The Culture of US Air Force Innovation
A Historical Case Study of the Predator Program

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Abstract

This study shows how the organizational culture of the US Air Force (USAF) shaped — and was shaped by — innovation in the Predator program. Current literature on UAV innovation has begun to question the conventional wisdom, captured in Col. Thomas Ehrhard's 2000 doctoral dissertation, that USAF culture has minimal impact on UAV innovation, and to the extent that it matters it is a positive influence. This thesis aims to get to the bottom of the debate about the role of USAF culture in UAV innovation by exploring the nature of the mutually-shaping relationship between USAF culture and the Predator program and how that relationship changed over time.

With the delivery of the last Predator to the USAF in 2011, this famous aircraft has become a part of history, yet it is still operational and its story is still recent enough to allow for the possibility of conducting over 60 interviews with individuals directly involved in the Predator program. Triangulating these interviews with sources inside and outside the USAF, as well as recently declassified historical accounts, official USAF correspondence, and secondary sources, this thesis provides a data-rich analysis of the evolving relationship between USAF culture and the Predator program. It reveals new details on the relative roles of the USAF versus other actors in spurring innovations in the Predator program; it shows how the USAF's enduring cultural tendency to favor manned aircraft over other technologies has slowed UAV innovation; and it demonstrates the importance of shifting perceptions of strategic contexts, visionary leaders, and USAF identity in mediating cultural attitudes toward UAV innovation. By revisiting the relationship between USAF culture and UAV innovation 16 years after Col. Ehrhard's study, this thesis challenges his minimalist view of cultural influence and calls for further study into the relationship between USAF culture and UAV innovation.

To Jarrett and Savannah

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INTRODUCTION

The proliferation of unmanned aerial vehicles (UAVs) in the US Department of Defense (DoD) over the last 15 years marks one of the most significant ongoing developments in military aviation in decades. Yet while the US military has been researching and flight-testing UAVs almost as long as piloted aircraft,[1] the history of UAVs has been marked by a tendency to all but completely drop the technology after periods of significant investment. Today many of the same factors that impacted the trajectory of earlier US military UAV programs — ranging from changes in the threat environment to technology maturity questions, federal budget pressure and inter-service rivalry — are once again emerging as live issues.

The US Air Force (USAF) has historically been a leader in UAV technology, but also vulnerable to the DoD-wide tendency to employ it in fits and starts. With the delivery of the last MQ-1 Predator to the USAF in March 2011, a new research opportunity has emerged to examine the service's decision-making process for UAV innovation as a complete analytical unit with a beginning, middle, and end. It is too early to say whether the Predator and its successor, the MQ-9 Reaper, have finally managed to do what previous UAVs have not; namely, earn a lasting place in the USAF's force structure. But the end of the USAF's Predator acquisition program, and the passage of several years since then, has created a unique opportunity to analyze how the USAF's attitudes toward the technology have evolved over time.

Researchers have offered a variety of competing explanations about why UAVs to date have not consistently remained a prevalent part of the US military's force structure. The theoretical background for much of their research is drawn from military innovation studies, which builds on international relations theory and organizational theory to identify a variety of factors involved in organizational

[1] The US military services have pursued UAV development since 1917. See, for example,

change. Some schools of military innovation theory identify factors internal to an organization, such as structural or functional imperatives, or cultural influences, to explain military change. Other schools focus on external factors as sources of change, such as civilian officials, the threat environment, technological progress or budget considerations.

While scholars seem to agree that UAV innovation over the last 15 years represents a potentially major military change, they have not come to a consensus on the source of the change. Among the handful of researchers who have explored the role of culture in spurring UAV development, there is a fundamental disagreement about the extent and nature of its influence. One view is that culture has not played a significant role in facilitating or constraining the USAF's capacity to integrate UAVs. These researchers have found that the USAF's historic failure to integrate UAVs has been due to technological immaturity and poor operational performance, not to cultural resistance. In the few cases where scholars concede a cultural influence, it is perceived as having facilitated UAV innovation rather than having blocked it. But this view has started to come up against critics, particularly as UAV technology has improved, and the US-led wars in Afghanistan and Iraq have allowed for extensive battle testing of UAVs.

Evidence of the operational utility of UAVs continues to be borne out on the battlefield, with ground commanders citing an "insatiable" need for UAVs to conduct intelligence, surveillance and reconnaissance (ISR).[2] Across the DoD, there has been an explosion in the US military's UAV inventory from 167 in 2002 to nearly 11,000 in 2013, although about 95 percent are smaller and less capable than the Predator and its cousins, the MQ-9 Reaper and MQ-1C Gray Eagle.[3] Today UAVs have reached a point at which their efficiency can potentially match that of other weapons alternatives — at least within certain contexts — raising anew questions about shortfalls in technological maturity and operational utility cited in previous findings.

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[2] See, for example, Abizaid (2005).
[3] Gertler (Jan. 3, 2012) 2; DoD (2013) 4; Arkin (2015) 9

One could argue that the USAF has now finally embraced UAVs precisely because they have reached technological maturity. But this argument is undermined by the fact that UAVs performed reasonably well in the Vietnam War, for example, and were still dropped after the war ended. Technological maturity also seemed to be less of a consideration than other factors in the case of the Predator, which is poorly equipped to operate in bad weather or contested airspace. Despite these shortcomings, the USAF nevertheless took steps to both facilitate Predator adoption and also to hinder its development, suggesting that other factors besides technological maturity were at play. In light of these considerations, several authors writing about UAV innovation more recently have found that resistance to modern-day UAV technology may hinge on other factors, with culture playing at least a peripheral role as a source of resistance to UAV innovation.

My research aims to get to the bottom of this debate about the role of culture in UAV innovation by focusing on the USAF's Predator program between 1993 and 2015. The Predator serves as a test case to explore my primary research question: how has USAF culture shaped – and been shaped by – UAV innovation? This question design allows considerable latitude to explore the dynamic and multi-faceted relationship between organizational culture and technology. It takes into account the possibility that, over time, elements of USAF culture may have constrained or enabled Predator program innovation. It also acknowledges the possibility that the Predator program itself spurred cultural change in the USAF.

This approach to understanding the role of USAF culture in UAV innovation is distinct from previous research on the subject. While scholars have tended to focus on the relative role of culture versus other variables in spurring UAV innovation, I see culture as a lens through which the USAF views all the factors that impinge on UAV development. I am still interested in the extent to which USAF culture triggered UAV innovation, but I take it for granted that culture mattered to some degree, and my primary concern is to understand exactly *how* it mattered, for reasons I discuss much further in chapter one. The literature review below looks at how other scholars have viewed the relationship between USAF culture and UAV innovation. Chapter one explores the theoretical background for my view of culture, and it also provides a justification for the following four sub-questions, which each explore various hypotheses about the nature of USAF culture to answer the primary research question above. These questions are asked across the substantive chapters that follow chapter one.

1. To what extent did individuals or groups within the USAF resist UAV innovation out of a concern that their jobs and status might be threatened by it?

2. To what extent were judgments about the potential and cost effectiveness of UAVs based on the USAF's enthusiasm for employing new technology and to what extent was the enthusiasm from outside the service?

3. To what extent were USAF judgments about the employment of UAVs driven by a desire to reduce the risk to friendly personnel and to what extent was that push from outside the service?

4. To what extent were judgments about UAVs based on a concern about maintaining the USAF's primacy over air assets in response to external pressure from the US Congress, civilian government agencies, or other military institutions?

Literature Review: Three Perspectives on USAF Culture and UAV Innovation

This literature review is limited in scope due to the sheer volume of material on UAVs, which has only grown in recent years as these aircraft, popularly referred to as "drones," proliferate. Historical surveys, such as Hugh McDaid and David Oliver's *Smart Weapons: the Top Secret History of Remote Controlled Airborne*

Weapons, among others, provide a review of UAV developments and make assessments about their likely role in future combat.[4] Much more recently, authors have sought to explain how advances in drone technology impact the relationship between humans and machines in warfare.[5] Other books, particularly Chris Woods' *Sudden Justice* and Mark Mazetti's *Way of the Knife,* explore the role of drones in the CIA and Special Operations Forces' post 9/11 shadow war against terrorism.[6]

Here I will limit the discussion to works that are directly relevant to USAF culture and UAV innovation, many of which go beyond re-tracing the USAF's UAV history to offer a nuanced, multi-dimensional perspective that has shaped the research design of this thesis. In terms of the research design, there is a similarly burgeoning supply of literature on the broader subject of military innovation and culture, which I therefore have left for the theoretical discussion in chapter one.

In this literature review, I examine the topics of USAF culture and UAV innovation from three different perspectives. The first perspective focuses on agency, exploring the relative roles of the USAF versus other actors in spurring UAV innovation. The second perspective examines the relative roles of culture versus a range of other factors in shaping the course of UAV innovation. The third perspective highlights how UAV innovation has raised a broader question about USAF identity, a key determinant of the service's capacity for innovation. Some works will arise more than once in the discussion because they cut across multiple perspectives.

The First Perspective: The USAF's Role in UAV Development

In regards to the first perspective, authors clearly disagree about the extent to which the USAF played a role in various UAV developments. The most contentious

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[4] McDaid and Oliver (1997). See also Wagner (1982); Armitage (1988); Siuru (1991); Newcome (2004); Yenne (2004); Yenne (2010)

[5]Arkin (2015); Mindell (2015); Ramo (2011) ;Coker (2007)

[6] Woods (2015); Mazetti (2013)

debate centers on USAF's role in the decision to arm the Predator with AGM-114 Hellfire missiles in the early 2000's.

In a 2011 paper for the Air Force Association, and later, in a 2014 book, journalist Richard Whittle argues that the USAF — under the leadership of General John Jumper, the USAF Chief of Staff from 2001 to 2005 —deserves full credit for weaponization.[7] His findings are based heavily on the work of then-USAF Lieutenant Colonel Sean Frisbee, who argues in a graduate paper that Gen. Jumper made the critical decision to arm the Predator. [8]

In contrast to Whittle and Frisbee, other authors accuse the USAF of obstructing weaponization. In his 2004 dissertation on UAV innovation, Jon Rosenwasser argues that the USAF weaponized the Predator under duress from the CIA, desperate to hunt down al Qaeda leader Osama bin Laden.[9] Peter Singer, a Brookings Institution scholar, and investigative reporter Stephen Coll, also claim that the CIA took the lead on Predator weaponization, with the USAF following along begrudgingly. [10]

The Second Perspective: USAF Culture and UAV Innovation

Turning to the second perspective, scholarship on culture and UAV innovation offers a range of views regarding the relative influence of USAF culture versus other factors in shaping decisions about UAV development. The landmark work on the subject to date is retired Col. Thomas Ehrhard's doctoral dissertation, which offers a comparative study of UAV programs across the US armed services over 45 years, including the USAF's Predator program.[11] Col. Ehrhard's main contribution is to clearly identify a variety of factors that impinge on UAV innovation. He forcefully concludes that USAF culture matters far less than other material factors

[7] Whittle (August 2011) 9; Whittle (2014) 169
[8] Frisbee (2004) 84-89.
[9] Rosenwasser (2004) 390-392 and 396-397
[10] Singer (2009) 35; Coll (2004) 534
[11] Ehrhard summarized his thesis in a 2010 publication cited heavily in Chapter 2. See Ehrhard (2010)

in shaping decisions about UAV innovation.[12] To the extent that it matters at all, he adds, USAF culture supports UAV development.[13]

Col. Ehrhard cites technological immaturity and poor operational performance relative to weapons alternatives — such as satellites, manned aviation and standoff missiles — as the main reasons for the USAF's historic failure to institutionalize UAVs.[14] Secondary influences cited by Col. Ehrhard include arms treaty limitations, congressional meddling, and cost problems after the National Reconnaissance Organization stopped funding the USAF's UAV research.[15] His conclusions are echoed by USAF Lt. Col. Richard M. Clarke in his 2000 USAF "occasional paper."[16]

Col. Ehrhard 's discussion of UAV innovation ends in 2000, when the Predator program was still in its infancy. He concedes that the "odd bird" [17] seemed to have "found a home"[18] in the USAF for the time being, but he argues that its relative lack of technological maturity— the same factor that he claims had held back UAV programs historically — threatened a "very shaky" future for the program.[19] Predator operations in Bosnia during Operation Deliberate Force and Kosovo during Operation Allied Force revealed the UAV's s lack of capability to fly in poor weather and its vulnerability to surface-to-air missiles (SAMs), leading Ehrhard to conclude that the Predator's long-term viability remained in question.[20]

Since Ehrhard published in 2000, however, a handful of scholars have revisited his conclusions about the relative role of culture versus other factors in spurring or stalling UAV innovation. As Ehrhard concedes, his study was completed at an "indeterminate, early stage" in UAV innovation, prior to any UAV

[12] Ehrhard (2000) 570
[13] Ehrhard (2000) 493
[14] Ehrhard (2000)404-405
[15] Ehrhard (2000)404-406
[16] Clark (2000) 48-67
[17] Ehrhard (2000) 52
[18] Ehrhard (2000) 546
[19] Ehrhard (2000) 513
[20] Ehrhard (2000) 546

having an enduring breakthrough into military operations.[21] More recent scholarship has sought to determine whether Ehrhard's findings about UAV innovation and the Predator program still hold in light of new information that has emerged in the 15 years since he examined the topic.

In his 2004 dissertation on UAV innovation between 1986 and 2002, Rosenwasser argues that Ehrhard's claim about technological and operational performance problems holding back UAV innovation has lost the explanatory power it once held. Advances in GPS, satellite communications, and other technologies allowed for the proliferation of UAVs with a range of enhanced capabilities during this time period.[22] He also argues that the strategic environment of the 1990's was highly conducive to UAVs, which demonstrated their operational efficiency relative to manned systems in terms of reducing aircrew risk and aircraft cost during conflicts in the Gulf (1991), the Balkans (1993-1997), Kosovo (1999) and Afghanistan (2001-2002). Rosenwasser also casts doubt on the idea of budgetary concerns or arms control treaties limiting the use of UAVs.[23]

In one of his six case studies, Rosenwasser concludes that the USAF could have done more to support innovation in the Predator program. He finds that, contrary to Ehrhard's findings, the service's reluctance had less to do with a rational assessment of the Predator's shortcomings than with three problems relating to USAF culture, including 1) a lingering perception in the dominant manned aircraft pilot community that UAVs were still as accident-prone as they had been in Vietnam; 2) a perception that the Predator program was insignificant from a bureaucratic politics perspective because it was viewed as a "tactical" asset that could not contribute to the USAF's war-winning edge; and, 3) an acquisition culture that focused on reliability at the expense of timely deployment.[24]

Other researchers have since highlighted USAF culture as a significant

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[21] Ehrhard (2000) 633
[22] Rosenwasser (2004) 20-24
[23] Rosenwasser (2004) 19-20
[24] Rosenwasser (2004) 390-391

barrier to Predator innovation. The most frequently noted sources of cultural resistance are the USAF's manned pilot community and its mainstream acquisition community. In terms of acquisition culture, a widely cited RAND Corp. study conducted in 1997 found that the USAF 's acquisition community was unprepared for the "major cultural change" required to accommodate the Predator, which was purchased and field-tested rapidly, requiring non-traditional acquisition practices.[25] In a 2012 follow-up to the RAND study, USAF Major Rojan Robotham found that the USAF's acquisition community still struggled to reconcile the high operational demand for the Predator with its own extremely regimented acquisition practices.[26]

One of the most prolific authors on the topic of manned aircraft pilot bias as an obstacle to Predator innovation is USAF Col. Houston Cantwell, an F-16 Fighting Falcon pilot who served as the 732nd Operations Group commander from 2012 to 2014 at Creech Air Force Base (AFB) in Nevada, home to the USAF's only UAV wing. In two separate graduate papers written while he was a USAF major, Col. Cantwell argues that the USAF was late to recognize the potential of the Predator program because of cultural biases.[27]

Col. Cantwell claims that misguided USAF personnel policies, which forced manned aircraft pilots to fly UAVs, have slowed down Predator innovation. Acceptance of the Predator program by mid-grade officers has been "lukewarm at best," he argues, because manned aircraft pilots forced to fly UAVs missed the thrill of flying and felt they had lost status within the USAF.[28] As Lt. Col. Matt Martin depicts in his book on Predator operations, airmen flying armed UAVs from ground control stations in the United States have major responsibilities in combat but carry them out in an office-like environment.[29] Many manned aircraft pilots would rather face the visceral realities of physically flying in the air medium, with all the

[25] Thirtle (1997) 78
[26] Robotham (2012) 63 and 66
[27] Cantwell (2006) and Cantwell (2007)
[28] Cantwell, (2006) 25; Cantwell, (2007) 81
[29] Martin (2010)

potential for risk and reward.[30] The USAF's decision to force them into Predator ground control stations has slowed down innovation, Col. Cantwell argues, because they are less likely to become Predator advocates as they are promoted through the ranks.[31]

Col. Cantwell also speculates that manned aircraft pilot bias at the policy level has slowed down Predator program innovation.[32] He stops short of arguing the case conclusively, however, noting that "many of the impacts on policy can only be inferred."[33] Ultimately, Col. Cantwell concludes that certain USAF leaders such as Gen Jumper, the USAF chief from 2001 to 2005, played a key role in overcoming cultural resistance among mid-level officers, supported by external actors including the US Congress, the DoD, and Predator manufacturer General Atomics Aeronautical Systems (GA-ASI).[34]

In his 2009 book on robotic warfare, Singer also suggests that USAF culture might be an obstacle to UAV innovation. He contends that the USAF's professional identity is tied to piloting manned aircraft and therefore the service has resisted the development of UAVs on the basis that they pose a threat to pilots' jobs and status. He speculates that this cultural bias led the USAF to cancel development of an advanced UAV known as the Boeing X-45 to keep it from competing with the manned F-35 Lightning II Joint Strike Fighter.[35]

The Third Perspective: USAF Identity and UAV Innovation

The third perspective, which focuses on USAF identity, provides further insight into the origins of claims about USAF culture constraining or facilitating Predator innovation. A common theme in this literature is that the USAF is undergoing an institutional identity crisis centered on whether its culture is tied to manned

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30 Cantwell (2007) 115; McCurley (2015) 16-17
31 Cantwell (2007) 115-118
32 Cantwell (2006) 28
33 Cantwell (2007) 115.
34 Cantwell (2007) 44
35 Singer (2009) 253.

aircraft or a broader commitment to the strategic employment of airpower.

In the late 1980's, protégés of then-Col. John Warden — a key architect of the USAF's 1991 Gulf air campaign — produced a white paper warning that the USAF's lack of a strategic vision was hurting its long-term relevance.[36] The white paper was never published, but was later summarized by historian Carl Builder in his landmark book on USAF culture, *The Icarus Syndrome.* Builder argues that the USAF's preference for manned aircraft has led it to view emerging innovations as a threat rather than an opportunity.[37] In his widely read graduate paper, *Rise of the Fighter Generals,* then-Col. Michael Worden further argues that the homogeneity of the USAF's leadership structure — historically dominated by bomber pilots, and later, fighter pilots — has reinforced these tendencies toward manned aircraft pilot parochialism and bias.[38]

Airpower theorists sought to bring a renewed strategic focus to the USAF by producing a watershed document in 1990, *Global Reach-Global Power,* which laid out broad strategic aims for the USAF that went far beyond a focus on manned aircraft or tactical missions.[39] The document pushed the USAF to embrace any technology that advanced the strategic aims of airpower. One of the architects of this document, then-Major David Deptula, became the USAF's first ISR chief and an advocate of taking full advantage of UAVs to achieve the broader aims of airpower. But the perception that the USAF's main contribution to warfighting has been limited to the technical skills and bravery of manned aircraft pilots has persisted, as evidenced by recent scholarship on the relationship between USAF identity and UAV innovation.

Several scholars have argued that the proliferation of UAVs has only deepened the USAF's identity crisis. The USAF's core cultural assumptions about manned flight have led to "an awkwardness, even unwillingness" to integrate UAVs, as retired Brig. Gen. Paula Thornhill explains in a 2012 RAND study on USAF

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[36] Olsen (2007) 133-134
[37] Builder (1994) 6-7
[38] Worden (March 1998) 238; Other fighter pilot culture studies include Sherwood (1996) and Anderegg (2001)
[39] Rice (June 1990)

culture.[40] A 2009 Air Force Research Institute study commissioned by Gen. Norton Schwartz, then the USAF chief, similarly finds that UAVs constitute "a fundamental transformation, or paradigm change, in military aviation that…creates an identity crisis for the pilot-centric Air Force."[41]

Sounding an optimistic note, Jeffrey Smith argues in his 2014 book that the cultural upheaval will ultimately lead the USAF to embrace a broader conception of airpower. [42] But several other scholars are pessimistic. Historian Martin Van Creveld predicts that the USAF will struggle to maintain a viable identity as pilot culture dies out with the decline of the manned aircraft.[43] Robert Farley similarly predicts that enthusiasm for an independent air force will wane as opportunities to fly manned aircraft wither with the rise of UAVs.[44]

A cross-cutting theme that emerges from all three of these perspectives on USAF culture and UAV innovation is that authors have not yet reached a consensus on the critical issues surrounding the relationship between USAF culture and the UAV innovation. They disagree on the extent to which the USAF has driven UAV innovation, whether or how culture has influenced USAF decision making, and the impact of USAF's identity on its capacity to embrace new innovations.

I aim to explore these questions by capitalizing on a unique opportunity that has emerged since the USAF received its last Predator in March 2011. It is now possible to use the Predator program's complete history as a laboratory to revisit these enduring questions regarding the relationship between USAF culture and UAV innovation. The passage of several years since 2011 allows for the collection of even more data about the evolution of USAF culture and the Predator.

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[40] Thornhill (2012) 1; Also see Riley (Jan. 2014) and Sweeney June 2010)
[41] Schultz (October 2009) 25
[42] Smith (2014)
[43] Van Creveld (2011) 437-441
[44] Farley (2014)

Importance of My Research

One of the main contributions of my research is that it reveals new insights about the Predator program. First, it breaks new ground by covering recent history. Whittle's 2014 account only covers the Predator program until 2002, and histories by Col. Cantwell, Rosenwasser, Frisbee and retired Col. Ehrhard do not extend to the present day. By covering the Predator program through 2015, I was able to explore several Predator developments with significant implications for USAF culture, including the establishment of a new UAV career field and the debate over UAV pilot medals. Second, my research sorts out disagreements in the existing literature, bringing to light new facts that clear up discrepancies in accounts of major milestones in Predator development, such as weaponization. While the USAF was indeed primarily responsible for weaponization, I found that the service as a whole was slow to appreciate its strategic potential. My research also reveals new information about the role of USAF culture in shaping the USAF's decisionmaking about the Predator. For example, several accounts suggest that the USAF ignored or actively resisted participation in the Predator program until it faced a challenge from control by the US Navy and US Army.[45] However, these authors disagree about whether culture or other factors guided this decision. My research found that the USAF's cultural preference for manned aircraft played a significant role under the leadership of the USAF chief at the time, General Merrill McPeak.

In addition to revealing new information, my research also attempts to make a significant policy contribution. By using the relationship between USAF culture and the Predator program as a vehicle, I aim to uncover important information about the USAF's capacity to pursue innovation. The Predator program is an ideal focus for such an analysis because it is the first UAV to demonstrate truly strategic potential based on its capacity to operate beyond line-

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[45] ACC History Office (2006) 5; Ehrhard (2000) 540; Cantwell (2007) 21-22; Rosenwasser (2004) 390-392

of-sight. By incorporating the latest in GPS technology and satellite communications, the Predator program was able to show for the first time that a UAV pilot could effectively employ his aircraft while sitting thousands of miles away from the battle space. The USAF capitalized on the opportunity presented by beyond line-of-sight operations, developing a unique concept for Predator employment known as Remote Split Operations (RSO). Pilots in theatre would launch and recover the Predator in the line-of-sight, but then hand over control to pilots in ground control stations thousands of miles away who would then fly the aircraft remotely.

As the first UAV to demonstrate the effective employment of RSO, the Predator has raised several important questions about the way the USAF reacts to the challenges and opportunities presented by new technology. To a degree unprecedented by previous unmanned systems, the Predator has thrown into sharp relief the issue of the physical and emotional disassociation of the warrior from the battlefield.[46] On one level, the separation of the pilot from the battlespace has involved technical and tactical changes that have led to significant but less-than-revolutionary reform of USAF roles, missions, and organizational structure. On a deeper level, however, the way that these changes have been perceived by the USAF as an institution may have broader implications for how the USAF sees itself and how those perceptions have shaped — and may continue to shape — the service's willingness and capacity to adopt a variety of innovations in the future.

Terms and Definitions

My research uses a DoD definition of UAVs, which is summarized in a 2012 Congressional Research Service Study as follows: "Powered air vehicles that do not carry a human operator, use aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload. The definition excludes ballistic or semi-

[46] See, for example, Coker (2002)130

ballistic vehicles, cruise missiles, and artillery projectiles."[47] One weakness of this definition is that it only rules out cruise missiles and artillery projectiles by fiat, since they technically could qualify. However, the advantage of this definition is that it is narrow, unlike the DoD's newest definition, amended in 2015, which is so broad that it could take into account almost any airborne object without a human operator.[48]

Over the years, a variety of terms have been used to describe UAVs, hinting at the sensitivities within the US military surrounding the relationship between human operators and aircraft with no pilot inside. A common early term for pilotless aircraft that emerged in the 1930's was "drone." But that nomenclature was eventually replaced in the 1970's with "Remotely Piloted Vehicle" (RPV). [49] Chapter two of this thesis, which discusses the USAF's historical approach to UAV innovation, uses "drone," "RPV," and "UAV" to reflect the usage of the words during the time period under study. Today "drone" has resurfaced as the most popular term in the media, although there has been some resistance from the DoD and the main UAV lobby group, the Association for Unmanned Vehicle Systems International (AUVSI), which insist that the term is misleading because it implies UAVs are entirely autonomous, when in fact there are many people involved in UAV flight operations.[50]

The USAF became so concerned about a misperception of total UAV autonomy that in 2010 it broke with DoD's preferred nomenclature, "UAV," because it felt that any reference to "unmanned" aircraft created an impression that a pilot was not required to control the aircraft remotely.[51] The USAF now officially embraces the term "Remotely Piloted Aircraft" (RPA) to convey the notion that the technology is manpower intensive, with a typical MQ-1 mission requiring about 168 people, including information exploiters, maintainers, sensor

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[47] DoD definition as cited in Gertler (Jan. 3,2012) 1.
[48] DoD (Nov.8, 2010, as amended through Nov. 15, 2015) 256
[49] For a history of UAV names, see Newcome (2004) 3
[50] Whittle (August 14, 2013)
[51] Tirpak (August 2010)

operators and pilots.[52] Since the terms "UAV" and "RPA" are both commonly used today, this thesis uses the terms interchangeably.

