and entities in the commercial, academic, civil society, and government sectors filed comments. Stakeholders at the May 18, 2016 meeting agreed to conclude the process, and a diverse group of stakeholders came to consensus on a best practices document. This document was updated at the request of stakeholders on June 21, 2016, to include background information and reaction, but it does not include any changes to the UAS best practices agreed to on May 18, 2016.

The stakeholders that support this best practices document include: Amazon, Association for Unmanned Vehicle Systems International (AUVSI), Center for Democracy and Technology, Commercial Drone Alliance, Consumer Technology Association, CTIA, Future of Privacy Forum, Intel, New America's Open Technology Institute, PrecisionHawk, X (Formerly Google [x]), Small UAV Coalition, Online Trust Alliance (OTA), News Media Coalition, Newspaper Association of America (NAA), National Association of Broadcasters (NAB), Radio Television Digital News Association (RTDNA), Digital Content Next (DCN), Software & Information Industry Association (SIIA), NetChoice, U.S. Chamber of Commerce.

(Link: https://www.ntia.doc.gov/other-publication/2016/multistakeholder-process-unmanned-aircraft-systems)

The increased use of drones for civilian applications has presented many countries with regulatory challenges. Such challenges include the need to ensure that drones are operated safely, without harming public and national security, and in a way that would protect areas of national, historical, or natural importance. A variety of the countries surveyed in this report have

also made efforts to address concerns regarding the property and privacy rights of landowners or other persons impacted by the operation of drones.

(Link: https://www.loc.gov/law/help/regulation-of-drones/index.php)

Drones—unmanned, remotely piloted, aerial vehicles, short UAVs—are now used by the armed forces of approximately 70 countries around the world. The club of armed UAV holders remains more exclusive; for the moment, its members only include Israel, the United Kingdom, the United States, and most likely China and Iran. This situation, however, is likely to change sooner rather than later with many countries considering the procurement of armed drones. Unconfirmed reports indicate that the U.S. military, security forces, and Intelligence Community operate over 10,000 drones. (Link: http://www.strategicstudiesinstitute.army.mil/pubs/parameters/issues/Spring_2014/12A_Franke-ReviewEssays.pdf)

Turkey, Syria, Iran, Russia, the U.S., Britain and Iraq all have used drones in the Iraq-Syria region. Kurdish militias, Syrian rebel forces, and the Hezbollah and IS have also used some form of drones. While the Pentagon tries to keep its drone program covert, it has admitted several times in recent months to striking specific IS targets with drones, according to news reports. Among the targets was Islamic State's Jihadi John, who was shown in gruesome videos beheading U.S. and Western hostages. The drone program, which is run by the CIA and the Joint Special Operation Command, largely operates out of a Turkish military base (Link: http://www.voanews.com/a/military-drones-flood-war-skies-over-syria-and-iraq/3330150.html)

The U.S. Military Faces Many Challenges with Drones

Remotely piloted aircraft (RPA) are one of the most in-demand capabilities the Air Force provides to battlefield commanders. Beyond replacing human beings in aircraft that perform dangerous roles, RPAs are highly valuable because they possess characteristics that many manned aircraft do not. For example, they can fly long-duration missions, thereby providing a sustained presence over the battlefield. In response to the increased demand, the Air Force has significantly increased the number of RPAs it uses for intelligence, surveillance, and reconnaissance and precision strike capabilities, according to Air Force documentation. Consequently, the Air Force has increased the number of its pilots flying RPAs from approximately 400 in 2008 to about 1,350 in 2013. Due to the increased demand for their capabilities, these pilots have served at a high pace of operations since 2007.

Most of these pilots are located on Air Force bases within the United States and fly the RPAs overseas in operational environments. The Air Force uses the term RPA to refer to large unmanned aircraft systems, such as the MQ-1 Predator. The Department of Defense (DOD) defines an unmanned aerial system as a system whose components include the necessary equipment, networks, and personnel to control an unmanned aircraft—that is, an aircraft that does not carry a human operator and is capable of flight under remote control or autonomous programming.

Pace of operations refers to the number of aircraft flying hours and it increases with the intensity and number of operations. In fiscal year 2013, the Air Force flew its Predator and Reaper systems for over 300,000 hours, combined.

GAO prior work has found that DOD has faced challenges in the development and acquisition of unmanned aircraft systems and in the integration of these systems into combat operations. Regarding personnel, we have found that the Air Force and the Army identified limitations in their approaches to provide personnel to meet unmanned aircraft systems force levels, and they had not fully developed plans to supply needed personnel. More recently, the National Defense Authorization Act for Fiscal Year 20135 required the Air Force to report on the education, training, and promotion rates of RPA pilots.