Even the terms "UAV" and "RPA" do not capture the whole picture, however, since they refer only to individual air vehicles, when in fact the entire UAV "system" is much bigger and more complex. In the case of the Predator, it consists of four air vehicles, a ground control station, a Predator Primary Satellite Link (PPSL), spares, equipment and the people required to operate the system.[53] **"**Unmanned aerial system" (UAS) and "uninhabited aerial vehicle" have largely replaced UAV and RPA in the international community. However this paper applies the term UAV for simplicity and also because unmanned technologies that predate the "UAS" term are frequently discussed.

In terms of military designations, the USAF initially designated the Predator as the RQ-1, reflecting its reconnaissance role. Once it was armed, it received a "multi-mission" designation: MQ-1. The Predator's successor is known as the MQ-9 Reaper. The Army's Predator variant was first known as the Warrior Extended Range/Multipurpose (ER/MP) and was later designated the MQ-1C Gray Eagle. This research uses these military designators as they apply, as well as the generic terms "Predator," "Reaper," and "Gray Eagle."

One last point of clarification concerns the descriptions of those who fly manned aircraft versus those who fly UAVs. My research follows the lead of the USAF, which today refers to flyers of both manned and unmanned aircraft as pilots.

Scope and Methodology

In this research, the USAF's Predator program serves as a test case for understanding how culture influences UAV innovation. My focus is the Predator program from its inception in 1993 to 2015, although I also address the follow-on Reaper program when it was employed alongside the Predator for the same types

[52] Air Force Scientific Advisory Board (April, 2011) 23
[53] Air Force (Undated) "MQ-1B Predator Fact Sheet "

of missions. The four sub-questions above provide direction for this inquiry into cultural influences within the USAF that facilitated or constrained Predator innovation.

Although USAF culture is the core issue of my research, I do not attempt to assess every cultural attitude within the USAF. Instead, I limit my investigation to aspects of culture in the USAF officer community that influenced UAV innovation. In every military innovation theory discussed in chapter one, military officers play a major or even central role in determining innovation outcomes. Civilians inside and outside the USAF can also influence innovation, so they are discussed as well, but it is the officer corps that runs the service and therefore inevitably plays a crucial role. Constraints on time and word length prevent expanding the investigation beyond officers and government civilians to include the cultural attitudes of several other important UAV user communities within the USAF, including enlisted Predator sensor operators, the Air National Guard (ANG) and Reserves, and Air Force Special Operations Command (AFSOC).

While space does not permit it here, the role of sensor operators in Predator operations is particularly significant.[54] These operators play a critical role because they control the sensor ball, the laser designator, and the cameras on the Predator, and they also ensure communication with ground forces, commanders and intelligence specialists. Yet, ultimately, it is the UAV pilot who makes executive decisions, including the decision to fire a weapon. The pilot provides direction to the sensor operator as he finds and fixes the target, and the pilot ultimately acts as the "trigger puller."[55] Until late 2015, the USAF has insisted that all UAV pilots be officers owing to the responsibility involved in flying in complex airspace and potentially firing weapons.[56]

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[54] Cullen (2011) 53-69
[55] Wood (May 15, 2013)
[56] GAO (April 2014)19 ; In Dec. 2015 the USAF announced enlisted personnel could fly the Global Hawk. See Hennigan (Dec. 17, 2015)

One limitation of much of the literature on culture and military innovation to date is its heavy reliance on historical documents.[57] Of course, a benefit of historical research is that the passage of time gives the author clarity and distance from the subject. But a frequent challenge lies in finding a way to accurately assess the impact of social factors on military change when important figures have passed away, primary source documents may be hard to find, and/or the available primary and secondary sources of data are infused with the sometimes hard-to-decipher biases of their authors.

My research topic is less bound to the limitations of historical documents because it focuses on the history of a program that is recent enough to allow for the use of first-person interviews. My research draws on over 60 interviews with individuals inside and outside the USAF, including every chief of staff between 1993 and 2015, as well as Neal Blue, the CEO of Predator manufacturer General Atomics Aeronautical Systems (GA-ASI) Inc. These interviews gave me the opportunity to ask key figures about their thoughts on the role of culture in shaping Predator developments.

The principle drawback of doing interviews is that individuals are not necessarily always candid or honest about the role of organizational culture in decision-making. As Builder notes in his book *The Masks of War,* military personnel and institutions may not admit the understandable, and not necessarily negative, tendency for cultural preferences rooted in self-interest to shape their decision-making about national security.[58] This potential bias among interviewees imposes two limitations on my methodology. First, because interviewees now have the benefit of hindsight, knowing that the Predator program has enjoyed substantial success, they may portray themselves playing a bigger role in facilitating the Predator program than was actually the case. Second, interviewees concerned about preserving their status within the USAF may express politically correct sentiments regarding UAVs rather than their honest, personal opinions. When Ehrhard published his thesis in the mid-1990's, for example, the USAF leadership's

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[57]For example, Kier (1997); Legro (1995); Nagl (2002)

[58] Builder (1994) 11.

strong support for UAVs may have led his interviewees to speak positively about UAVs, even if they held different personal opinions. Conversely, there were major morale problems in the USAF's UAV community during the time period of my study, which may have led my interviewees to feel pressure to criticize the USAF's approach to Predator innovation rather than focus on the bright spots.

To minimize the potential for such biases, I conducted interviews with a wide range of people in an effort to highlight true patterns in perception so that I could accurately gauge how USAF culture influenced the Predator program. In particular, it was important to triangulate interviews with uniformed and civilian USAF officials with interviews of individuals outside the USAF who were more likely to speak candidly about their perceptions of the USAF's institutional interests.

Further triangulation with official histories and other primary and secondary historical sources also helped to guard against critiques of validity, and to ensure that much of the data in this thesis can be gathered and reviewed by future authors. Historical evidence about the role of USAF culture in UAV innovation can be found in a variety of primary sources ranging from official histories to congressional testimony and email correspondence. In particular, I successfully requested the declassification of ACC's official history of the Predator program through the FOIA process.[59] I also obtained a special report written for Gen. Schwartz, the USAF chief from 2008 to 2012, regarding the cultural impact of UAVs on the USAF.[60] Finally, I obtained a variety of memos and emails about Predator history through the Air Force Historical Studies Office at Bolling AFB in Washington DC. In terms of secondary sources, I drew on the USAF's professional journals, the graduate papers of USAF students, and a variety of works mentioned in the literature review and chapter one.

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[59] ACC History Office (August 2006)
[60] Schultz (October 2009)

Structure

Chapter one discusses the theoretical literature on the subjects of culture and military innovation. It explains why I chose to take a holistic view of the concept of culture and why I chose the four sub-questions that are asked across chapters two through seven to answer my research question.

Chapter two paints a portrait of the relationship between USAF culture and unmanned systems from 1917, when the US military purchased its first UAV, the Kettering Bug, until 1993, when the Predator program began. This historical portrait is used as a baseline to assess whether USAF culture changed over time as it shaped — and was shaped by — developments in the Predator program.

Chapters three through seven explore the substantive history of the Predator program. Each of these chapters is divided into two parts. The first part presents a brief narrative history, while the second part provides an analysis of the mutually shaping relationship between USAF culture and that history.

Chapter three explores the reasons behind the USAF's initial reluctance to take control of the Predator program from the DoD in the wake of the Cold War.

Chapter four discusses the transition of the Predator program to the USAF, exploring the service's initial attitudes toward the program and changes that had to be made to accommodate Predator operations in Bosnia.

Chapter five examines the role of USAF culture in three major innovations on the eve of the Sept. 11 attacks: the installation of a laser designator; the arming of the Predator with Hellfire missiles; and, the introduction of RSO.

Chapter six explores how USAF culture in the early post-911 period influenced two more innovations: a device for viewing Predator imagery, the ROVER system, and a follow-on aircraft, the MQ-9 Reaper. It also explores the relationship between USAF culture and the service's wartime Predator policies.

Chapter seven addresses recent Predator developments as the US shifts its strategic focus beyond Afghanistan — most notably, the creation of a new UAV career field.

The concluding chapter summarizes the study's findings and discusses its broader implications for the USAF's capacity to pursue UAV innovations in the future.

CHAPTER ONE:

The Role of Culture in Military Innovation

In 1945, historian J.F.C. Fuller predicted that the inexorable progress of technology, regardless of human intervention on cultural or moral grounds, would ultimately lead to the removal of humans from the battlespace. "With the discovery of gunpowder…we pass into the technological epoch of war, the hidden impulse of which is the elimination of the human element both physically and morally, intellect alone remaining."[61] Today, public discussions about UAV innovation are frequently framed in the same logic of technological determinism, which sees technological developments as the most powerful determinants of the course of human events, regardless of social, political or cultural factors.[62]

In 2014, for example, Richard Whittle released a popular history of the USAF's Predator program concluding that the weaponized UAV has spurred a "drone revolution."[63] Now ubiquitous on the battlefield and increasingly present in civilian life, he concluded UAV technology is "here to stay" and the only question is "how to cope with the implications."[64] Peter Singer, a Brookings Institution scholar, has invoked Moore's Law — which states that the amount of computing power on a microchip doubles every two years — to argue that the US soon will have "tens of thousands of tomorrow's robots" with "amazing capabilities that seem like they are straight from science fiction."[65] And in 2011, the UK Ministry of Defense warned "there is a danger time is running out – is debate and development of policy even still possible, or is the technological genie out of the

[61] Fuller (1945)
[62] For more on technological determinism, see Marx and Smith (1994) ix-xv
[63] Whittle (2015) 299
[64] Whittle (2015) 305
[65] Singer (March 8, 2013)

ethical bottle, embarking us all on an incremental and involuntary journey towards a Terminator-like reality?"[66]

In the academic literature, however, the view of technological progression beyond human control has been widely rejected.[67] Technological breakthroughs alone do not guarantee an innovation will take hold, as Dima Adamsky observes in *The Culture of Military Innovation.*[68] The consensus of Adamsky and other military innovation researchers is that technological change generates opportunities for innovation, but the main determinants of military change — from relatively small adaptations to revolutions — are political, cultural and social.[69] It is hard to fault skeptics of UAV technology for trying to raise a broader debate about the surrounding moral and legal dilemmas. But to suggest that UAV technology has embarked on an inevitable ascent is to overlook the powerful role that social forces, particularly within the USAF, already play in shaping UAV development.

My research question (how has USAF culture shaped — and been shaped by — innovation in the MQ-1 Predator Program?) assumes that social forces within the USAF play a significant role in shaping UAV innovation. As such, the question rejects the deterministic view that technological innovation is inevitable, acting as a completely external source of pressure on a military organization to change. Instead, my question takes the position that the relationship between the USAF and UAV innovation is mutually constitutive.[70] Social forces within the USAF have shaped the Predator program, which in turn has shaped the USAF as a social institution.

From a theoretical perspective, the design of this research question raises two complicated issues, starting with how to define "social forces," which I refer to in the question as "culture." It also raises the thorny issue of how to evaluate the role of culture in military innovation. The latter problem is particularly complex

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[66] UK Ministry of Defense (2011) 5-12
[67] MacKenzie and Wacjman,(1999)
[68] Adamsky (2010) 1
[69] Adamsky (2010) 1-2; Rosen (1991)128; Farrell (December 2013) 111-113; Grissom (April 2015); Boot (2006) 9-11; White (1966) 28
[70] This view is derived from the social shaping of technology literature, discussed in Section 3. Also see Mackenzie and Wajcman (1999) 23

given the phrasing of the question, which assumes that culture pervades both the USAF and the Predator program. As a result, it is difficult, if not impossible, to isolate culture as an independent variable for analysis.[71] Fortunately, scholars in the fields of international relations (IR) and military innovation have made significant progress toward sorting out these theoretical challenges.

This chapter explores how these scholars have defined and evaluated the role of culture in military innovation and how their work applies to my study. IR and military innovation theorists have examined how culture impacts actor behavior at different levels of analysis, including the international or "system" level, the state level, the organizational level, and the individual level. I discuss how cultural influence cuts across these different levels, but my main focus is on the organizational level, because military organizations such as the USAF are critical drivers of military innovation, as I discuss further below.

The chapter is divided into four sections. The first section frames the debate about culture among IR theorists. This debate has, in turn, influenced the major theoretical models of military innovation studies, which are discussed in section two. Section three draws on the cultural models developed in IR and military innovation theory to explain how I plan to define and evaluate the role of culture in the USAF's Predator program. It also provides a justification for my four sub-questions about USAF culture that, when taken together, aim to answer my broader research question about the mutually shaping relationship between USAF culture and the Predator program. Finally, the chapter closes with a brief summary of the implications of the theoretical background for the rest of the thesis.

1. Culture in International Relations Theory

The two most established IR theories, neo-realism and neo-liberalism, ignore the role of culture as a determinant of behavior in world politics.[72] Both theories

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[71] This problem is discussed in Farrell (2005) 70
[72] Legro, *(*1995)

contend that the behavior and preferences of rational, self-interested states can be deduced from material structural constraints imposed by the anarchic international system. In the context of anarchy, these theories predict that states will seek to maximize material power, security or wealth to ensure their survival. While there are debates within and between the schools about whether power, security or wealth matter most, the emphasis in both theories is on the role of material interests in shaping preferences and behavior. [73]

As IR theory evolved in the mid 1990s and early 2000s, however, scholars increasingly recognized that the behavior of actors cannot always be deduced from the distribution of material capabilities in the international system. Today it is widely accepted that ideational interests – rather than strictly material ones – may shape states' preferences and behavior.[74] In this view, international politics is not a pure case of environmentally constrained competition for material resources. Social factors, including norms, identity and culture, play an important role in determining how states behave. [75]

The turn toward social factors in IR theory has been described as both "constructivism" and "culturalism."[76] Constructivists tend to focus on the international level of analysis, while cultural theorists focus on the organizational level. But Theo Farrell, a UK constructivist, argues that the two camps have enough in common to be grouped together under a single research program, which he broadly refers to as "constructivism." [77]

The common bond among constructivists is that they critique neo-realism and neo-liberalism for failing to recognize that the structural environment is social as well as material. More specifically, material structures are given meaning only by the social context through which they are interpreted.[78] In practice, this view explains why the US would see North Korea's possession of five nuclear weapons

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[73] For a comparison of neo-realism and neo-liberalism, see Baldwin (1993) 3-24.
[74] Hurd (Aug 2008) 301-302; Desch (1998) 144
[75] Katzenstein (1996) 5.
[76] Farrell (Spring 2002) 49
[77] Farrell (Spring 2002) 51
[78] Checkel (1998)

as far more threatening than the UK's possession of 500.[79] Because they see the international environment as inherently social, constructivists also assume that the social structure of the environment provides actors with understandings of their identity (the structure "constitutes" their identity.) In turn, actor identities imply a particular set of preferences that shape actors' behavior in the social environment.[80]

Constructivists have turned to the concept of "norms'" to explain the impact of social factors on international relations.[81] There is an emerging consensus among constructivists regarding the definition of norms as "collective expectations about proper behavior given an identity."[82] Constructivists look at norms differently than the older schools of IR theory, which are rooted in a rationalist perspective.[83] From a rationalist view, norms simply perform a "regulatory" function, providing rules that help actors with given material interests maximize their utility.[84] In contrast, constructivists see norms as going "all the way down" to constitute actors, providing them with fundamental understandings of their identity and interests.[85] Constructivists consider both regulatory and constitutive norms. Together, "these norms establish expectations about who the actors will be in a particular environment and about how these particular actors will behave."[86]

Moving forward, I refer to scholars generally interested in the role of norms as constructivists, and I use the term "culture" to generically refer to norms, identity or any social forces that are rooted in ideas rather than material interests.

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[79] Wendt (Summer 1995) 73
[80] Farrell (Spring 2002) 49-50
[81] Farrell (Spring 2002) 49
[82] Checkel (1998)
[83] Checkel (1998)
[84] Farrell (2005) 8; Checkel (1998)
[85] Wendt (1999) 92-138; Farrell (2005) 8; Checkel (1998)
[86] Jepperson, Wendt and Katzenstein (1996) 54

Methodology Problems: The Debate Over the Degree of Cultural Influence on Actor Behavior

Today, most proponents of major IR theories have come to agree with constructivists that neorealism and neoliberalism cannot explain everything. To varying degrees, scholars seem to recognize that a cultural perspective may help to at least supplement these older, well-established structural theories of state behavior. [87] However, neo-realists including Michael Desch and John Mearsheimer remain skeptical of constructivists for failing to agree on a way to evaluate the role of culture in shaping state behavior.[88]

While constructivists seem to have reached a consensus on the substance of cultural influence – norms, which operate at the various levels of analysis to constitute both actor identity and structure – they take a variety of stances on methodology.[89] Differences over methodology may seem abstract, but they matter a great deal to scholars who want to make sense of the role of culture in the real world. Students of culture, including myself, have to take a position on methodology, which impacts how culture is defined, the kinds of questions we ask about it, and the kinds of answers we produce.

Conventional Vs. Critical Constructivism

There are two main types of constructivists – conventional and critical[90] – who take different approaches to the question of methodology. The fundamental difference between them centers on the degree to which they accept positivism, a view of how to create knowledge that rests on four principles. First, positivists believe that the methodologies used in the natural sciences can be used in the social sciences. Second, there is an objective reality that is neutral between

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[87] Desch (1998) 144
[88] Desch (1998)145-155; Mearsheimer (1994/1995) 37-41 (Mearsheimer refers to constructivists as critical theorists)
[89] Jepperson, Wendt, and Katzenstein (1996) 65-68
[90] Hopf (1998) 181

theories. Third, the social world has regularities that can be "discovered" by theories to make predictions about the future.[91] And lastly, that the way to determine whether theories are true is to appeal to the objective facts, adopting what is known as an "empiricist" epistemology.[92]

Conventional constructivists are willing to embrace a positivist methodology as a means to engaging mainstream IR theorists. By talking to these theorists on their own methodological terms, conventional constructivists hope to show that cultural theories may explain behavior better than the material structural theories that mainstream IR theorists typically embrace, such as neo-liberalism and neo-realism. To make the argument that cultural factors may at least sometimes better explain actor behavior than material factors, conventional constructivists often choose puzzling cases.[93] These are cases in which rational behavior does not explain why a state pursued a particular action, so cultural preferences become an obvious alternative explanation.

In contrast to conventional constructivists, critical constructivists feel less obligated to engage mainstream IR theory to prove culture matters. They are skeptical of positivism, preferring instead to focus on interpretivist approaches. In fact, many critical theorists take the post-positivist view that the world is totally open to interpretation, so they are highly skeptical of the idea that humans can attain objective knowledge that can serve as a baseline for pitting cultural theories against mainstream IR theories.[94] Since there is no way to verify that any particular theory accurately explains how the world works, critical constructivists question why rationalist theories of neo-liberalism and neo-realism should

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[91] Constructivists engaged in causal theorizing do not adhere to the 3rd principle of positivism. Constructivism does not make predictions about future behavior because it is a social theory – similar to rational choice theory – that conceptualizes the relationship between agents and structures. It does not make specific claims about patterns in world politics. See Barnett (2014)157-158

[92] Smith (1997) 168

[93] Checkel (1998) 328; Farrell (1998) 409

[94] Price and Reus Smit (1998) 271-272

dominate IR theory. They see no reason why these theories should be held up as the main theories against which all others should be judged.[95]

With that said, there are some critical constructivists who believe it is important to engage mainstream IR theories as part of the process of questioning their dominance. While these critical constructivists acknowledge the contingent nature of knowledge, they recognize that they need to establish some type of objective criteria “to distinguish plausible from implausible interpretations of social life.”[96] Without such criteria, they argue, critical constructivists are open to Mearsheimer’s charge that constructivists accept “endless interpretations of the world around them.”[97] To dodge this accusation, critical constructivists like Richard Price and Christian Reus-Smit seek to engage mainstream IR theory by accepting that there is a “real world” — albeit a contingent one — that can be used to compare their interpretation of actor behavior to other theoretical accounts. [98]

Causal Versus Constitutive Theory

There is a cross-cutting divide between conventional and critical constructivists regarding the type of theory they employ to understand the role of culture in IR theory. The first type of theory is causal theory, which involves directly pitting mainstream IR theories against cultural theories to explore their relative strength. Only conventional constructivists employ causal theory.

The second type of theory is constitutive theory, which does not seek to directly challenge mainstream IR theory. Instead, it invokes description to show how culture may supplement or complement mainstream IR theory.[99] Both conventional constructivists and critical constructivists employ constitutive theory.

[95] Price and Reus Smit (1998) 261
[96] Price and Reus-Smit (1998)262
[97] Mearsheimer (1994/1995) 41
[98] Price and Reus Smit (1998)
[99] Jepperson, Wendt and Katzenstein (1996) 68-72

Causal Theory: Using a Narrow Definition of Culture

Causal theory requires thinking about culture in a relatively narrow way. Causal theorists accept the possibility that another theory — for example, a neo-realist view that privileges material factors and ignores culture — might better explain an actor's behavior. It may seem hypocritical for constructivists to employ causal theory since they profess to believe that norms always matter. In practice, however, many conventional constructivists feel compelled to pit cultural theories against culturally devoid mainstream IR theories, believing their case for cultural explanations will be stronger if they use IR theory's own positivist methodology.

The process of causal theory testing requires narrowing the scope of culture in three very specific ways. First, causal theorists must define culture independently of actor behavior to show whether culture or something else caused that behavior. Second, causal theorists must assume culture is relatively static to establish that it existed prior to the behavior they are trying to explain. Finally, cultural theorists interested in causal theory must be able to show that, absent culture, the behavior would not have occurred.[100]

The main debate among constructivists engaged in causal theory testing is *how much* independent causal power cultural theories have to explain state behavior.[101] Some constructivists argue that cultural explanations are paramount in explanations of strategic behavior, and material structural variables — like the balance of power or international institutions — are of "secondary importance."[102] Others argue that sometimes material structural variables will be more important than cultural variables, but oftentimes cultural variables will matter more.[103] Two leading examples of conventional constructivist works that adopt causal theory testing to engage mainstream IR include Jeffrey Legro's *Cooperation Under Fire*[104]

[100] Wendt (Dec. 1998) 105
[101] For more on this debate, see Jepperson, Wendt and Katzenstein (1996) 37-38 and 68-69; Kowert and Legro (1996) 496-497; Katzenstein (1996) 506-508
[102] Johnston (1995) 1
[103] Legro (1995) 221
[104] Legro (1995)

and Elizabeth Kier's *Imagining War: French and British Military Doctrine Between the Two Wars.*[105]

Constitutive Theory: A Broader Interpretation of Culture

Constitutive theory allows for a broader interpretation of culture. Rather than trying to establish the causal power of cultural explanations versus other types of explanations, constitutive theorists take for granted that culture matters. Instead of asking *why* X causes Y, constitutive theory asks *how* X causes Y.[106] In other words, constitutive theorists are less interested in the relative roles of culture versus other factors in shaping actor behavior and more interested in *how* culture — specifically, norms — operate at a deeper level to constitute actors and meaningful action. Constitutive theories look at how norms "function in both temporal and spatial settings to make some actions possible and other actions impossible." [107]

Constitutive theory does *not* see cultural preferences as separate from actor behavior or necessarily existing in time before actor behavior. Instead, constitutive theory tries to show how the properties of a system came to exist: how do norms constitute actors and their environment to make meaningful behavior possible?

Constitutive theory is usually not associated with a positivist methodology, because it assumes norms are pervasive and therefore cannot be isolated as independent variables to test their causality relative to other material factors in the system.[108] Nevertheless, Wendt argues that one does not need to abandon positivism completely to embrace constitutive theory. In his view, a conventional constructivist can use constitutive theory, too, because it is always possible that alternative theories, including neo-liberalism or neo-realism, might also explain how a system is constituted. Wendt calls on constitutive theorists to pit their

[105] Kier (1997)
[106] Wendt (Dec. 1998) 105
[107] Farrell (Spring 2002) 57
[108] Barnett (2014) 171; Wendt (Dec. 1998) 105-106

theories of how a system is constructed against other constitutive theories to determine which one most closely matches what is happening in "the real world." [109]

Wendt acknowledges the post-positivist argument that such "real world" evidence will necessarily be mediated by the researcher's own background understandings. But he counters that constitutive theories can and should be compared to see which one corresponds with reality, even if that reality is subject to the author's biases. The alternative is that the reader is left to accept the findings of a constitutive theory with no indication of why he or she should privilege that account over any other.[110]

2. Culture in Military Innovation Theory

The various ways of viewing culture in IR theory have significantly influenced military innovation research. Military innovation theories, which date back to the mid-1980's, initially were based on neo-realism and organizational theory, taking into account only an implicit role for culture. However, just as IR theorists acknowledge that material balancing dynamics fail to fully explain state behavior, military innovation theorists are also starting to recognize that military change is not a purely rational phenomenon.[111] This section frames the military innovation research program and reviews four theoretical models of military innovation based on the framework used by Adam Grissom in his landmark 2006 article on military innovation studies.[112]

Military innovation is a subfield of strategic studies, which explores the issues surrounding the use of force and draws heavily on IR theory.[113] Strategic studies researchers, who have long been interested in the question of why militaries innovate or stagnate, have reframed the question into a theoretical

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[109] Wendt (Dec. 1998) 106
[110] Wendt (Dec. 1998) 107; See also Price and Reus Smit (1998)
[111] Grissom (Apr. 2015)
[112] Grissom. (2006)
[113] Grissom (2006) 905.

inquiry into how and why military processes change over time.[114] The result has been the emergence of a new research program, military innovation studies, which puts military organizations at the center of analysis.

The military organization is a logical focus for the study of military innovation, according to Farrell and Terry Terriff, because most military action occurs within organizational structures in the modern world.[115] As Legro explains, military organizations have high "organizational salience" — or influence on state decision-making — particularly during wartime, because militaries have a monopoly on expertise and are in a unique position to quickly execute complex operations, especially in time-sensitive wartime situations.[116] From a historical perspective, Williamson Murray and Barry Watts note that, in the past, military change has generally been realized when existing military organizations undertake change by choice or under pressure, sometimes even creating new organizations to handle the change.[117]

Given its tendency to focus on the organizational level, military innovation theory draws heavily not only on IR theory but also on organizational theory. What is interesting about organizational theory is that it is based on the rational actor model, but it also acknowledges a role for culture in decision-making. Graham Allison and Philip Zelikow, in their famous models of organizational theory, as well as Morton Halperin in his model of bureaucratic politics, account for behavior driven by both rational imperatives and cultural preferences.[118] Therefore, one thing to keep in mind when examining "rational" models of military innovation is that, to the extent they draw on organizational theory, they often implicitly recognize a role for culture in military change. In the discussion of military innovation models that follows, I will flag instances in which military innovation theorists "smuggle" cultural explanations into their explicitly rational-actor based models.

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[114] Grissom (2006) 905.
[115] Farrell and Terriff (2002) 6.
[116] Legro (March 1996) 122.
[117] Murray and Watts (1996) 372-375
[118] Allison and Zelikow (1999); Halperin, Clapp, Kanter (2006)

Another unifying theme in military innovation studies is a growing consensus regarding three major characteristics of military change.[119] First, military innovation involves actual or attempted alterations to military behavior in an operational setting. Administrative change, involving acquisition or personnel reform, has not drawn the attention of scholars without a clear link to military operations. Second, the field tends to focus on major changes, rather than minor or ambiguous ones**.** Third, the field focuses on cases that result in greater military effectiveness. Building on these characteristics, Grissom developed a working definition of military innovation as " a change in the operational praxis that produces, or is intended to produce, a significant increase in military effectiveness."[120]

While military innovation theorists generally agree on the characteristics and scope of military change, they come to very different conclusions about what causes it. Grissom divided military innovation theories into four schools: civil-military relations; inter-service politics; intra-service politics; and, culture. The schools are assessed below in terms of their central tenets, empirical examples, and the extent to which they consider culture in decision-making.

The first three schools – civil military, inter-service rivalry, and intra-service politics – describe causes of military innovation built primarily around a rational perspective that draws on neo-realism and organizational theory. The fourth school, which describes the role of culture in military innovation, mirrors the constructivist perspective in IR theory. Obviously the cultural school considers the role of culture explicitly, but the assessment below attempts to flag any implicit role for culture in the other three models as well.

The Civil-Military Model

The earliest theory of military innovation, the civil-military model developed by Barry Posen in his 1984 book, provides a widely cited theoretical basis for

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[119] Grissom, (April 2015)
[120] *ibid*

explaining military innovation.[121] In *The Sources of Military Doctrine*, Posen argues that a combination of "balance of power" theory – a form of neorealism – and organizational theory best explains why military organizations innovate or fail to do so.[122] In Posen's estimation, these theories predict that states and military organizations will make rational decisions to maximize their power in response to changes in their material structural environment.[123] In practice, this means that civilians will force military organizations to change in response to shifts in the balance of power, but military organizations will resist change in opposition to their own organizational imperatives.[124] Posen tests his civil-military model by studying France, Britain, and Germany's doctrine between the two World Wars.

According to Posen's version of balance-of-power theory, civilian statesmen spur military innovation after making a rational assessment of threats to state security.[125] When security is scarce, the statesmen, preferably with the assistance of maverick military officers within the military service, seek to maximize state power to defend the value of state security. They audit military doctrines, determine the areas requiring innovation, and intervene directly in military affairs to spur military change. [126]

But military organizations tend to resist military innovation, Posen argues, because of organizational theory.[127] In his interpretation of this theory, military organizations, like states in the international system, will seek to maximize power in the face of material structural constraints. Internal constraints involve coordinating the actions of large numbers of people within the military organization, while external constraints may include civilian meddling and

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121 Posen (1984); Other empirical studies that reflect the civil-military model but do not necessarily draw on Posen's work per se include Beard (1976); Zisk (1993); Avant (1994); (Savos (1993); Armstrong (1982)
122 Posen (1984) 37
123 Posen (1984) 36
124 Posen (1984) 239-241
125 Posen (1984) 228-236
126 Posen (1984) 74-80
127 Posen (1984) 222-228

uncertainty about future conflicts, among other complexities.[128] Drawing on Allison and Zelikow's "Model II" of organizational behavior, Posen predicts that, in order to continue functioning despite these material constraints, military organizations will seek to maximize their autonomy and reduce uncertainty.[129] In practice, these imperatives require the organization to resist internal or external attempts to enforce change by employing standard operating procedures (SOPs) as outlined by Allison and Zelikow.[130]

On the surface, Posen's interpretation of organizational theory leaves little room for cultural explanations of a military organizations' behavior. However, his decision to categorize organizational theory as a fundamental alternative to balance of power theory implicitly acknowledges a substantial difference between the two theories: organizational theory takes into account norms rather than strictly focusing on material factors.[131] As Allison and Zelikow argue, SOPs are initially developed out of functional necessity, but they become engrained in organizational culture over time. When the military continues to use SOPs after they have outlived their usefulness, the role of culture holding back military innovation becomes apparent.[132] In other words, a military organization rejecting innovation may do so for rational reasons, but military culture eventually takes over as the dominant force resisting change.

Inter-service Rivalry Model

Grissom's second school of military innovation focuses on inter-service rivalry. Competition between the services is fueled by resource scarcity.[133] Military organizations are primarily concerned with the distribution of power (in the form of material resources such as budget authority and force size) in the system. This concern arises from their need to increase their budget and size to ensure their

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[128] Posen (1984) 44 and 48-49
[129] Posen,(1984) 41-46. Also see Allison and Zelikow (2006)143-185.
[130] Posen (1984) 48-49
[131] Duffield, Farrell, Price and Desch (Summer 1999) 157
[132] Allison and Zelikow (2006)169-170
[133] Grissom (1996) 910

autonomy, which ensures they can carry out traditional missions seen as essential to their continued functioning. The emergence of a new mission area, or the re-opening of an established mission area, is therefore seen as an opportunity to increase the organization's resources, and, in turn, protect its traditional missions. Military organizations scramble to develop the most appropriate capabilities to fulfill the new or re-emergent mission so they can claim it as their own. The result of these efforts is innovation. [134]

A leading example of this theoretical model is Owen Cote's doctoral dissertation, which contrasts the impact of inter-service dynamics on two Navy ballistic missile programs.[135] He finds that significant inter-service rivalry explains aggressive development of the Polaris program in the 1950's, and the lack of rivalry in the 1960's explains why Trident II innovation lagged.[136]

In ascribing causal power to inter-service competition for scarce resources, the inter-service rivalry model presents an apparently neo-realist view of organizations. Military organizations seek to maximize resources by pursuing new innovations, thereby ensuring their traditional missions continue. But a closer look at his model reveals that culture does play an implicit role. Organizations compete for limited resources to develop new innovations because they want to protect their *traditional missions.* But how do organizations decide what their traditional missions are? This is a question about cultural beliefs, not material factors.

Halperin explores how organizations develop beliefs about their traditional missions with the bureaucratic politics model. The organization makes decisions and takes actions to protect its "essence" – the dominant view within the organization of what its missions and capabilities should be. [137] Organizations have "considerable freedom" to define their essence, which shapes convictions about what types of people – and what types of expertise, experience, and knowledge –

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[134] Grissom (1996) 910
[135] Other works that reflect the inter-service rivalry model include: Sapolsky (1972); Armacost (1969); Bacevich (1986); Bradin (1994); Bergerson (1980); Campbell (2003)
[136] Cote (1998)
[137] Halperin ,Clapp, Kanter (2006) 27.

should be part of the organization.[138] Because organizational essence is determined by people within the organization, it is a social factor rather than a rational one.

Halperin notes that the impact of organizational essence is particularly powerful when it comes to inter-service dynamics. "Fights over roles and missions are particularly acute when they have an impact on the essence of the organization," he argues. Conversely, organizations may display "indifference" to missions that are not closely linked to their organizational essence.[139]

Through Halperin's view, we can see that while resource scarcity drives inter-service rivalry, it is not the only factor. Organizations will only compete to protect things that are considered close to their essence. In a budget-constrained environment, the USAF competed with the Navy for control over ballistic missiles. But the USAF would be unlikely to compete with the Navy over ships or carriers, regardless of budget constraints, because these weapons are perceived to fall outside the USAF's organizational essence.

Intra-Service Dynamics Model

Grissom's third school of military innovation theory, intra-service dynamics, focuses on competition between internal branches of a military service. Stephen Rosen wrote the seminal work in this school.[140] As Rosen explains, sub-communities within a military service compete for material factors, such as budget authority, power and promotions, to advance their unique vision for change.

Because the military establishment must constantly deal with uncertainty about the enemy and effectiveness of new technologies, each sub-community is left to form its own unique perception of the threat environment. Based on these perceptions, the sub-communities — led by senior military officers with a vision for a new way of warfare — campaign for the money, power, and promotion

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138 *ibid*

139 Halperin, Clapp, Kanter (2006) 38-40.

140 Rosen (1991). Other works that reflect the intra-service dynamics model include Marquis (1997); Davis (1967); Engel (1994); Haworth (2000)

authority needed to advance their innovations. The officers leading change are highly respected leaders who may be able to recruit assistance from mid-level officers and civilians who constitute a sub-community willing to advocate for change. The uniformed leaders marshal support within the sub-community to lead an "ideological struggle" within the military service built around a "new theory of victory." This new way of war is then institutionalized as the senior military leaders create new critical tasks, new incentives to do the tasks, and new career paths. [141]

Rosen's model of military innovation is rooted in neo-realism because decisions are still driven by the external threat environment. Sub-communities within a military service compete for power based on their own assessments of the balance of power in the international system. But Rosen also implicitly takes into account the potential role of culture by noting that these assessments are based on each sub-community's unique *perception* of the threat environment, which is shaped by the sub-community's unique culture and way of thinking.[142] Indeed, Rosen's model looks much like Halperin's concept of organizational essence, which describes how subgroups within an organization may develop their own view of organizational essence, and conflicts may arise between the sub-groups vying to define organizational essence.[143]

Another way that Rosen takes culture into account is in his reliance on organizational theory to describe the ideological struggle that leads to the creation of a new theory of victory. He builds on Allison and Zelikow's notion that sub-communities will struggle or bargain with each other to shape the operational objectives of the organization.[144] As Allison and Zelikow note in Model II of organizational theory, this bargaining process among sub-communities ultimately results in *de facto* agreements among the sub-communities that impose constraints

141 Rosen (1991) 18-22
142 Rosen (1991) 17
143 Halperin , Clapp, Kanter (2006) 27.
144 Rosen (1991) 18

on the organization and construct a unique organizational identity.[145] The very process of deciding on organizational objectives influences the organization's culture, since organizations define themselves as they make decisions.[146]

Cultural Models

Grissom's fourth school of military innovation explicitly identifies culture as a powerful variable to explain military change. Scholars in this school have come to a consensus that the models above, all derived primarily from neo-realist accounts, are too narrow. Instead they embrace the constructivist view that norms mutually constitute actors and their environment. Given that norms provide actors with fundamental understandings of their identity and interests, they have potentially significant power to explain why military organizations innovate.

The constructivist debate over how to view culture in IR theory, described above in section two, reflects a similar debate in strategic studies, of which military innovation is a subfield. The debate is centered on how to define "strategic culture," which emerged during the Cold War to illustrate the differences between US and Soviet policymakers' approaches to nuclear strategy.[147] On one side is Alastair Iain Johnston, an IR scholar from the "third generation" of cultural theorists,[148] who argues that culture can be separated from behavior to establish a falsifiable theory.[149] Military innovation scholars who side with Johnston employ causal theory testing to establish whether culture or some other variable best explains military change.

On the other side of the debate is Colin Gray, a strategist from the "first generation" of cultural theorists, who argues that culture is a context because it is found in both the ideas *and* behavior of the policymakers and military officers who embody the strategic culture. [150] He argues that "the traffic between ideas and

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[145] Allison and Zelikow (1999) 154
[146] *ibid*
[147] Farrell (Summer-Fall 2005) 3
[148] Three generations of theory are described in Johnston (Spring 1995) 36-43
[149] Johnston (Spring 1995) 44-63
[150] Gray (Jan. 1999) 54

behavior in strategic affairs is continuous" and therefore culture is a context that "weaves together" ideas and strategic action.[151] Military innovation theorists who adopt this broader view of culture espouse a methodology that looks more like constitutive theory to explore how culture sets the context for military change.

Culture as a Source of Military Change

Causal theorists are interested in explaining culture as a trigger for military change, not as a context in which change occurs. Yet the very idea that cultural norms can spur change may seem counterintuitive at first glance. After all, constructivists studying military innovation seem to agree that military organizations tend to have relatively stable organizational cultures.[152] As Farrell and Terriff explain, "cultural norms produce persistent patterns of behavior by becoming institutionalized in community rules and routines. Once institutionalized, norms are either taken for granted or enforced by powerful sanctions."[153] But, if cultural norms are generally characterized by continuity, how can they spur military innovation?

Causal theorists have offered two different ways to show that culture can drive military change. The first way is to demonstrate that organizational culture remains relatively static but imposes certain constraints on decision-making that lead to military change. Both Kier and Legro have written books and articles attempting to explain how a static organizational culture can spur military change.[154] They argue this is possible because the culture of a military organization provides a limited world view that shapes the organization's responses to external changes. For example, Kier finds that French military culture remained static but dictated a switch to a defensive doctrine during the interwar period in response to a change in French public opinion. [155] Similarly, Legro finds that the culture of the German Navy in the early 1940's remained consistent but nevertheless dictated

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[151] Gray (Jan. 1999) 54
[152] Kier (1997) 28-29; Legro (1995) 22-23;
[153] Farrell and Terriff (2002) 7
[154] Kier (1997) and Legro (1995)
[155] Kier (1997) 144-145

military change – specifically, the decision to violate the international norm against submarine warfare –in response to the outbreak of World War II (WWII). [156]

The second way that culture can drive military innovation is through cultural change enabling military change. The principle causal theorist who has explored this phenomenon is Farrell. He argues that a concept known as "norm transplantation" can lead to cultural change in three different patterns. Two of them are relatively straightforward and uncontroversial. First, under an incremental pattern, military organizations willingly engage in social learning to adopt new norms that fit within existing norm hierarchies.[157] Second, an outside agency compels the military organization to comply with a norm. This coercive power could be exercised either through power hierarchies or sanctions.[158] Third, in a more puzzling radical pattern, a community undergoes radical cultural change freely; the change clashes with existing norms but no coercion is required to make it happen.[159]

Farrell describes three enabling conditions that could apply to any pattern of change, but are most important in helping to explain radical cultural change in the absence of coercion. One enabling condition of cultural change cited in military culture literature is external shock, in the form of wars, depressions, and revolutions.[160] For example, some scholars argue that the antimilitaristic cultures of postwar Germany and Japan were a result of the searing historical experience of defeat in WWII.[161] This enabling condition alone, however, cannot explain cultural change, according to Farrell. Change does not happen automatically after a shock; instead, it involves a two-stage process of shock-induced cultural collapse followed by the consolidation of cultural change. Without consolidation, new norms may not endure after the shock has worn off and the culture may revert to its former

[156] Legro (Winter 1997) 43
[157] Farrell (2005) 45-46
[158] Farrell (2005) 46
[159] Farrell (2005) 13
[160] Legro (2000) 263; Farrell (2005) 14
[161] Berger (1996) 317-356; Duffield (1998) 251

state.[162]

Farrell argues that the consolidation of cultural change requires human agency. He therefore cites two more enabling conditions needed to explain cultural change: norm entrepreneurs and personnel change. In the norm entrepreneur model, the shock takes effect by creating political space for entrepreneurs to challenge existing norms in a process of "planned change." In the personnel change model, external shock may spur turnover in key or large numbers of people, in turn leading to cultural change.[163] In either case, people are needed to make sure the cultural change becomes permanent following an external shock. [164]

Culture as a Context for Military Innovation

In contrast to military innovation theorists who employ causal theory, there are other scholars who prefer to see culture as a context in which military innovation occurs. These theorists are less concerned with engaging mainstream IR theory. Because the international environment is socially constructed, it is "preposterous" to take seriously the idea that there is an alternative "neo-realist" universe that is totally bereft of cultural influence, just as it would be impractical to adopt an unmodified belief in a world in which cultural influence always dominated. [165]

Military innovation scholars who take this contextual view of culture are far less concerned with methodology than Kier, Legro, Farrell and the mainstream IR theorists. As Gray explains, the "methodologically devastating" truth is that culture cannot be isolated as an independent variable to explain behavior.[166] As a result, the only thing scholars interested in culture can do is accept that culture shapes both actors and their behavior and leave it at that. Sometimes culture will deeply impact decision-making and other times it will not; for Gray, the point is that it is

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[162] Farrell (2005) 15
[163] Farrell (2005) 12-15
[164] *ibid*
[165] Gray (2006) 9
[166] Gray (2006) 21

always a potential influence on decision and action.[167]

Military innovation scholars who see culture as context come from a variety of disciplines. Some are strategic studies scholars, while others have a background in social history and the social shaping of technology. In practice, however, they share two common traits: they adopt a similar methodology, and they are not limited to focusing on culture at a certain level of analysis. In terms of methodology, they tend to adopt approaches similar to the constitutive theory. Because they see culture as always having a potential influence on military change, they share constitutive theorists' interest in the question of *how* culture matters. Some scholars who take a contextual view of culture may share causal theorists' interest in seeking to engage mainstream IR theories to some degree, but others do not. In terms of levels of analysis, these scholars are not interested in isolating culture as an independent variable, so they do not have to focus exclusively on organizational culture or strategic culture, and instead broaden their aperture to consider how cultural norms in broader society may shape military change.

One discipline that tends to take a contextual view of the role of culture in military change is social military history. Social military historians are interested in examining how ideational factors — specifically myth and imagination — mutually constitute social identity and the state's approach to warfare and security.[168] A classic example is Michael Sherry's 1976 book, *The Rise of American Airpower: The Creation of Armageddon.* He explains how visionaries in the US and Europe imagined the bomber long before militaries could start building them and bombing people. At the same time, the arrival of bomber technology in WWII shaped how military and political elites, as well as broader society, imagined war. The destruction of strategic bombing, and, later, the use of atomic bombs in Japan, became possible because the bomber created physical and emotional distance between the Americans and the physical consequences of bombing.[169]

Another literature that draws attention to the pervasive role of culture in

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167 Gray (2006) 10
168 For a literature review of social history see Farrell (2002)
169 Sherry (1987)

military change is the social shaping of technology.[170] It sees technological innovation as the result of a social process in which different interest groups (consisting of military officers, politicians and scientists) put forward rival designs. The social process of reaching consensus on a design shapes the technological development; design efficiency has nothing to do with it. In this way, technological innovation is seen as socially constructed, not deterministic.[171] One example is Donald Mackenzie's history of nuclear missile guidance, which shows how a lab at the Massachusetts Institute of Technology developed missile guidance technology that ultimately shaped the development of the USAF's counterforce strategy in the early 1960s.[172]

Finally, in the field of strategic studies, there are several authors who have taken a more contextual view of culture to explain military innovation. These authors tend to draw on other disciplines, including social history with its focus on the mutually shaping relationship between culture and military force, to make their case.[173]

One notable example is strategic studies scholar Dima Adamsky's book, which explores why Russia, the US, and Israel took different paths to pursuing the revolution in military affairs despite having similar access to technology. Adamsky adopts a contextual definition of culture that sees it shaping both the cognitive styles of military and political elites and their behavior. He acknowledges that material factors like technological maturity and the threat environment also influence innovation, but he insists that culture always sets the conditions for how these material factors are viewed. His findings suggest a powerful role for strategic culture in setting societies on different paths to RMA development. Although he does not set out to make the claim that culture spurred RMAs in these countries, evidence of its powerful influence is bolstered by his use of three comparative and contrasting societies that took different approaches to the RMA despite access to

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170 Mackenzie and Wacjman (1999)
171 Mackenzie and Wacjman (1999) 21; Bijker, Hughes and Pinch (1987)
172 Mackenzie (1993)
173 See, for example, Adamsky (2010); King (2010); Mahnken (2008)

the same technology.[174]

3. Culture in UAV Innovation

Clearly, the concept of culture is pervasive in both IR theory and military innovation theory. Even scholars who purport to adopt an essentially neo-realist view, rooted in rational actor theory, tend to "smuggle" cultural factors into their accounts of military innovation.[175] Given the ubiquitous nature of culture in the existing literature, it is a difficult feat to isolate it as an independent variable that exists totally separate from material factors.

Nevertheless, causal theorizing remains the mainstream methodological approach, particularly in the United States.[176] The landmark doctoral thesis on UAV innovation to date, Col. Ehrhard's 2000 comparative analysis of UAV innovation in the US armed services over 45 years, employs causal theorizing.[177] He joins other causal theorists in separating military culture from behavior to assess its explanatory power relative to material factors in the international system.[178] In the case of the USAF, he concludes that technological immaturity and poor operational performance had more to do with the service's failure to institutionalize UAVs than "the cultural skepticism of pilots, as is often postulated."[179] In Ehrhard's view, the USAF is capable of assessing external material factors that influence UAV innovation on a completely rational basis, devoid of cultural influence. After applying this framework across US military UAV programs, Ehrhard declares that his "linchpin finding" is that military service culture matters less than material factors in terms of shaping decisions about UAV innovation.[180]

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174 Adamsky (2010)
175 Jepperson, Wendt and Katzenstein (1996) 39-40
176 Farrell (Summer-Fall 2005) 10
177 Ehrhard (2000)
178 Ehrhard (2000)17-20
179 Ehrhard(2000) 486
180Ehrhard 570.

Ehrhard divorces culture from decision-making by narrowly circumscribing the concept of culture at the organizational level of analysis. He divides the internal workings of the military organization into three categories: structure, function, and culture.[181] Under this rubric, a military service could disagree with outsiders about the cost and potential of a UAV for strictly rational reasons related to structure and function that have nothing to do with culture. For example, Ehrhard claims the Army and the USAF initially ignored the Predator program not because of cultural concerns, but because of its lack of proven combat capability and the Predator's "functional" shortcomings: "its capabilities fell in-between the Army's battlefield range and the Air Force's preferred altitude and speed comfort zone," he argues.[182]

But Ehrhard's strict adherence to causal theorizing has its own limitations. Even he cannot totally succeed in divorcing culture from the USAF's so-called "functional" imperatives. His description of the Predator falling outside the USAF's subjective preferences and "comfort zone" employs language that actually implies a strong cultural influence. This example highlights the difficulty of trying to put up barriers between "rational" and "cultural" influences on decision-making. Of course, many scholars understandably see a significant methodological benefit to putting up these barriers because doing so provides a clear way to test cultural theories against other theories to determine which one explains innovation outcomes the best.

But I believe we may learn more about the nature of cultural influence on UAV innovation by accepting it as a context for change, rather than looking at it narrowly as one variable that can be parsed from others to determine its influence. To this end, I believe that constitutive theory may prove to be a useful adjunct to causal theory testing. It allows for a more broadly encompassing view of culture's influence on innovation while still accepting that there are some baseline facts that can be used to judge whether a pervasive view of cultural influence, illuminated by constitutive theory, best explains innovation outcomes, or whether some other

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[181] Ehrhard (2000)17
[182] Ehrhard (2000) 547

theory, like neo-realism, does it better.

The main advantage of adopting a broad view of culture is that it becomes possible to look at a variety of facets of cultural influence. Most importantly, we can see culture as mutually shaping actors and their environment. In the case of the Predator program, culture pervades the relationship between the USAF and the UAV. It provides a lens through which the USAF makes myriad judgments about the Predator's cost, military potential, and technological maturity. Because these seemingly rational factors reflect USAF culture, they in turn have the potential to change that culture. For example, chapter three describes how the USAF initially rejected the Predator program based on rational concerns about cost and technological maturity that were colored by a prevailing cultural preference for manned aircraft. In turn, chapter four describes how the Predator program's cultural significance as part of the Revolution in Military Affairs (RMA) led the USAF to take a more optimistic view of UAV technology over the long term.

Given the breadth and depth of influence that I attribute to USAF culture, it makes the most sense for me to adopt the constructivist definition of the term. As described in section one, constructivists view culture in terms of "norms" that mutually constitute actors and their environment. In this way, norms operate "all the way down" to define actors, their situations, and the possibilities of action. Farrell neatly summed up how norms impact military innovation in his 2002 book on the subject: "In short, norms make meaningful action possible by telling military actors who they are and what they can do in given situations. In this way, norms define the purpose and possibilities of military change."[183] Throughout my research, I use the more generic concept of "USAF culture" interchangeably with the constructivist concept of cultural norms.

My main research question reflects the constructivist view of norms, drawing attention to the mutually shaping relationship between USAF culture and the Predator program. Rather than focusing primarily on causality, the question focuses on *how* USAF culture made certain decisions about the Predator program

[183] Farrell (2005) 7

possible, and other decisions impossible. Given that my research interest is closely aligned with military innovation scholars who see culture as a context for change, I adopt their methodology, roughly based on constitutive theory. In practice, this means I generally stay away from trying to assign a specific percentage of influence to culture versus some other material factor, and instead I focus on understanding how culture shaped the relationship between the USAF and the Predator program.

Of course, I do not ignore the important insights causal theorists have made about military innovation, or totally dismiss their interest in causality. As Price and Reus-Smit note, constitutive theory is actually a good method to assess causality because it helps to paint a fuller picture of culture that may ultimately provide a convincing case for its causal power.[184] This insight is important because I share causal theorists' interest in understanding how culture shapes decisionmaking, in this case, how USAF culture shaped the Predator program. Also, causal theorists have made important observations about military innovation that I intend to incorporate in my research. Farrell's description of cultural change, for example, is useful for understanding any apparent shifts in USAF culture that in turn led to change in the Predator program.