From 2008 to 2014, the Air Force has more than tripled the number of its active-duty pilots flying RPAs, which is the term the Air Force uses to refer to unmanned aerial systems such as the MQ-1 Predator. Due to increases in demand, RPA pilots have had a significant increase in workload since 2007. The General Accountability Office (GAO) was asked to evaluate the Air Force's approach to managing its RPA pilots as well as their quality of life and promotion rates. For this review, GAO evaluated the extent to which the Air Force (1) has used a strategic human-capital approach to manage RPA pilots; (2) has addressed concerns, if any, about the working conditions of RPA pilots that may affect their quality of life; and (3) analyzes the promotion rates of RPA pilots.

GAO analyzed personnel planning documents, Air Force studies, and officer promotion data. GAO also interviewed unit commanders at selected Air Force bases and Headquarters Air Force officials and conducted focus groups with RPA pilots. While the results of these focus groups are not generalizable, they provide valuable insights.

The Air Force has managed its remotely piloted aircraft (RPA) pilots using some strategic human-capital approaches, such as planning for the different levels of experience that it needs in these pilots. However, it continues to face challenges. High-performing organizations manage human capital to identify the right number of personnel and to target the right sources to fill personnel needs. In 2008, the Air Force determined the optimum number of RPA pilots—the crew ratio—for some units, but it did not account for all tasks these units complete. Air Force officials stated that, as a result, the crew ratio is too low, but the Air Force has not updated it. Air Force guidance states that low crew ratios diminish combat capability and cause flight safety to suffer, but the Air Force has operated below its optimum crew ratio and it has not established a minimum crew ratio. Further, high work demands on RPA pilots limit the time they have available for training and development and negatively affects their work-life balance. In addition, the Air Force faces challenges recruiting officers into the RPA pilot career and may face challenges retaining them in the future. High-performing organizations tailor their recruiting and retention strategies to meet their specific mission needs, but the Air Force has not tailored its approach to recruiting and retaining RPA pilots nor considered the viability of using alternative personnel such as enlisted personnel or civilians. Without developing an approach to recruiting and retaining RPA pilots and evaluating the viability of using alternative personnel populations for the RPA pilot career, the Air Force may continue to face challenges, further exacerbating

existing shortfalls of RPA pilots. Moreover, the Air Force has not used direct feedback from RPA pilots via existing mechanisms, or otherwise, to develop its approach to managing challenges related to recruiting, retention, training, and development of RPA pilots.

The Air Force has taken some actions to address potentially difficult working conditions RPA pilots face, but it has not fully analyzed the challenge pilots face to balance their warfighting roles with their personal lives. RPA pilots operate RPAs from bases in the United States and live at home; thus they experience combat alongside their personal lives—known as being deployed-on-station—which RPA pilots stated negatively affects their morale. While the Department of Defense has committed to maintaining high morale for service members, the Air Force has not fully analyzed the effects on morale related to being deployed-on-station, and thus it does not know whether it needs to take actions in response.

The Air Force monitors RPA pilot promotion rates, but has not analyzed factors that may relate to their low promotion rates. Statistical principles call for researchers to account for potential key factors in analysis because when they omit key factors, the relationships between other factors may not be accurately estimated. The Air Force analyzed promotions across a group of officers, including RPA pilots, and found factors that related to promotions in general. However, the Air Force has not analyzed the factors related to RPA pilots' promotions specifically and, as a result, it does not have the information to determine what factors may affect their promotions. Consequently, the Air Force may not be targeting actions it is taking to raise RPA pilot promotion rates at the appropriate factors, and information it has reported to Congress may not be accurate.

The initial training that the Air Force provides to its RPA pilots is designed specifically for flying RPAs and consists of two major components that take about 10 months to complete. The first major component is Undergraduate RPA Training and it consists of a basic flying skills course in which RPA pilots learn to fly a small manned aircraft in Pueblo, Colorado; instrument training in a manned-aircraft flight simulator at Randolph Air Force Base in Texas, and an RPA fundamentals course that is also at Randolph. In the second major component of their initial training, RPA pilots get their first opportunity to fly an RPA at a Formal Training Unit, which for most active-duty pilots takes place at Holloman Air Force Base in New Mexico. During this training, RPA pilots learn basic RPA operations in all mission areas including intelligence, surveillance, and reconnaissance as well as close air support. Following their time in Formal Training Units, RPA pilots finish their training by attending a 2-week joint weapons course in which they learn how to operate with the Army, Navy, and Marine Corps in a joint operational environment.