Because my research question implies a pervasive role for culture, however, it is necessary to pay special attention to the development of a systematic way to explore the nature of cultural influence on the USAF's Predator program. The advantage of causal theorizing is that it allows researchers to quickly and efficiently isolate cultural influence as anything that cannot be explained by rational behavior. Since I view culture as a mutually shaping context for action between actors and their environment, filled with both rational and cultural considerations, I do not share this advantage. Therefore, my solution is to put forward four sub-questions that are asked across each of the chapters that follow. Each question inquires into the core activities and distinctive stances of the USAF to develop an overall sense of USAF cultural attitudes toward UAV innovation.

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[184] Price and Reus-Smit (1998) 272

The questions are based on four hypotheses about USAF culture that are derived from an examination of norms flowing in and out of the USAF at the international, national, organizational, and individual levels of analysis. The main focus of my examination, however, is on norms at the organizational level. As noted in the section on culture and military innovation, most military action takes place within organizational structures, so the organizational culture of the USAF itself is a natural focus.

Below are the four questions, each followed by a discussion that forms the basis for surmising that the question leads to important insights about the nature of the relationship between USAF culture and UAV innovation.

1. **To what extent did individuals or groups within the USAF resist unmanned technology out of a concern that their jobs or status might be threatened by it?**

This question explores the extent to which the USAF has fractionated into competing factions based on weapons system affiliation rather than institutional affiliation. It suggests that USAF personnel do not reflexively welcome emerging technologies, such as UAVs, as a means to advance airpower's war-winning edge. Instead, their first instinct is to size up the technology to see if it poses a threat to their jobs and status, built around existing technologies. If the new technology threatens to replace their preferred weapon system, USAF personnel can be expected to resist its integration into the USAF's force structure.

Historian Carl Builder has written the preeminent work on the USAF's institutional loyalty to weapon systems rather than the USAF as an institution.[185] In *The Icarus Syndrome,* he argues that this fragmentation of USAF identity occurred in the mid-20th century due to a clash between USAF culture and airpower theory. Builder explains that the USAF was established after WWII around a unifying theory of airpower as an independent force — not just an

[185] Builder (1994)

adjunct to land or sea warfare —that could be used to bypass bloody, costly, and often indecisive engagements to strike at the heart of the enemy through the third dimension. This strategic view of airpower theory initially worked very well, providing a valid justification to the outside world for the USAF's existence, and also an institutional touchstone for the USAF's personnel. [186]

However, Builder argues that airpower theory began to crumble once new aerospace alternatives started to emerge in the 1950s and 1960s. This was particularly true in the case of the introduction of intercontinental ballistic missile (ICBM) technology in the early 1950s. The arrival of the ICBM forced the USAF's bomber generals, who dominated the service between 1947 and 1965, to reveal that their "true affection" was not for airpower theory — the idea of using whatever air asset could most readily achieve strategic effects — but rather for the continued employment of manned aircraft as the central means to win wars.

The bomber generals' preference for bombers above all else was rooted in an "emotional and cultural resistance" according to historian Kenneth Werrell.[187] They worried that ICBMs would pose a direct threat to manned bombers, around which they had built the justification for an independent USAF and their future prospects for promotion, as RAND analyst Robert Perry noted in a 1967 report.[188] Fearing a loss of control, the bomber generals sought to reinforce a USAF caste system with them at the top and everyone else split into factions devoted to specific aerial platforms competing for power. Following the arrival of the ICBM, a broad conception of airpower theory was paid only "lip service" while the bomber generals focused on preserving the centrality of manned aircraft, thereby ensuring their continued dominance. [189]

Builder, Werrell, and Perry's assessment of the USAF's reaction to the ICBM provides an indication that the USAF's manned pilot leadership might be inclined to balk at technological alternatives to manned aircraft, on which their jobs and

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[186] Builder (1994) 29-32
[187] Werrell (1985) 104
[188] Perry (Oct. 1967) 26
[189] Builder (1994) 177

status depend. In another book, Builder expressly argues that the USAF's pilot leadership culture is centered on supporting the jobs and status of manned aircraft pilots to the exclusion of any alternatives that might advance the broader causes of airpower theory.[190]

He finds that the USAF's narrow focus on manned aircraft is evident in the tendency of USAF pilots to affiliate themselves with their manned aircraft rather than their institution, referring to themselves as "F-16 drivers" rather than "USAF officers," for example.[191] He also finds that pilots tend to derive their status from their airframe rather than their institutional affiliation. Fighter pilots, who began to replace bomber pilots as service leaders starting in the late 1970s,[192] have the highest status in the USAF[193] owing to the skill required to fly fighters and the perception that fighter pilots assume the most risk. Since 1982, every chief of staff — with the exception of Gen. Norton Schwartz, (2008-2012) — has been a fighter pilot.[194] The trend was worrying enough to prompt Gen. Lew Allen, the USAF chief from 1978 to 1982, to develop "Project Warrior," an effort to redirect airmen away from their tendency to identify with technical communities instead of the USAF's broader warfighting goals.[195]

Based on Builder's research, manned aircraft pilots could be expected to see the emergence of UAVs as a particularly ominous threat to their status and their current jobs flying manned aircraft. In terms of job security, UAVs literally take flying opportunities away from manned aircraft pilots because they perform some of the same missions as manned aircraft. Intelligence, surveillance, and reconnaissance (ISR) missions, for example, can be performed by UAVs or manned MC-12W Liberty aircraft. Similarly, a high value targeting mission could be conducted by an armed UAV or a manned F-16. UAVs also potentially threaten the leadership status of manned aircraft pilots because they can perform critical

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[190] Builder (1989)
[191] Builder (1989) 23
[192] Worden (March 1998)
[193] Builder (1989) 28
[194]Air Force (Apr. 15, 2015)
[195] Keith (Jan.-Feb. 1984)

airpower missions, yet flying them does not require the elements that make pilots elite: namely, their mastery of traditional piloting skills and their exposure to the dangers of the air environment.

If Builder is correct that the USAF's manned aircraft pilot culture is devoted to manned aircraft — rather than a broader conception of strategic airpower — then USAF pilots could be expected to actively resist UAV integration. Several authors have claimed evidence of this resistance,[196] commonly referred to as "the white scarf syndrome."[197] Of course, the USAF's manned pilot leaders may not be the only sub-community to resist UAV integration to preserve their own jobs and status. As Builder notes, the fracturing of the USAF into affiliations based on weapon systems means that other sub-communities are always monitoring new technologies to ensure they do not pose a threat to existing ways of doing business. Under Builder's hypothesis, it is entirely possible that multiple USAF sub-communities may resist the introduction of UAVs as a means to improve on existing weapons technology.

If the USAF sees its future as tied to specific weapon systems such as manned aircraft, it risks fueling external criticism that could ultimately contribute to the service's demise. As noted in the literature review, several scholars have suggested there is no need for an independent air force if UAVs eventually are going to replace manned aircraft. Other military services already fly UAVs effectively and the USAF does not seem to contribute anything unique to UAV operations.[198] If the US and international community come to agree with these authors that the future of airpower rests with unmanned systems, then the USAF risks contributing to its own downfall if it continues to promote manned aircraft despite technological advances in UAV technology and growing outsider support for UAVs.

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[196] See, for example, Singer (2009) 253; Cantwell (June 2007) 126 and Spinetta (July-August 2013)

[197] For white scarf syndrome references, see, Ehrhard (2000) 30; Bone and Bolkcom (Apr. 25, 2003) CRS-1;Stulberg, Salamone, Long (2007) 189.

[198] Van Creveld (2011) 437-441; Farley (2014)

2. **To what extent were judgments about the potential and cost effectiveness of unmanned technology based on the USAF's enthusiasm for employing new technology and to what extent was the enthusiasm from outside the service?**

This question suggests that culture significantly influences how military organizations approach the integration of new technologies. Sociologist Morris Janowitz describes how officers in Western militaries tended to be conservative about technological innovation through WWII, overlooking innovations in favor of what has worked in past wars as a means to hedge against the uncertainty of future battles.[199] One widely cited example of this behavior is Edward Katzenbach's description of the persistence of the horse cavalry in the US and Europe despite major changes in technology that called the practice into question.[200] On the other hand, Janowitz finds that after WWII, military leaders increasingly incorporated technological innovations into their war planning in step with Western industrial society.[201] The post-WWII era gave way to a newfound technological optimism that has animated defense planning ever since.[202] Mahnken provides a colorful example: Military leaders spoke enthusiastically of the potential for technology to provide an omniscient view of the battlefield in 1960, and were still making the same unfulfilled predictions in 2000.[203]

Mahnken argues that these competing views — technological skepticism and technological enthusiasm — continue to pervade American society. But both sides overstate their case. Technophiles may overlook practical and strategic considerations to see technology as the solution to all of war's problems. Technology skeptics, on the other hand, may understate technology's benefits.[204]

The first avenue for exploration identified in the question above is based on

[199] Janowitz (1960) 24
[200] Katzenbach (1973) 406-422
[201] Janowitz (1960) 27
[202] Mahnken (2008) 2
[203] Mahnken (2008) 1
[204] Mahnken (2008) 6

the idea that there is a strain in USAF culture that embraces a deep reverence for new technologies, regardless of type, because they are seen as a means to ensure the future progress of aerospace power. Technological advancement is viewed as a competitive strategy to make airpower more efficient and effective, thereby allowing airpower to become more dominant in military power as a whole.

In *Masks of War,* Builder argues that the USAF's very existence depends on continued technological enthusiasm. The USAF has historically cherished technology because the airplane — itself an "expression of the miracles of technology" — provided a central justification for the creation of independent air forces. If technology is to ensure a rosy future for airpower, Builder argues, the USAF must "worship at the altar" of technological progress, to include not just manned aircraft but alternatives like spacecraft, to maintain its war-winning edge.[205] Airpower theorist Philip Meilinger confirms the view that the USAF's institutional relevance hinges on its embrace of a wide variety of technological innovations.[206] In his master's thesis on the characteristics of independent air forces, RAAF Wing Commander Stephen Edgeley notes that the RAF and the RAAF share the USAF's reverence for technological innovation.[207]

Based on this research, we should expect to see at least some elements of the USAF enthusiastically embracing UAV technologies, even without hard evidence of their cost effectiveness and military potential. Ehrhard suggests that the USAF's manned aircraft pilot leadership, for example, has expressed abundant enthusiasm for UAVs, while the Army and Navy aviation communities have been the ones to fall victim to "white scarf syndrome."[208] Another place to look for evidence of enthusiasm for UAVs is the USAF's research and development community, particularly its Big Safari organization, which has a long history of UAV involvement.[209]

The second area for exploration suggested in the above question leads

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205 Builder (1989) 19
206 Meilinger (Spring 1996) 13-14
207 Edgeley (2010) 93-94
208 Ehrhard (2000) 493 and 585
209 Grimes (2014) 1-3

down two separate paths. First, it is possible that the USAF and outsiders have been equally enthusiastic about UAVs, and second, it is possible that the USAF has been less enthusiastic than outsiders. If the USAF has been less enthusiastic, then it becomes prudent to look for any potential sources of technological skepticism within the USAF. In the event that the USAF proves less enthusiastic than outsiders, the USAF's motivation to pursue new technologies, such as UAVs, would depend on powerful individuals in the USAF who are able to drive a cultural change or pressure from outside the service.

Outside the USAF, there is reason to think that technological enthusiasm characterizes the strategic culture of the US, and therefore political and military elites would be likely to encourage the USAF to pursue UAVs. During WWII, strategic bombing and the ultimate use of nuclear weapons were enabled by a technological fervor among political and military elites that saw the bomber as marvel of military effectiveness that could win the war.[210] Technological enthusiasm among political and military elites has been central to the "American way of war" ever since.[211]

Technological enthusiasm within broader American society may also contribute to external pressure on the USAF to pursue UAV technology. The "machine-mindedness" of American civilization has led the US to seek air superiority in every conflict it has fought since WW I.[212] Air warfare is seen as a means to win wars because it is "high-tech, cheap in lives and (at least in theory) quick" argues strategic studies scholar Eliot Cohen.[213] During WWII, for example, the American public saw the introduction of bomber technology as a means to shorten the war, thereby reducing Allied combat losses and civilian casualties.[214]

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210 Sherry 1987) 219-255
211 Mahnken (2008) 5; Gray (1999) 147
212 Cohen (Jan/Feb 1994); Gray (1999) 147
213 Cohen (Jan/Feb. 1994)
214 Bilstein (2003) 25; Sherry (1987) 76-146

3 To what extent were USAF judgments about the employment of unmanned technology driven by a desire to reduce the risk to friendly personnel and to what extent was that push from outside the service?

This question suggests that airpower puts a smaller number of personnel at risk than does sea power or land power. The tyranny of geography requires a higher proportion of Army and Navy personnel to serve in combat compared to the USAF, and provides fewer opportunities to mitigate risk with technology.

While aerial attrition in the era of the World Wars resembled ground war in its staggering proportional losses,[215] Western air forces have since been able to dramatically reduce air combat casualties through technological innovation.[216] US loss rates per one thousand sorties fell from 9.7 in WWII to 2.0 in the Korean War and just 0.4 in the Vietnam War,[217] largely due to technological progress. Jet engines, precision-guided munitions, stealth technology, and, of course, UAVs, offer examples of technologies that have reduced risks to aircrews and other combat forces.

Scholars note that the substitution of technology for manpower has fueled an emerging norm in Western culture: a growing sensitivity to casualties. As military historian Philip Sabin argues, in recent decades Western nations have come to expect minimal air casualties and have become highly sensitive to media reports of manned aircraft shoot-downs, infrequent as they may be[218] (recent examples include the 1995 shoot-down and rescue of F-16 pilot Scott O'Grady in Bosnia and the 1999 shoot-down and rescue of an F-117 Nighthawk pilot over Kosovo).[219] Similarly, Western nations have become increasingly sensitive to ground casualties, calling for better protective measures, to include more or better air support, whenever any losses are suffered.[220]

[215] Wells (1995) 27-95
[216] Sabin (2009) 100
[217] Schlight (1996) 103-104
[218] Sabin (2009) 103
[219] Kelly (1996); Lambeth (2001) 116-120
[220] Sabin (2009) 104

The growing use of UAVs in the battlespace has fueled two trends that both stem from the casualty sensitivity norm in Western society. First, as UAVs have helped to reduce aircrew losses in recent decades the expectation of "zero casualties" has now become the new Western expectation, so there is even more pressure to use UAVs to avoid manned aircraft losses in the future.[221] Second, the proliferation of UAVs in Western society also has reduced the political risks of UAV reconnaissance and strike missions when their legitimacy is in question. Before UAVs were used for clandestine overflights, manned aircraft had to do the mission, risking great embarrassment to the US If they were caught. The Eisenhower administration was humiliated in 1960 when it publicly claimed USAF Captain Gary Powers drifted over Soviet territory while conducting a weather mission in his U-2 Dragonlady, only to have the Soviets announce days later that they had captured Capt. Powers who confessed he was spying for the CIA.[222] Without a pilot onboard, UAVs make it possible to conduct clandestine overflights (reconnaissance and strike missions) in places like Pakistan with far less political risk, prompting some scholars to argue that UAVs lower the threshold for killing.[223]

A second Western norm to emerge from the substitution of aviation technology for manpower is a growing disassociation between air forces and heroism. Scholars note that the Western perception of manned aircraft pilots as "knights of the air" is fading."[224] The flying aces of World War I (WWI) were considered elite because they overcame the dangers of flight and exhibited individual skill and bravery high above the masses of infantry in the trenches below.[225] These airmen embodied "the warrior ethos," — a willingness, or even an enthusiastic desire, to put one's life at risk in combat in service to the state.[226] Since WWI, however, aviation technology has distanced airmen from the glories of combat. Current Western perceptions of warfare, as embodied in images from

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221 *ibid*
222 Taubman (308-309)
223 Zenko and Kreps (June 2014) vii
224 Lee (Spring 2012) 1-19;
225 Wells (1995) 4; Harris (1958) 11-14
226 Coker (2007) 3-7

Afghanistan and elsewhere, seem to be that "Aircraft observe and kill, while soldiers fight and die."[227]

The growing use of UAVs in combat missions has further fueled the decline of the military aviator's reputation. The physical distance of UAV pilots from the battlespace stands in sharp juxtaposition to traditional conceptions of the warrior ethos. As air historian Seb Cox put it: "If the existential elements of warfare relate to concepts relating variously to bravery, self-discovery, self- image, action, vitality, adversity and trial, where does this leave the literally chair bound warrior flying a UAV, whose war is fought from a padded seat many thousands of miles away from his or her adversary?"[228]

The question above seeks to explore how far these cultural trends regarding aircrew risk have shaped decisions about UAV integration inside and outside the USAF. The first possibility suggested by the question is that the USAF has absorbed the Western cultural trend toward increasing casualty sensitivity. Following the air wars over Bosnia and Kosovo in the 1990's, some authors even argued that the USAF culture become *too* risk averse, with USAF leaders putting force protection priorities above the mission. [229] But other scholars point out that combatant commanders' casualty aversion often reflects a tendency in broader Western society to tolerate minimal casualties, particularly in limited wars when vital interests are not perceived to be at stake.[230] If USAF culture has embraced casualty avoidance as a priority, at least in contexts where vital interests were not perceived to be at stake, we would expect to find evidence of USAF leaders advocating for UAVs on the ground that they keep aircrews out of harm's way.

The second possibility suggested by the question above leads to two additional avenues of inquiry. First is the possibility that the USAF and outsiders have been equally concerned with reducing aircrew risk. Second is the possibility that outsiders have been more concerned than the USAF. If casualty avoidance is

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[227] Sabin (2010) 167
[228] Cox (2009) 89
[229] Walker (2001); Devine (1997)
[230] Bucknam (2003) 40

not a priority for the USAF, then we need to look for explanations for this lack of interest. One possibility is that the service sees technologies to reduce risk as a threat to the service's warrior ethos. In the event that the USAF is less concerned with casualty avoidance than outsiders, the USAF's motivation to pursue UAV technology would become more dependent on outside pressure from political and military elites or broader American society.

America's most senior political and military elites seem likely to provide a strong source of external pressure regardless of whether vital interests are at stake. Scholars note that US strategic culture is highly risk averse.[231] Military strategist Jeffrey Record has written about an element in US strategic culture that seeks to reduce risk to combat forces at almost any cost. He argues that "force protection fetishism" has overtaken a generation of American elites as a consequence of the Vietnam War, leading these elites to believe that the risks of using force, both in the physical battlespace and in the realm of domestic politics, usually outweigh the benefits, especially in the context of interventions in other states' civil wars. [232]

In contrast to US strategic culture, pressure from broader American society to substitute technology for manpower is more likely to depend on the circumstances. Overall, an impulse to minimize risk to US forces is rooted in American culture, which values the individual much more than the state and has therefore always sought to substitute technology for lives in battle.[233] However, some scholars argue that while it is difficult to sustain public support for bloody, inconclusive wars (like Vietnam) and military interventions (like Lebanon and Somalia), Americans will accept greater casualties when vital interests are directly threatened.[234] Record cites the 1941 Japanese attack on Pearl Harbor and the 2001 terrorist attack on the World Trade Center as examples of attacks that threatened vital US interests and therefore increased the American public's tolerance for

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[231] Sapolsky and Shapiro (Summer 1996) 119-127; Record (2000)
[232] Record (2000) and Record (2002)
[233] Record (2002); Dunlap (1999-2000) 100-101
[234] For example, Record (2002): Larsen (1996)

casualties.[235] Given the contingent nature of casualty aversion in American society, we would expect to see Americans exert more pressure on the USAF to employ UAVs in wars that do not impact vital interests.

4. **To what extent were judgments about unmanned technology based on a concern about maintaining the USAF's primacy over air assets in response to competition from other civilian and military institutions?**

The premise underlying this question is that air forces, like any large bureaucracy, jealously guard their autonomy. On one level, this question is different from the previous three because it emphasizes what the USAF has in common with other military organizations such as the Army and the Navy rather than what makes it distinctive. From a rational perspective, organizational theory tells us that military institutions of all stripes will seek to maximize autonomy and reduce uncertainty to maintain their hold on power.

But, from a cultural perspective, Halperin's concept of organizational essence tells us that military organizations only seek a monopoly over things that they see as essential to fulfilling their core missions.[236] This is where the distinctive culture of the USAF becomes relevant. The USAF is unlikely to compete for things that it does not believe are needed for its continued functioning —tanks, for example — but it is far more likely to put up a fight if another service tries to control an aerospace asset or mission. By looking at the extent to which the USAF has been willing to fight for control over UAVs, we can get a sense of how closely the USAF associates that technology with its organizational essence.

The USAF has been particularly protective of assets that it perceives as close to its core functions due to a longstanding insecurity about its position as an independent service. Like air forces in other democratic cultures, the USAF has a long history of challenges to its independence. The USAF, RAF, and the Royal Australian Air Force (RAAF) were all established much later than their respective

[235] Record (2002)
[236] Halperin and Clapp, with Kanter (2006) 27

national armies and navies. Inter-service rivalry bedeviled the birth of all three independent air services, as older armies and navies sought to protect their own organizational power by seeking to maintain control of their own air arms.[237] The three air forces all fought for their independence based on a shared understanding developed among airpower visionaries – an international norm – built on the idea that independent air forces were 1) efficient from an organizational and cost perspective, and 2) capable of delivering war-winning effects rather than merely providing a support function to other military services.[238] Today, insecurity about their independence still leaves these air forces vulnerable to getting locked in a "justification cycle," in which air force leaders feel compelled to insist that airpower can independently win wars and are reluctant to acknowledge joint or supporting roles.[239]

Given their perennial insecurity over independence, the USAF and like-minded air forces tend to see inter-service competition for greater resources and prestige as a fundamental threat to their independence, while the other military services simply see it as part of the normal political turmoil within the defense organization.[240] With the stakes so high, the USAF can be expected to be especially jealous in the safeguarding of aerospace assets and missions that are viewed as essential to its continued independent functioning, just as Halperin predicts. One notable example is the USAF's fight with the Army during the 1960's over control of rotary wing aircraft for the air mobility mission. On one hand, the USAF took little interest in the mission historically, but on the other hand it strongly resisted the Army's eventually successful efforts to establish an organic fleet, viewing the move as a threat to the USAF's monopoly over airpower missions.[241]

Over time the lines between the USAF's core missions and peripheral responsibilities have become even more blurred as technology has moved from air

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[237] Edgeley (June 2010) 19-35; Not all Western air forces followed this pattern; see Vennesson (1995) on the French Air Force.
[238] Edgeley (2010) 46
[239] Edgeley (2010) 35
[240] Edgeley (2010) 64
[241] Bergerson (1980)

to space and cyberspace. In each medium, the USAF has to make decisions about which missions and technologies to fight for and which ones to let go. These are important decisions because allowing a core mission to slip from the hands of the USAF could lead to the marginalization of the service, or, in a worst-case scenario, its ultimate demise.

The first possibility suggested in the question above is that the USAF aggressively protects a broad range of aerospace assets in response to challenges from outsiders. The service takes a maximalist view of the range of aerospace technology and missions with potentially war-winning effects and jealously guards control of all of them. For example, the USAF would be just as prone to resist an external challenge to its control satellites as it would be to rebuff an outsider's bid to control the B-52 fleet.

In this view, we would expect to find the USAF fighting for control of UAVS in response to outside challenges. While UAVs are essentially a tactical innovation, they have nevertheless delivered strategic effects in terms of their potential to reduce acquisition costs, increase the pervasiveness of aerospace power, and reduce aircrew casualties.[242] In this sense, they fall within a maximalist definition of technologies with potential war-winning effects and we would therefore expect the USAF to seek to maintain control of them and try to use them as efficiently and effectively as possible.

The second possibility suggested in this question is that the USAF protects a select few aerospace technologies and missions from outsider incursions because it takes a relatively narrow view of its core functions. Only a handful of technologies and missions are essential for achieving strategic effects. In particular, manned aircraft and manned aircraft pilots are needed to fulfill core functions of the service such as air superiority and strategic bombing. The rest of the aerospace portfolio is less essential because it is not seen as directly contributing to the USAF's war-winning edge. Under this narrow view, the USAF would be unlikely to protect UAVs from outsiders because they are not part of this

[242] Sabin (2009) 97-108

relatively narrow conception of its core functions.

Finally, the last possibility suggested in the question indicates that the USAF engages in paradoxical behavior in response to outside challenges. The service protects its authority over certain technology or missions even though it does not truly believe that those assets are essential for fulfilling core functions. In this scenario, the USAF adopts a narrow view of its core functions, but it does not want to cede authority of a mission or asset perceived as peripheral because it wants to ensure it stays that way.

Two examples of this behavior can be seen in the case of cruise missiles and ICBMs. To be sure, Gen. Arnold and his followers, including Gen. Bernard Schriever, genuinely embraced these technologies as a means to advance airpower in response to outside challenges. But there was another strain in the USAF that took a more cynical view. According to Edmund Beard, the USAF's early approach to these guided missiles had a "dual nature" in the sense that "missiles were downplayed within the Air Force, while they were urged over the competing projects of other services."[243] If the USAF is taking this same approach to UAV development, we would expect to see the service fight for control of UAVs, but do little to integrate them or use them efficiently and effectively as part of a larger airpower strategy.

4. Conclusion

This chapter began by exploring the thorny questions of how to define and analyze culture, concluding that it is best understood as a broad concept that shapes both actors and their environments. In section two, I discussed the implications of the pervasive nature of culture for my research. The main point is that I need to consider how USAF culture both shaped – and was shaped by – the Predator program. To better understand this mutually shaping relationship, section three introduced four sub-questions that are asked across each of the

[243] Beard (1976) 100

chapters that follow. Each of these questions seeks to explore what makes USAF culture distinctive and invites an analysis of how that culture interacted with UAV innovation.

One common theme that runs through these sub-questions is a significant cultural tension surrounding the issue of USAF identity. If the USAF largely identifies itself as a military service narrowly devoted to the continued dominance of manned aircraft and manned aircraft pilots, then UAVs fundamentally threaten the USAF's sense of purpose. If, on the other hand, the USAF sees itself as an institution broadly interested in strategic mastery of the air — regardless of the means —then UAVs are a welcome addition to the USAF's arsenal.

The stakes surrounding this debate about USAF identity could not be higher. As discussed in the introduction, there are people both inside and outside the USAF who believe the service's main contribution rests with manned aircraft and manned aircraft pilots. If these people are right, then aerospace innovations – UAVs, or any other type – pose a fundamental threat to the USAF's very existence. On the other hand, the USAF's future is far less fraught – and, frankly, far more filled with potential – if the service has been able to move away from an identity linked mainly to manned flight towards a broader conception of itself as the military service responsible for the expert employment of strategic airpower across the realms of air, space, and cyber space.

CHAPTER TWO

USAF Culture and UAVs: A Historical Perspective

The fight for an independent air arm in the United States, which began during the interwar period, centered on the premise that airpower could quickly and decisively win wars through offensive strikes directed at critical sources of enemy power. The conduct of such a strategic air campaign would require central and independent control of the air.[1] Starting in the 1920's, airpower proponents began developing a strategic bombing doctrine built around manned bombers as a means to implement this theory.[2] But as early as 1917, airpower advocates had to consider the possibility that other air weapons, including unmanned technologies, might also have strategic potential.

This chapter paints a historical portrait of the USAF's cultural attitudes toward unmanned technologies between 1917, when the US military experimented with its first UAV, the Kettering Bug, and 1993, when the Predator program began. Drawing on the four sub-questions identified in chapter two, it highlights significant patterns in the interaction between USAF culture and unmanned innovation in early US airpower history and whether those patterns changed over time. The purpose of the chapter is to determine whether USAF culture has historically nurtured a broad conception of airpower that welcomes unmanned technologies, or whether USAF culture has limited the service's focus to manned technologies with war-winning capability. The findings will serve as a baseline to assess whether and how USAF culture changed between 1993 and 2015 as it shaped- and was shaped by- developments in the Predator program.

Like the substantive chapters that follow, this chapter is divided into two sections. The first half provides a brief history of unmanned technologies, and the

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1 Builder (1994) 62
2 Wolk (2010) 3236

second half provides an analysis of the interaction between USAF culture and those technologies. The scope of the chapter is limited to UAVs as defined in the introduction. There is a wealth of information about the USAF's cultural attitudes toward other unmanned technologies, including ICBMs and cruise missiles, but they are not addressed here due to space constraints.[3] Even within the history of UAVs as defined in the introduction, so much information is available that a second limitation on the scope is necessary. Rather than conducting an exhaustive survey of UAV history, this chapter only highlights UAV programs that significantly influenced, or were influenced by, USAF culture.

Key Milestones in UAV Innovation

America's airmen were first introduced to UAV technology in 1917 when then-Col. (temporary) Henry Harley "Hap" Arnold, the executive officer of the US Army's Air Division, teamed with civilian scientists to produce the Kettering Bug.[4] The wooden biplane was one of several early attempts to develop what was generically known as an "aerial torpedo."[5] Designed to take a one-way trip, the ground-launched Bug carried a "warhead" containing 300 pounds of explosives.[6] By 1919, the Army's Air Service had ordered 100 copies of the Bug, but as WWI came to an end and flight tests yielded mixed results, the program was abandoned.[7]

Nevertheless, American airmen's interest in one-way UAVs continued into the late 1920s and early 1930s with a focus on improving aerodynamic stability and guidance systems.[8] In 1923, Brigadier General Billy Mitchell, the deputy chief of the Air Service, proposed using an aerial torpedo for his famous tests of aerial

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[3] On USAF culture and ICBMs, see: Beard (1976); Builder (1994) ; Mackenzie (1990); Perry (October 1967); Perry (May 1967); and Sheehan (2009) On USAF culture and cruise missiles, see Werrell (1985) and Beard (1976)
[4] Arnold (1949) 74; Daso (Winter 1996); Hughes (1989) 126-135
[5] Hughes (1989)32; Schultz (2007) 194
[6] Daso (Winter 1996); Armitage (1988) 3
[7] Armitage (1988) 3; Arnold (1949) 84
[8] Schultz (2007) 200

bombardment of battleships, although the plan never came to fruition because the vehicles were under modification at the time.[9]

Aside from the advocacy of then-Col. Arnold and Brig. Gen. Mitchell, however, overall progress on the aerial torpedo was slow during the interwar period. The program was even briefly mothballed in 1932 because there was no institutional impetus in the US Army Air Corps to move it beyond test stages and funding was scarce.[10] Frustrated by the lack of progress, Arnold took over aerial torpedo development in the mid-1930s as a major general. To ensure the program did not overlap with any of the US Army's tactical field artillery, he developed ambitious design specifications for an unmanned bomber. He stretched the range requirements from 20 miles to 100, called for far more stringent accuracy of a one-half mile diameter circle, and increased the payload capacity above 200 pounds.[11]

After a contracting competition yielded little interest, however, then-Maj. Gen. Arnold once again turned to Kettering, now working at General Motors, to build a new version of the Bug, the GMA-1.[12] In December 1941, the improved Bug demonstrated a range of more than 200 miles during flight tests.[13] It included an autopilot system, remote radio control, and a television camera on its nose. Operators could use the television system to guide the Bug via radio control, but the process required intensive human oversight and the range still fell short of the strategic reach needed to hit Germany,[14] so the contract was terminated in May 1943.

WWII-Era Unmanned Technologies

Although building unmanned bombers presented a technological challenge, basic UAV components were understood well enough even in the 1940s to allow for

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[9] Schultz (2007) 199
[10] Schultz (2007) 202
[11] Schultz (2007) 205- 207
[12] Schultz (2007) 207-208
[13] Arnold (1949) 259-260
[14] Arnold (1949) 261

widespread use during WWII. Shortly after its establishment in June 1941, the US Army Air Forces (AAF) ordered over 3,800 target drones from UAV manufacturer Radioplanes to train American antiaircraft gunners.[15] The use of UAVs was so widespread during WWII that the AAF created the Pilotless Aircraft Branch in 1945 to continue post-war development of cruise missiles and target drones, including Radioplane's target drones and the Ryan Aeronautical Q-2. The latter, a jet-propelled, subsonic target drone for anti-aircraft and air-to-air gunnery practice, was the progenitor of a series of Ryan Aeronautical Firebee drones that would serve as a reconnaissance workhorse in the Vietnam War, as discussed below.[16]

While target practice was the primary use of UAVs in WWII, efforts also continued to develop unmanned bomber technology. In June 1944, then-Maj. Gen. Arnold, now commanding general of the AAF, got a call from then- (temporary) Maj. Gen. Carl A. Spaatz, the chief of the AAF Combat Command in Washington DC, seeking an effective solution to destroy hardened German "V" weapon sites and the Pas-de-Calais electrical grid. Manned bombers did not carry a sufficient explosive load to do the job effectively, but unmanned bombers, including old B-17 Flying Fortresses and B-24 Liberators, might be more effective if they were filled with explosives and flown directly into the target.[17] The Navy partnered with the AAF on the War Weary bomber project, which the AAF codenamed "Aphrodite." In the end, a combination of fatalities among the pilots who had to bail out of the explosive-laden bombers, as well as misgivings about targeting accuracy, led to the cancellation of the short-lived program.[18]

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[15] McDaid and Oliver (1997) 16
[16] Clark (June 1999) 17
[17] Crane (1993) 78-79; Boyne (Nov. 2010) 86-88
[18] Crane (1993) 78 and 84-85

Cold War Reconnaissance: Figuring Out How to Manage Drone Development

As the Cold War dawned, it was becoming increasingly apparent that the US needed to prepare for the possibility of nuclear war with the Soviet Union. Recognizing the need for a reliable way to conduct peacetime reconnaissance of communist states, the US began to fly U-2 surveillance missions to assess the Soviets' missile capabilities in July 1956.[19] But after the Soviets shot down U-2 pilot Gary Powers on May 1, 1960, President Dwight Eisenhower halted the CIA-owned, USAF-operated U-2 flights over the Soviet Union.[20]

The US now faced a serious gap in its strategic reconnaissance capability. It would be eighteen months before the first US reconnaissance satellite would be operational, and the development of the manned, stealthy, high-speed CIA/USAF SR-71 Blackbird had just begun. It was the perfect time for UAVs to step into a three-way competition with satellites and manned aircraft to provide a strategic reconnaissance capability.[21] The days of using drones mostly for target practice and one-way suicide missions were coming to an end, giving way to a growing recognition that the technology existed to produce recoverable drones for aerial reconnaissance.

On July 9, 1960, the USAF awarded Ryan Aeronautical a small classified contract for a program known as "Red Wagon" to explore opportunities to reduce the radar cross section of its Q-2C Firebee target drone for reconnaissance flights over communist territory.[22] After a successful demonstration, however, the USAF rejected two Ryan bids for follow-on production of drones built for the strategic reconnaissance role between 1960 and 1962: a $50 million contract for a follow-on production effort also called "Red Wagon" and a $70 million contract for another production run codenamed "Lucy Lee."[23]

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[19] Taubman (2003) 183-184
[20] Taubman (2003) 314-315
[21] Wagner (1982) ix
[22] Wagner (1982)15
[23] Wagner (1982) 16-17 and 21

Fortunes for UAV funding would begin to shift in September 1961 when the Eisenhower administration established the National Reconnaissance Organization (NRO) to streamline overhead reconnaissance efforts.[24] Although the NRO was created mainly to corral satellite programs, the agency's "Program D" was established to pay for both unmanned reconnaissance aircraft and also manned versions including the U-2 and SR-71. Going forward, the USAF's UAV development efforts could be pursued without affecting the service's own budget, enabling the USAF to develop drones without financial constraints through the 1960s and 1970s.[25] This extra funding source would remain available until 1974 when the NRO closed Program D.[26]

The first major USAF UAV to benefit from NRO funding was the 147A Firefly, another modified version of Ryan Aeronautical's Q-2C Firebee. The USAF awarded a $1.1 million contract to the company in February 1962 for four drones, using the USAF's Big Safari office as a conduit.[27] Big Safari, which would later play a major role in Predator development, was established in 1952 as a means to rapidly acquire small fleets of highly classified weapons systems.[28]

The 147A Firefly found a home in Strategic Air Command (SAC), where it would stay until 1976 when Tactical Air Command (TAC) took control of the USAF's drone programs.[29] Variants of the Firefly family — known as "Lightning Bugs" after March 1963 when the code name was compromised[30] — became prized reconnaissance assets over Vietnam and China through the 1960s and 1970s. Standard Lightning Bug operations involved air-launching the drones from beneath the wing of a DC-130 Hercules airlifter. The drones were pre-programmed to fly a specified route before returning to a predetermined point for a parachute recovery.[31] Later models would use a mid-air recovery system (MARS) that

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[24] Berkowitz (Sept. 2011) 13
[25] Ehrhard (2010) 6
[26] Ehrhard (2010) 12; Berkowitz (Sept. 2011) 13
[27] Wagner (1981) 23
[28] Grimes (2014) 1-3
[29] Wagner (1981) 32
[30] Wagner (1981) 48
[31] Hall (Fall 2014) 24

employed a winch-equipped CH-3 manned helicopter to catch the drones while still in flight. [32]

The first mass production variant of the Lightning Bug was the 147B. The production run was prompted by the Soviet SA-2 shoot-down USAF Major Rudolph Anderson in a U-2 over Cuba on October 26, 1962.[33] The NRO immediately paid for nine 147B drones, modified to fly at altitudes of 62,500 feet to bring back high-resolution pictures covering large swathes of denied territory.[34] On December 20, 1963, the USAF approved an NRO-funded production order of 14 additional 147B aircraft. [35] As production increased, Big Safari opened its Detachment 3 Operating Location at Naval Air Station Point Mugu as a testing facility.[36]

Lighting Bug Missions over North Vietnam, China and North Korea

SAC's 147B Lightning Bug unit, part of the 4080th Strategic Reconnaissance Wing (SRW, renamed the 100th SRW In 1966) deployed to Kadena Air Base (AB) in Japan at the start of the Vietnam War in August 1964.[37] The Lightning Bugs flew missions along with manned U-2 aircraft over China and North Vietnam under the code name "Blue Springs," looking for signs of a military build-up in communist territory.[38]

In mid-November 1964, the Chinese Communists announced they had captured a downed 147B, which went on display in Beijing. But 147B missions continued unabated.[39] In fact, as the Chinese began to introduce high-altitude SA-2's in North Vietnam in early 1965, the 147Bs took full responsibility for all high-altitude photoreconnaissance missions over the territory, leaving the U-2 to fly in

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[32] *ibid*
[33] Taubman (2003) 328
[34] Wagner (1981) 42
[35] Wagner (1981) 50
[36] Grimes (2014) 232
[37] Wagner and Sloan (1992) 2
[38] Ehrhard (2010) 9; Peebles (1995) 91
[39] Wagner and Sloan (1992) 3

safer airspace outside North Vietnam where they conducted signals intelligence (SIGINT) missions. [40]

The Lightning Bugs experienced initial losses due to rocky parachute recoveries, but by 1966 the situation improved with the introduction of MARS.[41] Around this time, the Microwave Command Guidance System was also introduced to allow airborne remote control operators in the DC-130 and ground recovery officers to take over and fly the drone manually in an emergency.[42] Because this system provided a means to allow for real-time flying by ground-based operators, drones increasingly became known as "remotely piloted vehicles" (RPVs). [43]

SAC's 100th SRW flew 78 missions with the 147B before expanding its inventory of Lightning Bug variants in the late 1960s and early 1970s.[44] Aside from the high altitude types like the 147B, there was also a series of short-wing RPVs programmed to conduct photoreconnaissance at altitudes between 500 and 20,000 feet to avoid SAMs and cloud cover during monsoon season. Later models, equipped with improved engines, guidance systems, and barometric altimeters for low-level navigation, performed missions ranging from photographic intelligence to SIGINT and leaflet dropping.[45] Some also served as decoys to distract SA-2s from high-altitude RPVs, and others provided suppression of enemy air defenses through radar jamming and chaff dispensing.[46]

In anticipation of growing Lighting Bug production rates, the USAF transferred management responsibility from Air Force Logistics Command's Big Safari to the standard acquisition channels of Air Force Systems Command (AFSC) in 1969.[47] While standard acquisition procedures slowed the development process, NRO money kept USAF RPV programs thriving until 1974.[48] Also that

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[40] Peebles (1995) 95-96
[41] Hall (Fall 2014) 24-25
[42] Wagner (1981) 73; Grimes (2014) 242
[43] Ehrhard (2010) 20
[44] Wagner and Sloan (1992) 3
[45] Hall (2014) 23-24
[46] Peebles (1995) 97-98; Newcome (2004) 86
[47] Wagner (1981) 146
[48] Ehrhard (2010) 12; Berkowitz (Sept. 2011) 13

year, Teledyne bought Ryan Aeronautical, and the company became Teledyne-Ryan Aeronautical (TRA).[49]

One of the most notable Lightning Bug operations to take place after the management transition to AFSC was known as "Combat Dawn." After North Korean fighters shot down an EC-121 Super Constellation SIGINT plane over the East China Sea on April 18, 1969, killing the crew of 30, SAC grounded manned aircraft in the area and substituted high-altitude Lightning Bugs carrying SIGINT packages.[50] From 1969 to 1975, these RPVs flew through lethal airspace to collect radar data from targets in North Korea and China. [51]

Starting in the late 1960s, high-altitude strategic reconnaissance RPVs began to fall out of favor as costs grew and as the RPVs became more vulnerable to increasingly long-range Soviet SAMs. The USAF shifted its focus to the development of cheaper low-altitude RPVs that could fly below Soviet SAMs and bad weather to capture high-resolution images over North Vietnam. Of the 340 RPV missions launched in 1968, 205 were conducted by low-altitude 147S variants.[52] In January 1969, Ryan Aeronautical introduced the 147SC "Buffalo Hunter" RPV, which featured a radar for improved navigational accuracy and a camera for higher-resolution images.[53] During Linebacker I, a 1972 air interdiction campaign to cut off Vietnamese supply lines, the 147SC provided photoreconnaissance of bridge repairs in Viet Cong territory.[54] During Linebacker II, an attrition campaign to end the Vietnam War, over 100 Lightning Bug missions were flown, mostly to conduct bomb damage assessment following B-52 Stratofortress bomber strikes. [55]

Manned flights were suspended over Vietnam in 1973, but RPV reconnaissance missions continued for five weeks after the fall of Saigon on June 3,

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[49] Wagner and Sloan (1992) 11
[50] Wagner (1981) 166-172 and Hall (Fall 2014) 25
[51] Ehrhard (2010) 12; Wagner (1981) 167; Hall (Fall 2014) 25
[52] Peebles (1995) 105
[53] Elder (1973); Peebles (1995) 105
[54] Peebles (1995) 110
[55] Peebles (1995) 111

1975.[56] Over 1,000 147 Lightning Bug variants flew a total of 3,435 operational reconnaissance sorties in Southeast Asia between 1964 and 1975.[57] Despite their operational success, however, all of SAC's surviving 147 RPVs were placed in storage after the 100th SRW returned to the US in 1975. Shortly thereafter, SAC consigned all of its RPV responsibilities and assets to TAC.[58]

Attempts to develop high-altitude strategic reconnaissance RPVs that would be less vulnerable to SAMs also fell by the wayside by the mid 1970s. These contractor-driven efforts aimed to develop stealthy RPVs that flew fast and high enough to evade Soviet SAMs and spy on China's remote, secret nuclear test facilities. Lockheed Martin's D-21 Tagboard and follow-on Senior Bowl efforts, developed with NRO funding and USAF support, involved launching a stealthy RPV from aircraft: first, from an SR-71 flying at supersonic speed, and, when that effort failed, from a subsonic B-52.[59] TRA successfully pitched a similar NRO-funded, USAF supported effort, Compass Arrow.[60] These programs were cancelled by 1972, however, because they failed to compete with satellites and lost relevance following President Nixon's rapprochement with China in the early 1970s.[61]

RPVs in the Post-Vietnam Era

As the USAF shifted focus to the European Central Front in the early 1970s, the service decided that strategic reconnaissance drones warranted more consistent support than they had previously received. The increasing sophistication of Soviet SAMs pushed U-2s to the limits of their flight envelope, and imagery from satellites was limited by their position in orbit at any given time. In part due to these constraints, an effort emerged to develop "pseudolites" — high altitude, long-endurance drones, including Compass Dwell and Compass Cope, that would take

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56 Hall (1995) 26
57 Wagner and Sloan (1992) 3
58 Hall (Fall 2014) 26
59 Rich (1994) 262-270
60 Wagner and Sloan (1992)38
61 Wagner and Sloan (1992) 46-47; Peebles (1995) 130-131; Ehrhard (2010) 11

off and land like a conventional manned aircraft.[62] Their mission was to conduct photographic surveillance and electronic eavesdropping missions over the borders of Warsaw Pact nations. [63] As a cost-saving measure, the contracts were competitively bid through AFSC's traditional acquisition process, although Compass Dwell was still paid for with NRO money while Compass Cope got money from the National Security Agency.[64]

The USAF terminated Compass Dwell in 1973 because of concerns about European air traffic control allowing the UAV to fly in commercial airspace, and also because the aircraft's 40,000 foot ceiling was insufficient to avoid SAMs.[65] Compass Cope, which was designed to accommodate a USAF targeting system, the Precision Location Strike System (PLSS), was terminated in July 1977 because the PLSS got so heavy that the Compass Cope could no longer carry it and still meet its altitude requirements to stay above SAM engagement zones.[66] TAC, which had assumed control of all USAF UAV programs in 1976, argued that European air congestion remained a hurdle, although USAF headquarters reported that several European nations felt Compass Cope could be integrated into their air traffic control systems "without major problems."[67]

By the mid-1970s, the USAF found itself in the midst of a series of changes that significantly diminished the prospects for RPV development. In 1974, the NRO stopped paying for the USAF's RPV programs, shifting its focus exclusively to satellites.[68] In 1976, the Vietnam drawdown forced all major commands to cut their budgets by 10 percent. [69] In part because of these developments, TAC requested that all USAF RPV operations be terminated, resulting in the deactivation of TAC's 11th Tactical Drone Squadron on April 1, 1979. [70]

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62 Newcome (2004)101
63 Ehrahrd (2010 32; Wagner and Sloan (1994) 110
64 Ehrhard (2010) 32; Newcome (2004) 102
65 Ehrhard (2010) 32 and DARO (1994)
66 DARO (1994)
67 GAO (1977) 5
68 Ehrhard (2010) 12; Berkowitz (Sept. 2011) 13
69 Hall (Fall 2014) 26
70 Hall (Fall 2014) 26-27

From TAC's perspective, it was unclear that RPVs could meet the challenges of a changing threat environment, competition from manned aircraft and satellites, and an austere budget environment. TAC briefly explored the possibility of developing RPVs for use in the event of a nuclear war with the Soviet Union. But its main effort, the BGM-34C Multi-Mission RPV, a Lighting Bug variant designed for missions ranging from air-to-ground strikes to reconnaissance, was cancelled by the USAF in 1977 [71] after a USAF- Army panel questioned its high costs and limited capability given Europe's cold, cloudy weather, air congestion issues and arms treaty limitations. [72] By 1979, the USAF had dropped ongoing UAV operations, closed TAC's UAV unit, and cancelled all its major UAV projects. Frustrated with the military's perceived lack of interest in RPV programs, the US Congress cut all production and most RPV development money for fiscal years 1978 through 1982.[73]

UAVs in the 1980s

Ehrhard refers to the USAF's lack of UAV development during the 1980s as a "UAV hiatus" invoking the new term for unmanned systems that emerged during this decade.[74] The USAF would not become involved in UAV projects again until the mid-1980's, and even then it would play a secondary role to other agencies funding UAV programs. The USAF's first 1980s foray into UAV development was the Advanced Airborne Reconnaissance System (AARS), a classified stealthy UAV project that began in 1983 or 1984 after the NRO decided to revive the UAV business and provide funding.[75] AARS was envisioned as another "pseudolite" designed to loiter for long periods while tracking the movements of the Soviet Union's mobile nuclear missile launchers.[76]

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[71] Wagner and Sloan (1992) 107
[72] Ehrhard (2010) 36
[73] Krebs (April 1979) 1
[74] Ehrhard (38) 2010
[75] Ehrahrd (2010) 15 Sweetman (Sept. 2015)
[76] Ehrhard (2010) 13-17; Sweetman (Sept. 2015)

The USAF's second 1980s UAV project, the Medium-Range UAV (MR-UAV) began in 1985 when the Joint Staff directed the USAF and the Navy to work together on a stealthy Lightning Bug variant with a data link for real-time data transmission. The USAF was only responsible for the sensor package, the Advanced Tactical Airborne Reconnaissance System (ATARS), which could also be used on its manned RF-4 Phantom reconnaissance aircraft.[77]

Both AARS and the MR-UAV were transferred to new congressionally mandated central management organizations in 1989. AARS moved into the Airborne Reconnaissance Support Program (ARSP) within NRO, and the MR-UAV moved under the Pentagon's new UAV Joint Program Office (JPO).[78] But both programs were cancelled in the early 1990s after failing to survive post-Cold War budget pressures. AARS suffered from major cost growth, and the USAF's portion of the MR-UAV, the sensor package known as ATARS, also suffered from cost increases and did not fit properly on the MR-UAV. [79]

Frustrated with the failure of UAV programs during the 1980s, the US Congress launched another more dramatic effort to centralize UAV development in a new Pentagon organization called the Defense Airborne Reconnaissance Office (DARO) in 1993. That agency, along with the JPO, would use its power and budget authority to spur the USAF to develop its most operationally successful UAV of all time: the RQ-1 Predator.

Reflecting on the USAF's history with unmanned aircraft, it is clear that changes in the threat environment, cost growth, the loss of NRO funding, and technological challenges all contributed to the USAF's fitful approach to UAV development. Indeed, the USAF was the only military service to enter the Persian Gulf War in late 1990 without its own operational UAV.[80] But how determined was the USAF to overcome these external challenges? The four questions below aim to

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77 Ehrahrd (2010) 41
78 Ehrhard (2010) 15; Sweetman notes (Sept. 2015); Ehrhard (2010) 41
79 Ehrhard (2010) 43;
80 Ehrhard (2010) 42

answer that question by exploring how USAF culture shaped its attitudes toward UAV development between 1917 and 1993.

1. To what extent did individuals or groups within the USAF resist UAV innovation out of a concern that their jobs or status might be threatened by it?

Even in the early post-WWII period, airmen displayed a tendency to minimize technologies that potentially challenged the central role of manned aircraft and manned aircraft pilots in airpower doctrine. The USAF's manned aircraft pilot community, which has historically dominated uniformed leadership positions,[81] sought to preserve their dominance by promoting pilots to the exclusion of other career fields. When then-retired Gen. Arnold asked his son to transfer from the Army to the USAF not long after WWII, he balked because he felt his promotion prospects as a trained missileer would be grim. "I realized right then that my career was going to be definitely limited," recalled Bruce Arnold. "This really is, I think the pilot/silver wings syndrome…which really determines the leadership of the Air Force. There are very, very few people that can get into that very special elite society of pilots unless they wear those wings." [82]

Further indications that the USAF's promotion structure favored manned aircraft from the earliest days can be seen in the views of the USAF's research and development leadership at the time. Before he retired, Gen. Arnold created a Scientific Advisory Group (later known as the Scientific Advisory Board) to make recommendations for improving technological innovation in the USAF. In a 1949 report, the group called for "equal promotion rates for technical personnel and regular flying airmen." A prophetic note in the margin of the report written by General Benjamin W. Childlaw, commander of Air Material Command, reveals the extent to which the USAF's pilot leadership fended off efforts by other career fields

[81] For an overview of the USAF's transition from bomber pilot dominance to fighter pilot dominance, see Worden (March 1998).
[82] Yenne (2013) 283-284

to seek leadership positions. "Very doubtful point," he wrote." Perhaps I am a pessimist but I'll never live to see equal recognition." [83]

Post-WWII Drones: Bias in the Fighter and Manned Reconnaissance Communities

Not surprisingly, given their desire to maintain their chokehold on leadership positions, the USAF's pilot community viewed unmanned technologies with strategic potential as a significant threat.[84] Chapter one discussed how the bomber generals, who dominated the USAF until the Vietnam War, saw ICBMs as a challenge to their jobs and status. Similarly, the fighter generals who began to replace the USAF's bomber leadership during the Vietnam era saw UAVs as potential competition to manned aircraft, and, consequently, their preeminent status in the USAF.