The Air Force spends considerably less to train RPA pilots than it does to train manned-aircraft pilots. Specifically, Air Education and Training Command officials estimate that the Air Force spends about $65,000 to train each RPA pilot to complete Undergraduate RPA Training. Conversely, these officials estimate that the Air Force spends an average of $557,000 for each manned-aircraft pilot to complete the corresponding portion of manned-aircraft pilot training, which is called Undergraduate Pilot Training.

The Air Force currently flies the bulk of its RPAs using a concept known as remote-split operations. With remote-split operations, a small number of RPA pilots deploy to operational theaters located overseas to launch and recover RPAs from various locations around the world while other RPA pilots remotely control the RPA for its mission from Air Force bases in the United States. According to Air Force officials, remote-split operations help the Air Force reduce the personnel and equipment it deploys overseas because the units that launch and recover RPAs are staffed with a relatively small number of pilots, sensor operators, support personnel, and equipment. In addition, remote-split operations provide the Air Force flexibility to change the geographic region of the world where an RPA pilot conducts a mission without moving the pilot, support personnel, or equipment needed to control the RPA. If the Air Force is not able to use one of its launch and recovery sites for various reasons such as poor weather, the Air Force can continue its RPA operations by launching RPAs from a different launch and recovery site.

Drone Air Force Careers

The Defense Officer Personnel Management Act (DOPMA)11 created a system for managing the promotions for the officer corps of each of the military services. DOPMA specifies that the secretaries of the military departments must establish the maximum number of officers in each competitive category that may be recommended for promotion by competitive promotion boards. Career categories, also known as competitive categories, cluster officers with similar education, training, or experience, and these officers compete among themselves for promotion opportunities. Under this system, as currently implemented in the Air Force, there are several competitive categories including one that contains the bulk of Air Force officers called the Line

of the Air Force, which includes RPA pilots, as well as pilots of manned aircraft and other operations-oriented careers.

To consider officers for promotion from among those who are eligible, the Air Force assigns groups of senior officers to serve as members of a promotion selection board for each competitive category of officer in the Air Force. Promotion boards consist of at least five active-duty officers who are senior in grade to the eligible officers, but no officer on the board is below the rank of major. In addition, Air Force guidance states that the Air Force attempts to provide a balanced perspective on promotion boards, and hence it selects officers who mirror, as much as possible, the officers they are considering with respect to race, sex, aeronautical rating, career field, and command. Promotion boards typically convene annually at AFPC headquarters to review a variety of records for each eligible officer, including performance and training reports as well as recommendations from supervisors. Board members assess these records using a best-qualified approach and use a variety of methods to score the records and resolve differences among the scoring of the board members, if necessary. An Air Force officer cannot serve as a member of two successive promotion boards considering officers of the same competitive category and rank.

A key feature of DOPMA is its "up-or-out" promotion system. Under this system, as currently implemented in the Air Force, promotion to the first two ranks in an officer's career is not competitive. Specifically, 100 percent of fully qualified Air Force second lieutenants and first lieutenants are promoted after serving for 2 years in their respective ranks and do not meet with a competitive promotion board. However, as officers advance through the ranks in cohorts that are

determined by the year they were commissioned, they compete for promotion against other members of their cohort at set years or zones of consideration for each rank. For example, Air Force officers are generally considered for promotion to major, or the grade of O-4, after 10 years.

Under the DOPMA system, a select group of officers can also be considered for promotion 1 or 2 years early, or "below the zone." However, because only a limited number of officers below the zone may be promoted, officers have their greatest potential for promotion "in the zone." If officers in a cohort are not promoted while they are in the zone, they can compete for promotion in the following one or in some instances two years later, which is known as competing "above the zone." However, if these officers are not selected for promotion above the zone, they could be involuntarily separated from the Air Force.

DOD has noted that the prevalence and use of unmanned systems, including RPAs, will continue to grow at a dramatic pace. As discussed above, the Secretary of Defense has stated specifically that the requirement for 65 CAPs represents a temporary plateau in progress toward an increased enduring requirement. Also, as the national security environment changes, RPA pilots will be expected to conduct a broader range of missions across different conditions and environments, including anti-access and area-denial environments where the freedom to operate RPAs is contested. By not creating an environment where RPA pilots can receive the training and development opportunities they need to perform their functions effectively, the Air Force may be hindering its ability to perform its mission even if it is able to operate at the optimum crew ratio that is set in the Air Force instruction.