Evidence of the USAF pilot leadership's cultural preference for manned aircraft surfaced during the funding debate over "Red Wagon" and "Lucy Lee." In his book on Lightning Bug drones, William Wagner argues that both programs fell victim to an internal struggle within the USAF between supporters of the reconnaissance drones and supporters of the manned SR-71. Lieutenant Colonel Lloyd Ryan, the deputy in the USAF Headquarters Reconnaissance Division, told Wagner that SR-71 supporters within USAF leadership felt threatened by the reconnaissance drones. "It was a problem to explain that a low-to-medium altitude unmanned drone system was not in competition with the big, fast, high altitude piloted airplane — that it really constituted one of several capabilities the Air Force should have and should continue to develop."[85]

The USAF's rising fighter pilot leadership also felt threatened by the emergence of drones. In the spring of 1962, Lt. Col. Ryan, still working for the USAF's Reconnaissance Division, asked Gen. Walter C. Sweeney, the commander of TAC, if he would be willing to assume operational control of the Ryan Aeronautical

[83] Quoted in Beard (1976) 111
[84] Perry (1967); Sheehan (2010); Beard (1976); Builder (1994); Werrell 1985
[85] Wagner (1981) 16

147A for tactical reconnaissance missions. The general "wanted no part of unmanned aircraft," Lt. Col Ryan recalled.[86] One participant at the briefing recounted a less diplomatic response from Gen. Sweeney, who reportedly ended the meeting by saying: "When the Air Staff assigns eighteen-inch pilots to this command, I'll reconsider the issue!"[87] TAC did not embrace the reconnaissance drones until 1976, when it saw them as a means to overtake the dominant bomber community, as discussed in Question 4.

The USAF's manned reconnaissance aircraft community also saw drones as a direct threat. U-2 pilots did not welcome the introduction of the first operational reconnaissance drone, the 147B, which was rushed into service in response to the shoot-down of Maj. Anderson, the U-2 pilot, over Cuba. Lt. Col. Fred Yochim, deputy of Big Safari's System Program Office for drones, said that buried beneath U-2 pilots' concerns about the military potential of drones was a fear that the drones *would* be technologically sound enough to replace manned aircraft. That might mean the elimination of their jobs as manned aircraft pilots, leaving the reconnaissance mission to the low-status drone operator. "There was real resistance on the part of the manned recon troops," recalled Lt. Col. Yochim. "The initial, first reaction of people getting flight pay was that they didn't believe the technology was that good, and secondly – perhaps subconsciously – they felt they were being threatened." [88]

Manned reconnaissance pilots feared a loss of prestige should they become drone operators because they saw drones as inferior systems. The 100th SRW, the SAC wing that deployed the Lightning Bug during its first operational missions over China and North Vietnam, consisted of both a drone squadron and a U-2 squadron. SAC officers assigned to the drones were dismissed as the "Bug" section of the wing and did not have their own squadron, nor the status or pay associated with it.[89] Maj. Jay Merz, described what it was like to be a SAC officer involved in

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[86] Wagner (1981) 32
[87] Hall (2014) 23
[88] Wagner (1981) 50
[89] Wagner (1981) 113

ground-based drone recovery operations. The job was not glamorous, but the responsibility was great. The only time he did any flying was via the Microwave Command Guidance System in the event of an emergency:

> *He is an Air Force pilot who never flies a flight plan. He's not allowed to pre-flight his airplane. He never gets to strap in. They won't allow him to start the engine. He never sees a cheerful thumbs up from his crew chief. He never gets to taxi. Nobody will fly with him. He's never permitted to make a takeoff or landing. He never gets to hear the reassuring roar of his engine. He can't even raise and lower the gear. He's not allowed to look out the windows. He only gets to fly when there's a problem or he's running out of gas. But you let one little thing go wrong and we confiscate his tapes, drag out the manuals, and hang the guilty bastard!"*[90]

In some cases, drone advocacy cost USAF officers their jobs. Bob Reichardt, Ryan Aeronautical's manager of all drone programs, recalled that Col. Ellsworth Powell, who held a number of SAC leadership positions in the 1960s, stalled his career due to his support of Lightning Bug programs. "I would venture his total commitment to drones may have cost him a general's star," said Reichardt. "He just lived and breathed drones." [91]

USAF Attitudes Toward RPVs in the Post-Vietnam Era

Once responsibility for drone programs transferred from SAC to TAC in 1976, the command found itself having to make a strong case for continued drone development in the midst of a post-war budget crunch and the 1974 loss of NRO funding. But many outsiders felt that TAC 's drone advocacy was halfhearted. The US General Accounting Office (GAO) issued a report in 1981 noting the decline of RPVs in the USAF coincided with the transfer from SAC to TAC. [92] Funding and manpower allocations decreased at the time of the power transfer, and TAC did little to keep the momentum going. After interviewing a variety of "RPV experts" – to be sure, many of them with their own bias in favor of RPVs – GAO concluded

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[90] Wagner 81.
[91] Wagner (1981) 150
[92] GAO (July 22, 1981) 5

that the principle reason for the lack of TAC support was a "pro-pilot bias" rather than concerns about the cost or potential of RPVs. The bias led to a "general reluctance to replace a known quantity [manned aircraft] with an unknown [RPVs]," and created a perception that RPVs were "drab or unexciting compared to manned aircraft." [93]

Similar concerns about a pro-pilot bias in TAC leading to the demise of RPVs in the late 1970s were expressed by Republican Senator John J. Tower, who told an RPV symposium in 1978 that he believed manned aircraft would always win over RPVs in a contest for limited funds, due to cultural bias: "I do not think that the Air Force will give up funds for tactical aircraft even though that would provide a greater number of strike RPVs," he told the symposium audience. "I say this because tactical air forces are structured around man, the pilot, and that is not likely to change for the indefinite future."[94]

One other bias that contributed to the decline of RPVs in the USAF in the late 1970s relates to reconnaissance assets. Even Ehrhard, who argues that pro-pilot bias had nothing to do with the decline of RPVs in the USAF, concedes that there was a bias within TAC against reconnaissance, the primary RPV mission during the Vietnam War, and that this likely contributed to the demise of RPVs in the 1970s.[95]As Gen. Robert T. Marsh, the commander of AFSC in the early 1980s, explained to Ehrhard: "Tactical recce is like electronic warfare (another Firebee mission) – when we're at war, everyone wants it, but in peacetime, nobody wants it."[96]

From the earliest days of airpower, USAF outsiders have surmised that the service's manned aircraft pilot leaders have viewed alternatives to manned aircraft as a threat to their jobs and status. This view manifested itself in the leadership community's attempts to preserve promotion slots for manned aircraft pilots, its

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[93] *ibid*
[94]Krebs, (April 1979) 59.
[95] Ehrhard (2010) 45-46
[96] Ehrhard (2010) 46

reluctance to adopt UAV technology during peacetime, and its perception of drone operators as having lower status than manned aircraft pilots.

2. To what extent were judgments about the potential and cost effectiveness of UAVs based on the USAF's enthusiasm for employment new technology and to what extent was the enthusiasm outside the service?

During the era of the world wars, airmen publicly pinned their hopes for an independent air service on a doctrine built around the use of the manned bomber. The doctrine reflected a deeply engrained preference for manned aircraft discussed in Question 1. But there were two visionary airmen, Gen. Arnold and Brig. Gen. Mitchell, who were willing to look beyond existing doctrine and cultural mores to recognize the potential for unmanned systems to expand the scope and legitimacy of air weapons. [97] In their leadership positions, they were able to draw attention to unmanned technologies even as the rank-and-file in the air service and the American public focused on manned aviation.

Brig. Gen. Mitchell was a comprehensive airpower advocate willing to look beyond manned flight to see the potential benefits of UAVs. His unsuccessful bid to employ aerial torpedoes in his aircraft-versus-battleship tests in 1923 suggested that he cared more about demonstrating the strategic potential of airpower rather than any specific commitment to daylight strategic bombing doctrine or the manned bombers and pilots needed to implement it."[98]

Later, during the interwar period, then-Maj. Gen. Arnold even more directly questioned whether USAF doctrine required a focus on only manned aircraft. His 1938 proposal for an improved Bug, the GMA-1 came with a concept of operations that directly challenged the Army Air Corps' strategic bombing doctrine, built

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[97] Schultz (2007) 194
[98] Schultz (2007) 199

around the manned bomber.[99] He envisioned the improved Bugs flying in large numbers over enemy territory, each carrying about 800 pounds of explosives for a cost of between $800 and $1000 per aircraft. In contrast, he estimated that a four-engine heavy bomber would cost $200,000 for a medium size and $400,000 for a large size. Reflecting on the decision to pursue the Bug, Gen. Arnold said he recognized he was suggesting an alternative to the very doctrine around which the AAF was building its case for independence. "I now had to decide whether the four-engine bomber, and the whole bombardment program we had worked toward for so many years, should take second place in favor of something else," he wrote in his book, *Global Mission.*[100]

Ultimately, even then-Maj. Gen. Arnold's enthusiasm for the technology could not overcome the simple fact that the Bug lacked the range to reach Germany.[101] But the Bug's failure did not stop him from continuing to advocate for unmanned technologies, even when the technology was not quite ready. The War Weary program was nicknamed "the Old Man's Baby" in honor of then-Maj. Gen. Arnold's unflagging support despite the program's record of killing aircrews, its ineffectiveness against heavily defended targets, and its lack of navigational accuracy.[102]

Then-Maj. Gen. Arnold's willingness to embrace unmanned technologies was particularly bold given that UAVs, while being unpopular among airmen, were also relatively unknown to the American public. Supporting unmanned technology was not likely to bolster the case for an independent air force, given that Americans hardly paid attention to drones through the end of WWII. There were enthusiasts, including British actor Reginald Denny, who started his own successful target drone company, Radioplanes.[103] By and large, however,

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[99] Schultz (2007) 205-207
[100] Arnold (1949) 259-261
[101] Arnold (1949) 260-261
[102] Crane (1993) 82
[103] Newcome (2004) 58

Americans during this time were preoccupied with by the image of the manned aircraft pilot, willing to put his life on the line. [104]

Despite these challenges, Gen. Arnold's advocacy ensured that UAVs were not completely forgotten after he retired. He articulated a broad view of airpower theory that provided a rationale for a generation of airmen to fight for control of pilotless aircraft during the struggle for USAF independence and, later, to insist on integration of the ICBM into the USAF. "We have just won a war with a lot of heroes flying around in planes. The next war may be fought by airplanes with no men in them at all," he declared at the end of WWII. "Take everything you've learned about aviation in war, and throw it out the window, and let's go to work on tomorrow's aviation."[105]

Post-WWII Drone Programs: Conflicting USAF Views of Potential

While Gen. Arnold's vision had a profound impact on ICBM development, his influence on UAV innovation was less enduring. His handpicked protégé, then- Col. Bernard Schriever, played a central role in ICBM institutionalization, but there was no standard bearer for UAV technology after Gen. Arnold retired.[106] It was left to mid-level officers in the Air Staff's Reconnaissance Division to maintain support for UAV innovation. Notably, Col. Harold Wood and his deputy in the Reconnaissance Division at USAF Headquarters, Lt. Col. Ryan, were enthusiastic drone supporters because of their potential to reduce aircrew risk (discussed in Question 3). To keep drone programs moving forward, they took advantage of the fact that the reconnaissance division had "carte blanche" to go outside normal USAF procedures and access high levels of the US government.[107]

The Reconnaissance Division turned to Big Safari, supported by NRO funds, to develop the Ryan Aeronautical 147A. Operating under an ethos that

[104] See, for example, Franklin (2003) 336
[105] Quoted in Barclay (July 29, 2015)
[106] Taubman (2003) 52-53
[107] Wagner (1981) 50

prized building equipment quickly, Big Safari was able to deliver an operational 147A just 91 days after a contract was awarded.[108] While Big Safari was not a drone advocacy organization per se, its rapid acquisition processes would facilitate the development of a variety of USAF drone programs, eventually to include the Predator.

The Reconnaissance Division approached Big Safari to develop the 147A as a means to avoid the Air Staff. In addition to the cultural preference for manned aircraft discussed in Question 1, the Air Staff also suffered from a fear of the unknown. Their regimented acquisition procedures, which included a complex approval chain, provided plenty of opportunities for risk-averse senior leaders to say "no" to drone contracts.[109] Even after Big Safari developed the 147A, the Air Staff demonstrated "a great reluctance to deploy the system" due to "the unknown nature of just how good it would be" and a concern about exposing the technology to the Soviet Union before it was really needed, according to Lt. Col. Ryan.[110]

Outside the USAF, support for post-WWII drone programs was more consistent, although the programs were still so classified that widespread congressional and industry support was not yet forthcoming. [111] The NRO, which funded these programs, was created by the Kennedy administration with no input from the US Congress. Until the 1970's, only a handful of lawmakers on the House and Senate defense and appropriations committees knew about the NRO's existence and funding, and asked few questions.[112] Even so, there was still significant external advocacy for USAF drone programs among a small group of drone manufacturers and the NRO.

At the center of industry support was Ryan Aeronautical, which had released an optimistic press release about using drones for tactical reconnaissance as far back as 1955.[113] After the USAF's Reconnaissance Division indicated interest

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[108] Wagner (1981) 23
[109] *ibid*
[110] Quoted in Wagner (1981) 50.
[111] Krebs (April 1979) 22-24
[112] Laurie (June 2001) 10-14
[113] Wagner (1981) 8

in a reconnaissance drone in late 1959, the company assembled a group to start pushing the project, despite the lack of a contract guarantee from the USAF.[114] Knowing that "Red Wagon" and Lucy Lee" were ambitious and costly programs, Ryan Aeronautical was ready to give the USAF's Reconnaissance Division a more modest proposal to modify the Q-2C Firebee, which ultimately resulted in the Big Safari contract for the 147A.[115]

The Vietnam Drone Build-Up: Conflicting USAF Views Persist

By the time the Vietnam War started, the USAF's Reconnaissance Division had managed to locate another drone advocate within the USAF's acquisition apparatus. Col. Powell, then the head of SAC's Reconnaissance Division, played a central role in convincing SAC to take on the 147A after both SAC and TAC initially rejected it.[116] He was also instrumental in the development of low-altitude variants of the Lightning Bug, [117] So important was Col. Powell's influence on expediting drone operations that Robert Schwanhauser, the head of Ryan Aeronautical's Lightning Bug operations, cited Col. Powell's retirement as one of the major reasons that AFSC was able to wrest control of drone programs from Big Safari in 1969.[118]

Even if there were elements of AFSC that were enthusiastic about the cost and potential of drones, the agency's regimented, risk-averse acquisition procedures tended to stifle drone innovation. The transition of drone programs to AFSC was positively portrayed in the media as a sign that the USAF was taking drones seriously and wanted to expand their use and the variety of contractors able to compete for drone projects.[119] But many already involved with drone programs saw the move as a mistake. AFSC's risk aversion was so culturally engrained that there was no room for flexibility, even in response to combat needs.

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114 Grimes (2014) 230
115 Wagner (1981) 22
116 Wagner (1981) 38
117 Wagner (1981) 93 and 110
118 Wagner (1981) 146
119 Miller (Nov, 9, 1970) 47

Ryan Aeronautical contractors and SAC drone operators felt that drone management had suffered under standard acquisition procedures, leading to delays in the deployment of drones to combat.[120] Even after AFSC took charge, USAF drone advocates continued to look for ways to bypass it. In the fall of 1969, mid-level officers went directly to Brig. Gen. Doug Steakley, responsible for reconnaissance on the Joint Staff, to expedite the deployment of the 147T, a high-altitude SIGINT Lightning Bug variant, in the wake of the EC-121 shoot-down off the North Korean coast.[121]

Even the USAF's most ambitious drone programs of the 1960s, developed with NRO funding outside normal acquisition channels, suffered from the USAF's highly regimented acquisition procedures. Lockheed Skunkworks president Kelly Johnson claimed that the D-21 Tagboard failed because uniformed USAF officers, following USAF maintenance rules, disassembled the aircraft several times over the course of nine months at Beale AFB in California prior to the test flights.[122] Similarly, Ryan Aeronautical complained that the Compass Arrow suffered from over-management from the Pentagon, AFSC, and SAC.[123]

The Vietnam War: Growing USAF Support for RPVs

As the Vietnam War progressed, RPV development accelerated as the USAF gained confidence in their combat effectiveness. In 1966, Dr. Eugene Fubini, Assistant Secretary of the USAF called a 147E electronic signals mission that successfully collected fuzing data on the SA-2 "the most significant contribution to electronic intelligence in the last 20 years."[124]

Appreciation of the RPVs' military potential also began to increase among TAC officers as the war continued. Gen. John D. Lavelle, the commander of the 7th Air Force, which controlled all tactical air forces in Vietnam, asked SAC for more

[120] Grimes (2014) 243
[121] Wagner (1981) 165-166
[122] Rich (1994) 269-270
[123] Wagner and Sloan (1992) 39040
[124] Wagner (181) 102

drones in 1971 on the basis that they are the "vehicle most effective under Northeast Monsoonal conditions."[125] Assessing the 147SC Buffalo Hunter's performance in Linebacker II, Gen. Lavelle's replacement, Gen. John Vogt, said it did a much better job at bomb damage assessment than the SR-71. "The high altitude airplanes such as the SR-71 and our own tactical reconnaissance, which fly at altitudes considerably higher [than an RPV], are not capable of doing this particular job…Buffalo Hunter was extremely valuable to us during the intense combat period in December."[126]

Outside the USAF, support for RPVs expanded following the release of a 1970 report written by AFSC in partnership with RAND, a federally funded research center. The report found that RPVs were technologically feasible for roles ranging from air-to-air combat to logistics and resupply.[127] On the heels of the RAND report, John S. Foster, the Pentagon's chief weapons officer from 1965 to 1973, directed another Pentagon organization, the Defense Advanced Research Projects Agency (DARPA), to start working on RPVs. In an era of post-Vietnam budget pressure, Foster made the case that RPVs were truly a cheaper alternative to manned aircraft for many missions.[128] He turned to DARPA, whose mission is to develop risky technologies that the military services cannot or will not fund, to make it happen.

Buoyed by the claims of technological feasibility and reduced cost, the RPV industry formed the National Association of Remotely Piloted Vehicles (NARPV) in 1972 as an industry lobby group, now known as the Association of Unmanned Vehicle Systems International (AUVSI).[129]

The US Congress, too, slowly began to play a more active role in drone programs starting in 1974, when the USAF's RPV funding moved out of the NRO and into the USAF's budget. More generally, congressional interest in intelligence matters, to include previously classified drone programs, increased in the wake of

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[125] Elder (1973) 17
[126] Elder (1973) 30
[127] Ehrhard (2010) 30
[128] Ehrhard 2010) 29
[129] Wagner and Sloan (1992) 15-16

the Vietnam War, Watergate, and revelations of operational wrongdoing by the CIA in the 1960s and early 1970s.[130]

Post-Vietnam: Declining USAF Support for Drone Development

Inside the USAF, however, the percolating drone enthusiasm of the early 1970s began to wane as the decade came to a close. Drone advocates from the early years, like. Col. Wood and Lt. Col. Ryan, had retired, as had later advocates like John McLucas, the USAF secretary from 1973 to 1975. Because drone programs were kept secret within the USAF until the mid-1970s, there was no internal constituency to keep the programs going.[131] Even when these drone advocates were in power, they were never able to effectively articulate a strategic role for drones in the USAF in the same powerful way that Gen. Arnold had done during his career. " If there is no grand architectural design that's clear to advocates of RPVs, then it's hard to know where one fits," one USAF general remarked at a 1976 NARPV conference. "Consequently, there is slow acceptance of the technology into the operational inventory."[132]

US lawmakers tried to remain supportive of drone development, despite a feeling that the USAF — specifically TAC, which took control of RPVs after the Vietnam War —had failed to think strategically about the role of RPVs in the force structure as the strategic focus shifted to Europe's Central Front. When lawmakers de-funded all USAF RPV programs in 1977, they blamed the USAF for failing to manage the programs correctly. "The committee would… like to convey support for the requirement to have RPVs in our military inventory in view of their demonstrated performance in actual combat, " members of the House Armed Services Committee stated in a report accompanying the fiscal year 1979 budget. "The committee has been concerned over the decline in service support for these

130 Laurie (June 2001) 20
131 Wagner (1982) Forward; Krebs (April 1979) 24
132 Quoted in Krebs (April 1979)42

necessary systems that not only serve as force multipliers but in many instances perform those missions that greatly endanger pilots."[133]

Support for UAVs in the 1980s

Although lawmakers eliminated funding, they did not give up on UAV programs in the 1980s. After holding hearings to discuss the need to streamline UAV development, lawmakers centralized all Pentagon UAV programs under the UAV JPO in an effort to reduce cost by encouraging "commonality."[134] The NRO also remained a strong UAV advocate, funding the AARS program.

But the USAF remained pessimistic about the future of UAVs. Even when there was an apparent strategic purpose for a UAV program, it did not enjoy much support. The AARS, for example, might have functioned in the post-War environment as a long-loiter strategic surveillance asset, but no one in the USAF was very optimistic about its cost and potential. Dubious of its capacity to fly autonomously without a pilot having real-time control, the USAF insisted that the prototype carry a pilot to handle in-flight problems and that the production copy have an option for manned flight. [135] The AARS ultimately failed to move to full-scale development in 1991 because one of the AARS partners, likely the USAF, was reluctant to commit funding.[136] Asked about the prospect of an SR-71 follow-on such as AARS, USAF Chief of Staff Lawrence Welch said, "There are a couple programs…Frankly we have not found them too promising."[137] Ehrhard's analysis of the AARS demise provides the most telling indication that the USAF held excessively pessimistic views of AARS technology. In his view, a "combat pilot-led Air Force" simply could not trust a "risky unmanned surveillance program."[138]

[133] Quoted in Krebs (April 1979) 2
[134] Mosier (1988)
[135] Ehrhard (2010) 20
[136] Sweetman (Sept. 2015)
[137] *ibid*
[138] Ehrhard (2010 17

In conclusion, it is clear that the USAF was more willing to take risks on unmanned technology during wartime than during eras of relative peace. Also, leadership played an important role in determining the USAF's willingness to embrace unmanned technologies. Gen. Arnold's broad conception of airpower and powerful position in the service allowed him to effectively start several UAV programs. But later UAV advocates in the USAF's Reconnaissance Division lacked the authority and the vision to effectively advocate for UAV programs over the hesitance of TAC and AFSC, which tended to be far more risk-averse and wary of the cost and potential of UAVs.

3. To what extent were USAF judgments about the employment of UAVs driven by a desire to reduce risk to friendly personnel and to what extent was that push from outside the service?

Airmen recognized the potential of unmanned technologies to reduce aircrew risk during WWII. But on the whole, courage in the face of physical danger was expected from American and British bomber crews, and efforts to improve bomber aircraft were primarily aimed at improving military effectiveness, with aircrew risk being a secondary consideration.[139] Gen. Arnold's advocacy for unmanned technologies to reduce aircrew risk was a notable exception. As he weighed the costs and benefits of successors to the Kettering Bug, he remarked: "Much more important than any monetary factor was the possible saving in human life. "[140] This view was reflected in his advocacy for not only the Bug variants, but also the War Weary bomber program and the JB-2, a cruise missile.[141]

Outside the USAF, there is little evidence of pressure to develop technologies to reduce aircrew risk during the WWII period. This is likely due to the fact that, as noted by scholars including Jeffrey Record and Eric Larsen, the American public has historically accepted a large number of casualties when it

[139] Wells (1995)
[140] Arnold (1949) 260
[141] Quigg (2014) 55-56

perceives its vital interests are threatened, as was the case after the Japanese attack on Pearl Harbor.[142]

Dawn of the Cold War: Early Recognition of Drone Employment to Reduce Risk

Even before Gary Powers was shot down in 1960, two individuals in the USAF's Reconnaissance Division, Col. Wood and Lt. Col. Ryan, were already worried about the risks of using the U-2 for strategic reconnaissance.[143] Col. Steakley, who flew a B-29 adapted for aerial reconnaissance during WWII and later served as the Deputy Director of Reconnaissance for the Joint Chiefs of Staff (JCS), also made the case for reducing aircrew risk after the October 26, 1962 shoot-down of Maj. Anderson over Cuba.

In part due to these airmen's efforts — and in response to the shoot-downs —USAF outsiders increasingly came to realize the importance of drones as a means to reduce risk to aircrew. In a September 1961 memo, the Pentagon's chief weapons buyer, Harold Brown, cited the "immediate and urgent" requirement for drones to conduct reconnaissance of the Soviet Union and China. He noted that drones were preferable because they eliminated the political risks associated with downed aircrew.[144] Not long after, Ryan Aeronautical was able to win an NRO-funded Big Safari contract for the 147A. Then, in late 1962, Army General Maxwell Taylor, the JCS chairman, expedited the NRO's purchase of nine Ryan 147B high-altitude drones after Col. Steakley pointed out to the chairman that they could reduce aircrew risk.[145] The US government's growing concern with aircrew risk resurfaced again in late 1966 when Cyrus Vance, the Secretary of Defense, told Lockheed Martin to pursue the D-21 Tagboard and the follow-on Senior Bowl, because "our government will never again allow a Francis Gary Powers situation to

[142] Record (2002); Larsen (1996)
[143] Wagner (1981) 6-7
[144] Wagner (1981) 19-20
[145] Wagner (1981) 41

develop. All our overflights over denied territory will either be with satellites or with drones."[146]

The early 1960s also saw growing enthusiasm for drones as a means to reduce aircrew risk in private industry. Lockheed Martin pitched the D-21 Tagboard to the USAF after Skunkworks president Ben Rich convinced his predecessor, Kelly Johnson, that a drone "was the pragmatic solution to spying over extreme hostile territory without worrying about loss of life or political embarrassments of the Francis Gary Powers variety."[147]

The Vietnam War: A Growing Appreciation for Reduced Risk Inside and Outside the USAF

The capacity of drones to reduce aircrew risk, and, consequentially, political risk, became increasingly apparent to the American public in the mid-1960s during the 147B's "Blue Springs" missions over North Vietnam and China. While looking for signs of a communist military buildup, the first 147B was shot down over mainland China on November 16, 1964, followed by three more in early 1965. The Chinese Communist Party sought to portray the shoot-downs as a major victory, initially causing an uproar in the American press. But it died down quickly because the US government refused to confirm ownership of the drones. "The Chinese could claim whatever they wanted, but they didn't have a captured 'spy pilot' as evidence," said Wagner, a Ryan Aeronautical spokesman who wrote a history of 147 Lightning Bug drones.[148] The 147B had offered a means to conduct surveillance over China without risking the political embarrassment of a captured pilot.