The Work Life of a Drone Pilot

RPA pilots find their mission rewarding, but they reported that they face multiple, challenging working conditions. RPA pilots in 8 of the 10 focus groups we conducted reported that they found it rewarding to be able to contribute to combat operations every day through the RPA mission. For instance, one pilot stated that the mission is the reason that he had decided to become a permanent RPA pilot and that it was rewarding to contribute to overseas contingency operations, which he would not be able to do in any other job. Similarly, the Air Force School of Aerospace Medicine published studies in 2011 and 2013 that evaluated the psychological condition of RPA personnel and found that RPA pilots held positive perceptions of the effect and contributions of their work. However, RPA pilots also stated that they face multiple challenging working conditions including: long hours, working shifts that frequently rotate, and remaining in assignments beyond typical lengths.29 RPA pilots in all of our focus groups reported that these challenging conditions negatively affected their morale and caused them stress. Similarly, the Air Force School of Aerospace Medicine studies found that RPA personnel reported sources of stress that were consistent with the challenges we identified. These challenges include the following:

- RPA pilots in 8 of our 10 focus groups stated, and Air Force studies we reviewed show, that RPA pilots work long hours. RPA pilots in 7 of our focus groups described factors that contribute to their long hours including performing administrative duties and attending briefings, in addition to flying shifts. The Air Force studies also found that working long hours was one of the top five reasons for stress among personnel in RPA squadrons. In the studies, over 57 percent of respondents reported that they worked more than 50 hours per week. In addition, the studies found that over 40 percent of respondents

reported that performing administrative duties added hours to their work week and was the third-highest reason for stress among active-duty RPA personnel.

• RPA pilots also reported that it was challenging to work on shifts that rotate. RPA pilots in 7 of the 10 focus groups we conducted stated that constantly rotating shifts caused sleep problems for them because they must continuously adjust their sleep schedule to accommodate new shifts.30 In addition, pilots noted that continuously rotating to new shifts disrupted their ability to spend time with their family and friends. Officials told us that it was ideal for pilots working evening or night shifts to maintain a consistent sleep pattern on their off-duty days even though those sleep patterns would require that pilots sleep while their family and friends were awake. However, some RPA pilots reported that they typically adjusted their sleep schedules dramatically on their off-duty days so they could spend time with their families and that these changes to their sleep schedules resulted in significant fatigue both at home and when they returned to work. Similarly, over half of the respondents to the surveys included in the Air Force studies we reviewed reported that shift work caused a moderate to large amount of their stress.

• RPA pilots in 5 of our focus groups reported that being assigned to continue flying RPAs for periods extending beyond the typical Air Force assignment was difficult. In all of the focus groups we conducted with RPA pilots, those who plan to return to flying manned aircraft stated that they have been required to stay in their assignments for periods that are longer than a typical Air Force assignment. Air Force officials stated that there is no requirement for officers to move to a new assignment after a specified period. However, pilots in our focus groups and Air Force headquarters officials said that officer assignments typically last 3 to 4 years. Air Force documentation shows that some of these

> pilots have been in their RPA assignments for over 6 years. Moreover, the Air Force studies also found that one of the most common stressors that RPA personnel cited was the lack of clarity regarding when they would return to their careers in manned aircraft. Specifically, the 2011 study states that the Air Force informed RPA pilots who previously flew manned aircraft that their RPA assignments were temporary and after 3 to 4 years they could return to their manned-aircraft career. The study goes on to state that due to the increasing demand for RPAs and the long-standing surge in RPA operations, many pilots have been unable to return to their manned-aircraft careers and, until recently, the Air Force kept them in these assignments indefinitely.

The Air Force has taken some actions to address some of the challenging working conditions that RPA pilots face. The Air Force studies included over 10 recommendations to address the sources of stress that RPA personnel reported. For example, the studies recommended that the Air Force assign an operational psychologist to each RPA unit to help commanders optimize work-rest schedules and shift cycles, and identify pilots who are reaching elevated levels of fatigue or stress. In response, the Air Force has assigned mental-health providers that are dedicated to RPA squadrons at Beale, Cannon, and Creech Air Force Bases. However, the studies also recommended that the Air Force increase staffing in RPA squadrons to reduce the number of hours that RPA personnel work and to help establish better shift schedules. Air Force researchers stated that increasing staffing levels, or crew ratios, in RPA squadrons would be the most-effective means to reduce RPA pilot stress, but as discussed above, the Air Force has operated its RPA squadrons below the optimum crew ratios.