Inside the USAF, the potential for drones to reduce risk to aircrew also gained appreciation during the "Blue Springs" operation. Even manned reconnaissance pilots, who were losing missions to Lightning Bugs, began to

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146 Rich (1994) 267
147 Rich (1994) 262
148 Wagner (1981) 74 and 78-79

appreciate the drones' risk-reducing benefits. Robert Schwanhauser, the top Ryan Aeronautical official deployed with SAC's 100th SRS at Bien Hoa AB in Vietnam, recalled the reaction of a U-2 pilot after flying alongside a Lightning Bug over a SAM site. "From his offset position, the U-2 pilot saw the Lightning Bug shot down," said Schwanhauser. "Back at the Officer's Club later at Bien Hoa, he told me how he watched the 'telephone pole' consume the drone. The rivalry stopped when he said, "from now on, you guys can have that mission.'"[149] Dale Weaver, a Ryan Aeronautical technician at Bien Hoa, said that after a U-2 was shot at over North Vietnam, he frequently heard pilots say they were happy to let drones do their missions. "The first time I heard it, it really made the whole operation seem worthwhile," he said. "A couple of captains at the bar at Tan Son Nhut were discussing the fact that they didn't have to fly the next day because the Lightning Bug had already made the mission!"[150]

As the Vietnam War wore on, the American public also expressed growing concern about physical risk to aircrews, which in turn raised the political risks of using manned aircraft. After North Koreans captured a Navy research ship, the USS Pueblo, in 1968, a Navy EC-121 was shot down off the North Korean Coast in April 1969, prompting TIME magazine to admonish: "In the wake of the Pueblo incident, there was surely a legitimate question as to the prudence shown by the U.S. in sending slow, unprotected planes to spy on a jumpy Communist nation already notorious for pugnacity and unpredictability."[151] Within the USAF, the mid-level staff officers who had always supported drone use to reduce aircrew risk reached out to their advocate on the JCS, then-Brig.Gen. Steakley. As a result, efforts to replace the EC-121 mission with 147T drones for Combat Dawn missions were swift. Test flights started six months after the shoot-down.[152]

TAC, which up until this point had largely ignored drones, also began to show a growing interest as the SAM threat mounted. Toward the end of 1970,

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149 Wagner (1981) 99
150 Wagner (1981) 100
151 Quoted in Wagner (1981) 167
152 Wagner (1981) 168

TAC's 7th Air Force complained that it needed more 147SC Buffalo Hunter drones to reconnoiter air defenses and MIG locations before sending in manned B-52 bombers, which required fighter escort for protection, to strike those targets.[153]

Post-Vietnam Support for Drone Development: Divided Views Inside and Outside the USAF

Aircraft survivability remained a pressing issue after the Vietnam War. Israel lost more than 100 aircraft to Soviet-built anti-aircraft defenses operated by Egypt and Syria during the 1973 Yom Kippur War.[154] One estimate predicted the USAF would be decimated in about two and a half weeks if there were a full-scale war with the Warsaw Pact forces in Central Europe.[155] But as the fighter generals wrestled with TAC's lack of preparedness for the SAM threat in Vietnam, the command turned mostly to manned aircraft improvements rather than increased drone development as a means to reduce risk.

As discussed in the narrative above, TAC initially attempted to develop some plans to use drones in a war with Warsaw Pact nations, but decided there were too many challenges involved with European weather and air traffic control. Instead, the command focused its energy on mitigating the SAM threat by improving tactical aircraft development and training. In the mid-1970s, the USAF developed new tactics for fighter pilots in air-to-air training exercises known as "Red Flag."[156] Nascent work on stealth technology for fighters, which ultimately led to the F-117, also began in the mid-1970s.[157]

Despite the USAF's loss of interest in RPVs as a means to reduce aircrew risk, civilian government officials remained enthusiastic. In 1975, USAF Secretary McLucas wrote a paper extolling the use of RPVs to "reduce manned aircraft attrition in very high threat environments" and "to provide an acceptable way to

153 Elder (1973) 13-14
154 Aronstein and Piccirillo (1997) 11
155 Aronstein and Piccirillo (1997) 12
156 Boyne (November 2000)
157 Werrell (2003) 125-131

accomplish certain tasks when the mission or area of operation is politically sensitive, and we just don't want an aircraft flight crew exposed."[158]

Lawmakers also continued to support RPV development after Vietnam, partly on the grounds that the aircraft reduced aircrew risk. After the Pentagon's 1979 decision to shut down drone programs, Democratic Senator Strom Thurmond lamented: "By this…decision…manned aircraft must now be used to fly RPV-type missions into the most hostile of enemy environments."[159] Lawmakers did not forget about the potential for RPVs to reduce aircraft risk in the 1980s, creating the UAV JPO in 1988 in part to stimulate UAV development following the loss of an F-111 aircrew in an air strike over Libya in April 1986.[160]

As the 1980s came to a close, three trends in attitudes toward aircrew risk became apparent. First, interest in reducing aircrew risk was highest — both inside and outside the USAF — during wartime. Second, consistent interest in reducing aircrew risk inside the USAF was limited to certain officers, including Gen. Arnold and the officers in the Reconnaissance Division. Third, in comparison to the USAF, there was relatively consistent support for reducing aircrew risk, even in peacetime, among US lawmakers and the American public.

4. **To what extent were judgments about UAVs based on a concern about maintaining primacy over air assets in response to competition from other civilian and military institutions?**

In the early days of American airpower, airmen showed a keen interest in protecting their prerogatives over unmanned weapons from encroachment by Army infantry. Early airpower advocates, including Brig. Gen. Mitchell and especially Gen. Arnold, realized that embracing a holistic view of airpower, to include unmanned technologies, would bolster their power and prestige, both needed to support their claim for an independent air arm. The "ironic reality," as

158 Quoted in Bigham, (Nov.-Dec. 1977)
159 Quoted in Wagner and Sloan (1992) 108
160 Ehrhard (2010) 21

Timothy Schultz describes it in his 2007 dissertation on the changing relationship between airman and aircraft, was that “the best interests of an institution led by pilots were served by the development of unpiloted technology.”[161]

Gen. Arnold’s UAV advocacy, described in Question 2, provided the strategic framework for airpower advocates to adopt a broad view of airpower theory that embraced UAVs in response to challenges from other military branches on the eve of USAF independence in 1944. In the case of the Kettering Bug and “aerial torpedo”-type programs in general, the USAF sought to carve a role separate from the Navy in debates over terminology. In April 1941, the Air Corps stopped using the term “aerial torpedo” to generically describe Kettering Bug variants after a joint Army-Navy conference determined that this moniker belonged only to devices dropped from aircraft into the water. Instead, airmen started to use the phrase, “controllable bomb, power driven” to denote a powered, guided unmanned aircraft directed at any type of target. [162] As the AAF prepared to separate from the Army after the war, the AAF began to use the term “pilotless aircraft” in a bid to make a claim on missile technology.[163]

Post-WWII: Competing USAF Views of the Importance of Drones

While airmen felt compelled to claim UAVs and cruise missiles to make the case for an independent USAF prior to WWII, they felt no similar impulse in the post-WWII period. Initially neither SAC nor TAC wanted to take responsibility for the first operational reconnaissance drone, the 147A.[164] There were no other services competing for the drone, developed in Big Safari, and it was not seen as part of SAC’s or TAC’s core mission set. As suggested in Question 1, TAC also harbored a cultural bias against drones, which further dampened its interest.

[161] Schultz (2007) 235
[162] Schultz (2007) 208
[163] Von Karman (1967) 298
[164] Wagner (1981) 32

As discussed in Question 2, SAC finally agreed to take on the 147A after previously rejecting the program. The command's wartime success with the Lightning Bug successors to the 147A spurred an intra-service rivalry over management of the drones. In the mid-1960s, TAC began to argue for more direct control over Lightning Bug operations in Vietnam on the grounds that SAC was not being responsive enough to the tactical needs of combatant commanders in Vietnam.[165]

The fight over command and control over the Lightning Bug was a microcosm of a much bigger fight between SAC and TAC over who would run the USAF.[166] The bomber generals had historically dominated leadership positions because of their central role in strategic bombing in WWII. During the Vietnam War, however, fighter pilots made their case for their own ascendancy based on the fact that they were now assuming the most risk in combat.[167] Given the effectiveness of RPVs in the Vietnam War, TAC felt it could no longer ignore the technology as it sought to boost its claim as the standard bearer of the USAF's war-winning capabilities.[168]

Almost as soon as TAC gained responsibility for RPVs in 1976, however, it lost interest as it faced the peacetime realities of a budget crunch and a loss of NRO funding. Instead of making trade-offs with its manned fighter fleet to invest in new RPV technology, TAC let RPVs die off completely. While there were clearly a host of externalities agitating against RPV development at this time — including a shift in strategic focus back to the Soviet Union, competition from manned aircraft and satellites, and weather problems on the European Central Front —there was still robust support for RPV development from the US Congress, as discussed in Question 2.

The main reason for TAC's loss of interest — the reason that Congress cut RPV funding in 1977—was that the command failed to think about RPVs as part of

165 Elder (1973) 12-18
166 Ehrhard (201) 26
167 Worden (1998) 185-204
168 Ehrhard (2010) 26-27

a broader concept of airpower. As discussed in Question 1, many USAF outsiders, including the GAO, members of the RPV industry, and lawmakers, believed that TAC purposefully neglected careful planning for the future of RPVs, preferring to focus on strategic planning for manned fighters, the platform on which the command hoped to build the USAF's future. Without wartime pressures or external competition from SAC, TAC returned to a narrow conception of airpower built around the promotion of fighter pilots and fighter aircraft.

Lack of Interest in the 1980s

The USAF abdicated responsibility for UAV innovation in the 1980s, despite the fact that innovation efforts continued in the other military services. [169] For example, the Army continued to develop the Aquila, an ambitious UAV that it eventually abandoned in favor of a joint effort with the Navy, the Pioneer, which saw action in Desert Storm.[170] As noted in the narrative, the USAF was the only service to enter the war without its own operational UAV.[171]

The USAF's UAV development in the 1980s had been limited to joint programs, including AARS and the MR-UAV, which failed in part because of cost growth as each of the participating services heaped on additional design requirements.[172] The USAF allowed these programs to die, and it would take external pressure from centralized UAV organizations in the Pentagon — the UAV JPO and DARO — to launch the Predator program in the early 1990s.

Ultimately, the findings here indicate that the USAF tended to ignore external challenges to control of UAVs in the absence of visionary leadership or wartime expediency. This behavior shows that the USAF generally did not closely associate UAVs with its core functions, with the exception of the visionary

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[169] Kennedy (Apr. 1998) 11-12
[170] Zaloga (2008) 26-28
[171] Ehrhard (2010) 42
[172] Ehrhard (2010) 16-17 and 42

leadership of Gen. Arnold, who pushed for the USAF to embrace a broad conception of airpower theory that included UAV innovation.

Conclusion

In his research on UAVs, Ehrhard concludes that the USAF has historically failed to incorporate UAVs on a permanent basis due to a variety of externalities unrelated to USAF culture. The "UAV hiatus" of the 1980s was a result of competition from satellites, arms control treaty limitations on UAVs, and a variety of technological challenges including the failure of UAVs to accommodate the change in threat environment from Vietnam to a Soviet challenge in the European theatre, and the high costs of UAV development.

But this review of more than 70 years of American airpower history suggests that a consistently present and powerful influence on the USAF's capacity for UAV innovation has been the service's cultural preference for manned aircraft. The pro-manned aircraft bias has led the service to shun unmanned technologies and make pessimistic assessments about the cost and potential of UAVs, minimize the importance of aircrew risk, and compete for UAV programs only reluctantly.

The intensity of UAV skepticism has tended to vary according to whether the nation was at war. During WWII and the Vietnam War, airmen were willing to take a risk on UAV technology to meet combat needs. Visionary leaders nurtured UAV development in periods of conflict. Gen. Arnold played the role of a visionary leader during WWII, making a connection between expanding the variety of the USAF's airborne arsenal and advancing the cause of airpower. During the Vietnam War, middle-level reconnaissance officers, with the help of Big Safari, took positive views of the cost and potential of UAVs, their capacity to reduce risk, and their potential to increase the USAF's war-winning edge.

But during periods of relative peace and constrained budgets, the USAF was far less willing to take a risk on UAV technology. Arguments about technological immaturity and high costs became far more prominent during the 1980s. But when one considers that airmen employed UAVs far more frequently during WWII than they did during the “UAV Hiatus” of the 1980s, the argument about technological maturity rings hollow. While UAVs of course had development problems — consider the lethal results of the War Weary Bomber program — the USAF nevertheless judged their potential military potential to be worth the risk. The USAF’s widespread use of UAVs during wartime considerably weakens the argument that the USAF saw UAVs as too technologically immature to take on UAV development risks.

In contrast to Ehrhard’s research, my findings indicate an early and influential set of biases that held back UAV development. This is not to say that external forces did not help to slow down the USAF’s UAV programs, but it does suggest that USAF culture played a crucial role in mediating the USAF’s assessments of UAV technology during wartime versus peacetime. From the earliest days of American airpower, airmen clung to the manned aircraft as their central justification for a new military service. The cultural preference for manned aircraft often led the USAF to ignore UAV innovations, unless wartime imperatives or visionary leaders demanded it, because they were seen as a fundamental threat to the service’s identity.

CHAPTER THREE, The Peace Dividend Era: The USAF Rejects the Predator

The USAF rejected the Predator when it first became a US military program in 1993. In fact, none of the military services were willing to operate the UAV, which started in the Pentagon's UAV JPO and was managed by DARO. It was not until 1995 that the Army, seeking a mission for a newly available UAV unit, agreed to fly the Predator in the Balkans with support from the Navy. But the USAF continued to minimize its involvement, sending just one airman to support Predator operations.[1]

The first half of this chapter examines the technical, political, and bureaucratic dynamics that led to the Pentagon's decision to establish the Predator program and the USAF's decision to reject the UAV. Because of the USAF's limited participation, the narrative in the first half of the chapter focuses mainly on the other players in Predator development, including civilian leadership in the Pentagon and UAV industry leaders. The second half shifts the focus to the USAF, exploring how USAF culture shaped the decision to forgo participation in the Predator program in 1993 and 1994.

UAVs in the Post-Cold War Era

In the wake of the Cold War, there was a broad push across the DoD to reduce the military's budget by developing cost-effective, low-risk weapon systems. The drive to reduce military spending — while maintaining capability — stemmed from the Clinton administration's desire in the early 1990s to capitalize on "the peace dividend."[2] In 1993, the Pentagon released the Bottom-Up Review (BUR), which called for increasing US military capability by relying heavily on engagement and

[1] Ehrhard (2000) 540
[2] Senior Pentagon civilian interview (Mar. 27, 2013)

prevention, thereby saving money after more than four decades of heavy spending on conventional forces to meet the Soviet threat.[3]

That same year, William Perry, the Deputy Secretary of Defense, and John Deutch, the Pentagon's chief weapons buyer from 1993 to 1994 (and later, CIA director) asked Larry Lynn, the deputy undersecretary of defense for Advanced Programs, to lead a Defense Science Board (DSB) summer study on Global Surveillance.[4] The study found that the Pentagon's long-endurance surveillance capability was seriously lacking.

At the time, the USAF was committed to a strategic reconnaissance strategy built around satellites.[5] Gen. Merrill McPeak, the USAF chief from October 1990 to October 1994, believed that satellite imagery and communications held the key to achieving "information dominance," which he described as "the ability to observe the whole theater, to rapidly asses threats and opportunities, to identify targets, and to navigate precisely to those targets."[6]

But the DSB study cited two factors that led Pentagon officials to favor UAVs over satellites. First, the DSB found that satellites lacked the tactical flexibility to meet the long-dwell coverage requirements of the emerging strategic environment.[7] While the Cold War was over and the free flow of spending with it, "military operations other than war" (MOOTW) — as they were known in the 1990s — were on the rise. Conflict was escalating among ethnic and national groups in the former Yugoslavia. The American, French, and British governments faced increasing media and public pressure to stop the Bosnian Serbs' ethnic cleansing campaign, which eventually led to the deaths of thousands, including many civilians.[8]

Satellites, which could only provide sporadic coverage, were ill-suited for this rapidly changing battlespace. In order for the US government to conduct air

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[3] Larsen, Orletsky, Leuschner (2001) 41-79.
[4] Entzminger interview (Dec. 15, 2012); Lynn interview (Apr. 23, 2013)
[5] McPeak (August 1995) 207-213 and 214-220
[6] McPeak (Aug. 1995) 207
[7] Entzminger interview (Dec. 15, 2012); Barzelay and Campbell (2003) 157; Blackwelder interview (Aug. 13, 2013)
[8] Bucknam (March 2003) 65

strikes on Serbian military targets — the policy that it finally settled on in May 1993 and continued until December 1995 — it would first need continuous and accurate information on Serbian air bases, entrenchments, supply caches, and troop movements, as well as UN-mandated safe enclaves for civilians.[9] In contrast to satellites, which provided only intermittent coverage depending on their orbit, long-dwell UAVs could persistently monitor these moving targets, which were scattered across Bosnia's expansive, mountainous terrain, often under heavy cloud cover.[10]

The second factor weighing in favor of UAVs concerned technological maturity. Claims that UAVs lacked the technical capability required to be useful to the military had been losing credibility since the Vietnam War. The DSB study concluded that UAVs had come of age.[11] UAV component technologies were becoming increasingly available, including software for command and control, computer processing power for autonomous flight control systems, and sensors to provide color, video imagery and other information.[12]

Most significantly, a major leap in the maturity of navigation systems and satellite communications occurred during the 1980s.[13] In Vietnam, Ehrhard notes, navigation errors prevented 147 Lightning Bug variants from finding more than 50 percent of their reconnaissance targets.[14] But Global Positioning System (GPS) technology, which had grown increasingly reliable and smaller in size since its introduction in 1978, began to show potential for dramatically improving the capacity to direct UAV flights and to provide usable targeting information.[15] By the late 1980s, a full constellation of GPS satellites was on orbit. Satellite data links

[9] Newcome (2004)107; Strickland (March 2013) 2
[10] Strickland (2013) 2.
[11] Barzelay and Campbell (2003) 157
[12] Rosenwasser (2004) 21-22
[13] Blue interview (June 11, 2012) ; Karem interview (June 12, 2012); Bowie (September 2010)
[14] Ehrhard (2001) 409-411.
[15] Rosenwasser (2004) 22; Blue interview (June 11, 2012); Karem interview (June 12, 2012)

also emerged around 1990 to enable communication between UAVs and remotely-positioned ground stations, thereby enabling UAVs to fly beyond the line of sight.[16]

The Creation of a UAV Bureaucracy

Around the same time as the 1993 DSB study, Lynn — with the support of Perry and Deutch — launched a new acquisition concept known as the "Advanced Concept Technology Demonstration"(ACTD).[17] Lynn ultimately initiated over 50 ACTD programs, designed to provide a fast, low-risk way for the military services to test new technologies in combat and then accept or reject them depending on their performance.[18] Lynn, Perry, and Deutch were especially interested in using the ACTD process to force the UAV JPO to accelerate the delivery of UAVs to combat commanders for testing, all the while keeping requirements minimal and costs low.[19]

To briefly review, the US Congress had established the UAV JPO in 1988 to increase "commonality" among UAV programs and reduce costs. But as discussed in chapter two, the centralized organization had failed to produce combat-ready UAVs because it could not protect joint UAV programs such as the USAF-Navy MR-UAV from the military services' mounting requirements and the associated development delays and growing costs. The UAV JPO was ultimately a slave to the services' demands because it did not have leverage in the form of its own budget.

The ACTD process was the Pentagon civilians' attempt to overcome the UAV JPO's weaknesses. The UAV JPO would still bear responsibility for managing UAV-related projects, but Pentagon civilians would pick the projects and set the requirements. Lynn chaired a committee that settled on three "tiers" of UAV efforts.[20] Tier I was a requirement for a relatively small UAV that could easily be filled by an existing airframe, the CIA's Gnat-750. Tier II was a requirement for a

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16 Rosenwasser (2004) 21
17 Thirtle, Johnson, Birkler (1997) xiii and Perdue interview (Apr. 11, 2013).
18 *ibid*
19 Perdue interview (Apr. 11, 2013); Williams interview (Apr. 14, 2013); Thirtle, Johnston and Birkler (1997) 13
20 Lynn interview (Apr. 23, 2013)

medium-altitude UAV, which would eventually be filled by the Predator. Tier III involved a high-altitude design that would become the USAF's RQ-4 Global Hawk and the later-cancelled Darkstar program. [21]

Pentagon civilians took one further step to diminish the role of the UAV JPO and the military services in UAV development. They hatched a plan to develop a new Pentagon organization, DARO, which would control all funding for UAVs and other reconnaissance aircraft. DARO funding was usurped from the airborne reconnaissance budgets of each of the military services.[22] DARO would redistribute these funds to pay for the highest priority airborne reconnaissance programs while cutting lower-priority efforts.[23]

DARO would pay for the first two years of airborne reconnaissance ACTD programs. Once a military service took responsibility for an ACTD, DARO would release the funding to the military service, but also would require the service to commit a dedicated funding stream to the program.[24] The US Congress adopted language approving the Pentagon civilians' construct for DARO, which officially stood up in November 1993.[25]

The same month that DARO was created, Deutch issued the requirements for the new Tier II UAV, which would eventually become known as the Predator. Drawing on Deutch's requirements, the UAV JPO released a request for a Tier II "tactical endurance" UAV, calling for a first flight within six months and the delivery of 10 air vehicles within 10 months.[26] The UAV was expected to fly beyond the line-of-sight and have an endurance of up to 44 hours.[27] Additionally, it was expected to have satellite capability for navigational control and imagery transmission, and also to fly 500 nautical miles, remain on station for 24 hours,

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[21] Thirtle, Johnston and Birkler (1997) 10

[22] Blackwelder interview (Aug. 13, 2013); Ehrhard (2010) 48; Fogleman interview (Oct. 22, 2013),

[23] Blackwelder interview (Aug. 13, 2013)

[24] ACC History Office (Aug, 2006) 5; Fogleman interview (Oct. 22, 2013)

[25] Ehrhard (2010) 48

[26] Thirtle, Johnston, Birkler (1997) 20

[27] Thirtle, Johnston, Birkler (1997) 9

carry a 4,000 to 5,000 lb. payload, and fly at 15,000 to 20,000 feet.[28] The Tier II UAV was required only to relay still images, not full motion video (FMV), according to the original request for proposals.[29]

As soon as the Tier II bid was released in 1993, UAV development accelerated at General Atomics Aeronautical Systems (GA-ASI), where the aircraft that became the Predator was born. The small, San Diego, California-based company was run by two adventurous brothers, Neal and Linden Blue, who had been hatching a plan to get into the aviation business. Just three years earlier, General Atomics had added "Aeronautical Systems" to its company name after buying Leading Systems, the manufacturer of the CIA's combat-tested Gnat-750.[30]

GA-ASI's Tier II design was a "stretch" version of the Gnat -750, with longer wings and a larger four-stroke engine to accommodate satellite data links in the nose of the aircraft, allowing for beyond line-of-sight operation and real-time data transmission.[31] The Tier II design also augmented its inertial navigation system with GPS to dramatically improve navigation.[32] These innovations had already been developed and tested onboard various versions of the Gnat-750, as discussed below.

GA-ASI initially called its Tier II design "Birdie" because it was supposed to be "cheap cheap cheap"[33] before Thomas Cassidy, a retired Navy admiral and the president of the company's aeronautics division until 2010, proposed the name "Predator."[34] In May 1994, reported cost data put the price of one Predator vehicle at $4.2 million; later that year another estimate put the cost of the air vehicle at $1.6 million, plus $2 million for the ground station.[35]

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28 Thirtle, Johnston, Birkler (1997) 11
29 Big Safari scientist interview (Aug. 21, 2013) .
30 Newcome (2004) 107.
31 Hirschberg (2010) 15
32 Ehrhard (2001) 535.
33 Blue interview (June 11, 2012)
34 Blue interview (June 11, 2012)
35 Fulghum (May 16, 1994) 20; Fulghum (Nov. 28, 1994) 62.

On January 7, 1994, the UAV JPO awarded GA-ASI a $31.7 million contract to deliver up to 10 Predator aircraft for Tier II.[36] By that time, GA-ASI had already starting building two Predator air vehicles.[37] There was an open bidding competition for the Tier II design, but US defense officials decided the GA-ASI bid was the obvious choice because it was based on the CIA's combat-proven Gnat-750.[38] While this was technically true, the reasons that the UAV JPO picked a Gnat-750-based design — under heavy influence from Pentagon civilians and DARO — ran far deeper than that.

Strategic Potential: Predecessor UAVs Set the Conditions for Predator Development

The lineage of the Predator program reveals how it became possible to build a UAV with truly strategic potential during the 1980s, which had been a particularly barren time for military UAV development, especially in the USAF. UAV design was consigned to small UAV companies widely thought of in the defense community as "garage tinkerers."[39] But underestimating this small inventor community turned out to be a mistake. Abraham Karem, an Israeli inventor and founder of Leading Systems, literally built the Predator's prototype, known as the Albatross, in his garage in California.[40] The Albatross' humble beginnings belied major design innovations and Karem's connections with powerful figures in the US government that would make it possible to build a UAV that could succeed where so many others had failed.

The Albatross was a modest-looking aircraft, but it represented the first UAV that could potentially provide reliable, long-range aerial reconnaissance. Initially funded with private money, Karem built the "Albatross" using plywood, homemade fiberglass, and a two-stroke engine similar to those in used in go-karts.

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[36] Thirtle, Johnston and Birkler (1997) 20.
[37] Lynn interview (April 23, 2013); Thirtle, Johnston, and Birkler (1997)
[38] Evers (Feb. 7, 1994) 54.
[39] Zaloga (January 1999) 97
[40] Karem interview (June 12, 2012); *The Economist* (Dec. 2012); Finn, Peter (23 Dec. 2011)

[41] The design was simple, and the UAV could take off and land like a manned aircraft. After the Albatross demonstrated the capacity to stay aloft for up to 56 hours during a series of DARPA-funded flight tests between 1980 and 1982, DARPA officials contracted Karem's company to build a bigger, more capable version known as Amber.[42]

The main purpose of DARPA's Amber program was to demonstrate that it was possible to build a long-range UAV less prone to crashes.[43] At the time, there was no systematic data collection to support the defense community's perception of UAVs as unreliable toys, nor was there data to support their reliability. The Pentagon would not conduct its first–ever study on UAV reliability until 2003.[44] Yet even UAV supporters conceded that the paltry data available suggested that UAV reliability rates had become a major obstacle to UAV innovation. Bob Williams, a project manager for UAV programs at DARPA in the 1980's, pieced together available data in 1981 to conclude that the US had spent about $50 billion on UAVs since the 1960s, but it had been unusual to conduct more than 30 to 40 relatively short flights before a loss.[45]

Losses occurred for many reasons, but in the 1980s landing difficulties anecdotally accounted for the largest category.[46] Even today, landing a UAV on a runway is the most challenging part of the flight envelope because it requires the physically-separated pilot to judge his UAV's approach and landing conditions from a distance. Karem's view was that more operator experience — rather than technology fixes — would improve UAV reliability. He did develop a version of Amber that could be launched from a torpedo tube for the Navy, but he felt that reliability would be best improved by taking "a serious manned aircraft approach."[47] To this end, he developed a version of Amber that included a cockpit-like ground control station and required manual takeoff and landing on a

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[41] Karem interview (June 12, 2012); *The Economist* (Dec 2012)
[42] Hirschberg (2010) 11; *The Economist* (Dec. 2012); Williams interview (Apr. 14, 2013).
[43] Williams interview (Apr. 14, 2013)
[44] DoD (Feb. 2003)
[45] Williams email, interview (April 27, 2013)
[46] Williams email, interview (April 27, 2013)
[47] Karem interview (June 12, 2012)

runway.[48] Instead of relying solely on flight controls as many previous UAV designs had done, Karem put a nose in the camera of the aircraft, giving pilots a bird's eye view of the landing in order to reduce landing accidents.[49] He also established a flight training program for test pilots within Leading Systems to reduce flight test crash rates.[50]

By 1988, Amber represented a highly successful attempt to improve UAV reliability, achieving 650 flight hours with only one incident, an engine failure.[51] The loss rate stood in stark contrast to earlier UAVs, such as the RQ-2 Pioneer, the longest-serving UAV in the US military, which has a lifetime loss rate of 1 loss per 50 flights.[52] But Karem suffered a major disappointment that year when the Navy and the Army backed out of their plans to take over the Amber from DARPA. The Navy had just accepted responsibility for management of the UAV JPO, giving them more power to control the fate of Pentagon UAV projects. Navy officials decided to kill Amber, citing the growing costs of the Pioneer, which had already been combat-tested in the first Gulf War.[53] Karem's last-ditch attempt to pitch the Amber to the Army also failed. [54]

Karem was undeterred. Even if the US military did not realize it yet, he had successfully overcome a major barrier to UAV innovation by improving reliability. Now he turned his attention to another historic showstopper: navigation accuracy. He developed a scaled-down version of the Amber, the Gnat-750 that would employ GPS technology, which was just starting to come on the market in the late 1980's. But money was tight. Karem borrowed funding from Hughes Aircraft to build 10 pre-production models of the Gnat-750, and, after going bankrupt because the UAV JPO refused to let him export the aircraft, he turned over control of

48 Karem interview (June 12, 2012)
49 Williams interview (April 14, 2013)
50 Karem interview (June 12, 2013); Hirschberg (2010) 12.
51 Hirschberg (12010) 13.
52 DoD (Feb 2003)
53 Hirschberg (2010) 14.
54 Karem interview (June 12, 2013); Williams interview (Apr. 14, 2013); *The Economist* (Dec 2012)

Leading Systems to Hughes. When Karem's close colleague at Hughes passed away, he again was in need of a buyer to could keep his company in the UAV business.[55]

By 1990, Neal and Linden Blue at General Atomics were also thinking about how to build a UAV that solved the navigation accuracy problem. Neal Blue began looking into the Trimble GPS system, an inexpensive handheld device, and he also bought a cheap UAV kit from an Australian designer to conduct some flight tests.[56] What Blue still needed, however, was a reliable UAV designed for military missions. With the DoD still focused on a major conventional conflict with the Soviet Union, he began to imagine using a swarm of GPS-guided UAVs to strike Soviet tanks in the Fulda Gap.[57] The question then became what the actual UAV would look like. He recalls thinking at the time: "We knew we can demonstrate high-level accuracy with a cheap GPS transmitter, and then the question is: what do we put this on? We wanted something that could handle the Fulda Gap, and we wanted something that was cheap." [58]

The opportunity to build a reliable, GPS-guided UAV emerged in 1990 when a friend called Linden Blue and asked him if he was interested in buying Karem's Leading Systems.[59] General Atomics purchased the company, salvaging Karem's GPS-guided Gnat-750, which with minor modifications would later become the Predator. General Atomics sold six copies of the Gnat-750 to Turkey in 1993,[60] the same year it established GA-ASI to run its UAV business.[61] The foreign military sale was the first signal that the strategic and political tide in the US was about to shift dramatically in favor of UAV technology.

The CIA was first to pick up on the growing strategic potential of UAVs relative to other surveillance systems in the early 1990s. As conflict heated up in the Balkans, US European Command (EUCOM) became increasingly desperate for a

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[55] Karem interview (June 12, 2012); *The Economist* (December 2012).
[56] Blue (June 11, 2012)
[57] *ibid*
[58] *ibid*
[59] Karem interview (June 12, 2012) ;Newcome (2004) 106-107
[60] *The Economist* (Dec. 2012); Newcome (2004) 107.
[61] Trimble (Mar. 17, 2011).

“loitering surveillance capability.”[62] While the USAF advocated satellites, the CIA was turning its attention to UAVs. After assuming the position of CIA director in February 1993, James Woolsey immediately began to investigate how to overcome the intelligence gaps in the region.[63] He came down firmly on the side of those who saw a need for new long-endurance surveillance assets, expressing a view completely at odds with the USAF’s notion that satellites were the optimum solution. Based on decades of experience in government service — including leading a panel on reconnaissance for Robert Gates, the previous CIA director — Woolsey was concerned about the limitations of satellites, including their main drawback: they only provide coverage for a few minutes a day, when they are correctly positioned on orbit.[64]

As he searched for alternatives, Woolsey was alerted to the possibility of using an operational UAV, the Gnat-750, to tackle the Bosnia surveillance problem by Gen. George Joulwan, the four-star Army general running US Southern Command (SOUTHCOM). The general learned about the Gnat-750 from Williams, one of his staffers who had worked on the Gnat-750 predecessor, Amber, at DARPA. Eager to fill a major surveillance shortfall in the SOUTHCOM theatre, Gen. Joulwan asked the Joint Staff for a UAV with design specifications mirroring the Gnat-750: a 500 nm radius, 24 hour loiter time and a 300 lb. payload for surveillance and satellite devices.[65]

The Joint Staff asked the USAF’s Big Safari office to review Gen. Joulwan’s request. The secretive acquisition unit based at Wright Patterson Air Force Base (AFB) in Ohio normally jumped at the chance to deliver tailor-made, combat-ready solutions.[66] But in this case, the organization ignored the combatant commander’s requirement for a UAV and instead suggested the use of a manned Schweitzer glider.[67]

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[62] Barzelay and Campbell (2003)156-157; Strickland (2013) 2.
[63] Strickland (2013) 3.
[64] *ibid*
[65] Williams interview (Sept .13 2014)
[66]Grimes (2014) 1-3.
[67] Williams interview (Sept 13, 2014)

Frustrated with the USAF's response, Gen. Joulwan presented the Gnat-750 concept to Woolsey, who was familiar with UAVs from his time working on US-Soviet arms treaties. Woolsey also knew the Gnat-750's inventor, Karem, from working with him a decade earlier on MX missile basing.[68] Woolsey immediately agreed with Gen. Joulwan that the Gnat-750 provided a potential solution to their shared concern about the gap in theater-level surveillance assets and began to lobby the Pentagon for the acquisition of the Gnat-750.[69]

The CIA director first paid a courtesy call to the UAV JPO, now notorious for its bureaucratic delays. But after being told it would take $20 million per year over five years to procure the Gnat-750,[70] Woolsey turned to civilian leadership in the Pentagon — Perry, Deutch, and Lynn — to secure funding. Already in the throes of streamlining UAV acquisition processes, the Pentagon civilians were sympathetic to the need to act quickly and readily provided funding. Woolsey flew to GA-ASI in California to tell Karem he wanted to purchase four Gnat-750 aircraft for CIA operations in the Balkans.[71]

In early 1994, the CIA flew the Gnat-750 from an air base in Albania to conduct surveillance in Serbia and Bosnia. One major success of the deployment was that it demonstrated that a UAV could transmit electro-optical and infrared FMV to Washington, DC. [72] Flying at low altitude, the Gnat-750 followed UN convoys, collecting imagery that was clear enough to distinguish decoy artillery and SAMs.[73] In a further indication that the Gnat-750 had become a useful surveillance asset, the CIA returned the Gnat-750 to combat in the summer of 1994 at the behest of EUCOM, which by this point was run by Gen. Joulwan.[74] Operating

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[68] Strickland (March 2013) 3
[69] Williams interview (Sept. 13, 2014)
[70] Karem interview (June 12, 2012)
[71] Hirschberg, (2010) 15
[72] Fulghum (July 11, 1994a)
[73] Fulghum (July 11, 1994a).
[74] Williams interview (April 14, 2013); Fulghum (11 July 1994b)

closer to Bosnia on the Croatian coast,[75] the Gnat-750 returned with a new high-resolution Mitsubishi thermal imager and a SIGINT payload.[76]

But the Gnat-750 still suffered from serious limitations. Its C-band data link was line-of-sight.[77] This meant that FMV feeds had to be relayed through a manned aircraft to a ground station in Albania, and then transmitted via satellite to the Pentagon.[78] The line-of-sight limitations also capped the Gnat-750's range to a maximum radius of 500 miles.[79] Although the CIA brought the Gnat-750 back for a second deployment, the results of the first had been marginal: 12 of the 30 missions attempted were successful.[80] The data relay process was cumbersome, and bad weather threatened the Gnat-750's delicate internal electronics and created poor flying conditions. [81]

The introduction of satellite data links around 1990 presented an opportunity to streamline FMV transmission processes. Before leaving SOUTHCOM, Gen. Joulwan secured funds to develop a wideband satellite data link on the Gnat- 750.[82] Karem used the money to equip the UAV with a bulbous satellite pod carried on top of the aircraft[83] The resulting design, known as the Gnat 750 "whale configuration," allowed for near-real time FMV transmission to CIA headquarters, as opposed to the old, unwieldy relay process.[84]

In 1994, SOUTHCOM successfully tested the whale configuration, leading the Vice Chairman of the Joint Chiefs of Staff, Admiral William Owens to declare it a "Revolution in Military Affairs"**[85]** Over the previous decade, the Blue Brothers and Karem had been able to develop a series of UAV prototypes with increasing strategic potential – first, there were improvements in reliability, followed by leaps

[75] Hasik (2008) 35; Newcome (2004) 107.
[76] *Jane's Unmanned Aerial Vehicles and Targets* (Oct. 28, 2010)
[77] DoD UAV JPO (1993) Slide 1.
[78] Newcome (2004) 107.
[79] DoD UAV JPO (1993) Slide 1;
[80] Fulghum (May 16, 1994) 20.
[81] Fulghum (May 16, 1994) 20; Howard (June 1995)
[82] Williams interview (April 14, 2013)
[83] Hirschberg (2010)15; Williams interview (April 14, 2013)
[84] Trimble (17 March 2011).
[85] Hirschberg (2010) 15.

forward in navigation accuracy due to GPS, and now, with the advent of satellite communications, it was possible to achieve near-real-time data transmission. The addition of a wideband satellite data link also opened the possibility of flying a UAV beyond-line-of sight, thereby dramatically expanding its range, although that capability was not exercised until the late 1990s, as discussed in chapter five.

While the Gnat-750 experience indicates that UAV technology was evolving quickly in the early 1990s, assessments of technological maturity, reliability, combat capability, and cost were not yet backed by the evidence that can only become available after a lengthy combat record. As a result, UAV performance was still open to the interpretation of stakeholders with varying agendas. The intelligence community, Gen. Joulwan and Adm. Owens were enthusiastic, but it would be up to a new set of stakeholders — Pentagon civilians and the military services — to determine whether the Gnat-750 design could make the transition from the CIA to the US military.

The Army Deploys with the Predator

Ehrhard argues that UAV innovation is most successful when military services start their own programs. In his view, civilian intervention often leads to bungled UAV programs because civilians do not understand the services' requirements.[86] Yet he concedes that the Predator was an exception to this rule.[87] The Predator only made its way into the Pentagon acquisition system by the intervention of high-ranking Pentagon civilians working through the UAV JPO and DARO.

Because it enjoyed no backing from a military service, the Predator had to prove itself before it could find a home. Its first flight occurred on July 3, 1994, five days before the six-month deadline specified in the ACTD requirements.[88] Additional tests at Fort Huachuca in Arizona culminated in a 40-hour, 17 minute

[86] Ehrhard (2000) 490-491.
[87] Ehrhard (2000) 535-536.
[88] Thirtle, Johnston and Birkler (1997) 22; Fulghum (July 11, 1994) 22

flight in January 1995, shattering the previous UAV endurance record of 29 hours set by another Predator progenitor, Amber, in 1989.[89]

Although the USAF's Big Safari office was not yet involved in Predator development, a Big Safari scientist tracking UAV developments stepped in to demonstrate the extent of its untapped potential. While the ACTD requirements only called for still imagery, the Big Safari scientist convinced the Pentagon to allow him to demonstrate a real-time FMV capability in January 11, 1995. While the Gnat-750 "whale configuration" had already shown the feat was possible, piping the Predator's FMV directly into high-security Pentagon communications networks presented logistical challenges. But the Big Safari scientist was able to overcome them. "That was the breakthrough moment," said the Big Safari scientist, who would later become a central character in the development of Predator satellite communications. "I had accomplished my mission of exposing full motion video and its value."[90]

After additional FMV demonstrations in 1995 during an Army exercise known as Roving Sands, the Predator entered the final stage of ACTD development: an operational deployment. By now, EUCOM was eager to deploy the Predator to Gjader Airfield in Albania to conduct surveillance, just as its predecessor, the Gnat-750 had done.[91] But Pentagon officials were still having trouble finding a military service willing to take operational responsibility for the deployment.

Army, Navy, and USAF generals were kept apprised of Predator developments at weekly "Breakfast Club" meetings with Lynn, the Deputy Undersecretary of Defense for Advanced Programs.[92] But none of the services expressed significant interest in the Predator. Lt. Col. Donald Blackwelder, a USAF representative at the meetings, said he asked Air Combat Command (ACC), the headquarters for the USAF's combat aircraft, to provide specifications for Predator

89 Defense Daily (Jan. 24, 1995).
90 Big Safari scientist interview (Aug. 21, 2013)
91 Fulghum and Morrocco (June 5, 1995) 22
92 Blackwelder interview Aug. 13, 2015)

design improvements, but the command declined to do so because it had no formal "requirement" for a long-loiter UAV. [93]

The USAF did not change its position when it came time to find a service home for the Predator program. Both the USAF and the Navy initially rejected the program outright.[94] Eventually, the Army expressed interest when one of its UAV units became available to take on the Predator.[95] Army officials volunteered to take the Predator to Bosnia, and the Navy agreed to provide maintainers to support the deployment.[96] The USAF, however, provided just one airman for the deployment. [97] The lack of USAF influence on early Predator development would become a major problem later on, as described in chapter four.

In the summer of 1995, the Army took the Predator to Bosnia on its first deployment, known as Operation Nomad Vigil.[98] The UAV was initially expected to stay in theater 60 days, but at the behest of theater commanders stayed for 120.[99] Before leaving in November because of poor winter flight conditions, the Predator flew 750 flight hours and 80 surveillance missions, which provided evidence of weapons movements in violation of NATO agreements.[100] NATO commanders drew on that intelligence to inform major strike decisions,[101] including the decision to launch the August 1995 air campaign known as "Deliberate Force," which in turn led to the signing of the Dayton Peace Accords in December 1995.[102]

Of the 10 Predators initially built under the ACTD, two were destroyed in Bosnia. The first was possibly destroyed by enemy fire and the second was intentionally crashed into a mountain after engine trouble.[103] The putative shoot-down was hardly covered in the media because there was no pilot capture or

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[93] *ibid*
[94] Ehrhard (2010) 50;Lynn interview (Apr. 23, 2013)
[95] Lynn interview (Apr. 23, 2013); Blackwelder interview (Aug. 13, 2013)
[96] Blackwelder interview (Aug. 13, 2013)
[97] Blackwelder recalls the USAF sending an enlisted maintainer, Blackwelder interview (Aug. 13, 2013) ; Ehrhard's history said it was a B-52 pilot, Ehhard (2000) 540
[98] Ehrhard (2010) fn 400; Perdue interview (April 11, 2013)
[99] Thirtle, Johnston and Birkler (1997) 24
[100] Fulghum (Nov. 13, 1995) 72
[101] Fulghum (Nov. 13, 1995) 72
[102] McDaid and Oliver (1997) 107; DARO (1996) 9
[103] Fulghum (Aug. 21, 1995); McDaid and Oliver (1997) 107

death. A RAND report written in 1997 concluded that the Predator deployment "was considered an overwhelming success by the warfighters in Bosnia."[104]

But there were tactical and technical problems with imagery collection. Initially the concept of operations called for flying above clouds, at a significant altitude of 15,000 feet where the Predator could not provide useful surveillance. (Today the Predator is more likely to be found below 10,000 ft., and also has synthetic aperture radar to see through clouds). In terms of technological barriers, the KU-band data link that had allowed FMV during the Roving Sands exercise was not immediately available.[105] Instead, a UHF satellite data link transmitted still images with a 20 to 30-second delay to a satellite earth station, which in turn relayed the images through a Pentagon teleconferencing system, the Joint WorldWide Intelligence Communication System (JWICS).[106] Access to the KU band was added later in the deployment to enable FMV, but the still-immature technology delivered relatively low-resolution images.[107]

As the Predator's first Bosnia deployment ended, it was clear that the arguments historically cited for the USAF's waxing and waning interest in UAVs were now being called into question. UAV component technology and reliability had improved. EUCOM's request for a long-dwell surveillance capability also revealed a pressing demand for better theater reconnaissance in the wake of the Cold War. Yet the Predator's deployment experience was still limited, so there was a lack of reliable data on its combat capability and its total costs relative to other weapon systems.

Pentagon civilians, who were not constrained by the USAF's budgetary concerns, believed the emerging evidence regarding UAV technological maturity, reliability, combat capability, and cost was sufficient to field the Predator in combat. But the USAF and the other military services, which had lost their reconnaissance budgets to DARO and were in the midst of a major post-Cold War

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[104] Thirtle, Johnston and Birkler (1997) 24
[105] Thirtle, Johnston and Birkler (1997) 25
[106] Big Safari scientist interview (Aug. 21, 2013)
[107] Thirtle, Johnston and Birkler (1997) 25. Big Safari scientist interview (Aug. 21, 2013)

drawdown, had far more incentive to question the evidence regarding material improvements in UAV technology. Clearly there were rational reasons to reject the Predator program, but how far did culture impact the USAF's initial reluctance to embrace the UAV? The second half of this chapter will discuss how USAF culture colored the service's assessments of the Predator program and the service's decision not to participate.

1. **To what extent did individuals or groups within the USAF resist the Predator out of a concern that their jobs or status might be threatened by it?**

Gen. McPeak, the USAF chief from 1990 to 1994, told me that he rejected the Predator program based on his concerns about its cost and combat effectiveness relative to manned aircraft, as discussed in Question 2. But he also revealed that he saw the Predator and other UAVs as a potential threat to the dominance of manned aircraft and manned aircraft pilots in the early 1990s. "I worry a lot" about the impact of the Predator and other UAVs affecting the jobs and status of USAF pilots, he told me. In his view, USAF pilots represented the human dimension of warfare, which UAVs such as the Predator threatened to eviscerate. "This is about human values. I've never heard of any robots having a reunion or an 'I love me' wall," he said.[108] Asked in 2012 whether UAVs make combatants "less noble" in warfare by increasing the distance between adversaries, Gen. McPeak said "Yes, and I lament it, and I spent a lot of time as a warrior myself and as a leader of various units — small, medium, and large — trying to inculcate this warrior ethos which really requires some kind of intimacy with the enemy." [109]

Gen. McPeak took a dismissive view of USAF members who were not "operators," a reference to manned combat aircraft pilots. Shortly after he retired, he gave an end-of-tour interview in which he clarified that the main goal of his

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108 McPeak interview (Apr. 7, 2013)
109 McPeak interview (Nov. 19, 2012).

tenure was to make operations more central to the USAF and to enhance the warrior image of the service. “Operators should be placed in charge…and the whole thing should be wired together or wrapped up in a way that makes clear the warrior ethos of the whole enterprise.”[110]

While Gen. McPeak sought to preserve the superior status of all manned combat aircraft pilots, he was most worried about maintaining fighter pilot dominance. The central role of the fighter pilot in USAF culture had fueled his own rise to the top of the service. In the 1970s, during the USAF’s leadership transition from bomber generals to fighter generals, a greater number of fighter pilots received promotions “below the zone” (ahead of schedule) than peers in other career fields because they had more combat and leadership experience because of their frequent deployments to Vietnam.[111] As these fighter pilots advanced through the system, there was simply a better chance — better than half by 1990 — that the USAF chief would be a fighter pilot.[112] Since 1982, every chief had been a fighter pilot, and Gen. McPeak intended to preserve fighter pilot dominance. In 1991, he bluntly announced his intention to promote fighter pilots to leadership positions over officers in other career fields. “The service‘s purpose is to generate combat capability that protects the country, and not necessarily to provide equal career opportunities for those who fly heavies [transport aircraft] or, heaven forbid, don‘t wear wings at all,” he said.[113]

To further consolidate fighter pilot dominance, Gen. McPeak combined Strategic Air Command (SAC) and Tactical Air Command (TAC), into a new ACC. The move was part of his broader view, expressed in a 1991 speech, that the USAF’s legacy culture built around strategic bombing, embodied in SAC, needed to shift toward a “strategic attack” construct built around fighters and fighter pilots. The lines between strategic and tactical were blurring, he argued, as demonstrated in the 1991 Persian Gulf War when stealth fighters dropped precision guided

110 Watson and White (1994) 3-4
111 Worden (1998) 224; Michel (Dec. 15, 2006) 62-65
112 Smith (2014) Figure 7.3
113 Quoted in Danskine (June 2001) 105

munitions on strategic targets. As a result, combat pilots should all reside under one command: ACC. [114]

In reality, however, the merger of SAC and TAC within ACC was widely perceived as a "hostile takeover" by TAC, the nerve center of fighter culture, as one USAF lieutenant colonel described the transition at the time.[115] This was probably an accurate perception, inasmuch as Gen. McPeak himself argued that fighter pilots were most qualified to lead the USAF because they assumed the most risk and took on the most strategically significant missions.[116] The organizational construct at ACC further confirmed the perception. The new ACC was based at Langley AFB, the old headquarters of TAC.[117] New ACC offices were headed by TAC officers with SAC officers acting as deputies, and the new ACC patch was actually a TAC patch with "Air Combat Command" written on it. [118]

A 1991 document circulated around the air staff in the Pentagon, titled "TAC-umcizing the Air Force: The Emerging Vision of the Future," confirmed the cultural implications of Gen. McPeak's organizational changes. Highlighting the problems with the dominant fighter pilot culture of the McPeak era, it noted that under Gen. McPeak's leadership, "manly men" (i.e. fighter pilots) ranked first in the service, followed by cargo crews, acquisition officials, administrators, enlisted airmen, and others. "First, manly men must dominate Headquarters USAF," the brown paper said. "Second, they must command all Air Force major commands. Last, USAF must have a wing structure [favoring fighter units] which will grow and nurture the future leaders of the Air Force."[119]

As a result of the backlash generated by Gen. McPeak's focus on fighter pilots, then-USAF Secretary Donald Rice asked him to tone down his remarks. "One of the few issues I had a little concern over myself was this favoritism-to-pilots

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[114] McPeak (August 1995) 7-14
[115] McGuirk (April. 15, 1996) 15
[116] Danskine (June 2001) 105
[117] McGuirk (Apr. 15, 1996) 15
[118] ibid
[119] Quoted in Worden, ix-x.

issue," Rice said at the time, adding that he asked Gen. McPeak to tone down his comments.[120]

Gen. McPeak's preferences for preserving the dominance of manned combat aircraft pilots, and especially fighter pilots, led him to see UAVs as a potential threat. While UAVs were not yet doing the same missions as fighters, the very possibility was enough for Gen. McPeak to proactively resist their introduction into the USAF. "I was pretty successful in resisting buying a lot of drone aircraft," he told me.[121] When Robert Gates, the CIA director from 1991 to 1993, approached Gen. McPeak about collaborating on UAV development, Gen. McPeak said he declined to spend his shrinking budget on a reconnaissance UAV. Gates interpreted the rejection as evidence of pilot bias: "The Air Force wasn't interested because, as I was told, people join the Air Force to fly planes and drones had no pilot."[122]

Gen. Michael Moseley, USAF chief from 2005 to 2008, was more sympathetic to Gen. McPeak's point of view, arguing that his response did not reflect a pro-pilot bias but rather the cultural tension between military commanders preparing for war and intelligence personnel collecting information. That tension was acute at this time, Gen. Moseley said, because Gen. McPeak was already being asked to cut one third of his budget. "Gates was not an operator, so Gen. McPeak would not have been humored by this analyst showing up and saying 'this is what you need to do' while he is having to kill one out of three of his babies," said Gen. Moseley. [123]

Nevertheless, many outsiders interpreted Gen. McPeak's rejection of UAVs as evidence of his pro-pilot bias rather than his concern for preserving the USAF's combat capability in an austere budget environment. The senior civilian official in charge of the Predator ACTD said he got the impression that the service simply disliked UAVs. "I think they worried about the threat to manned airplanes," he

120 Quoted in Hopper (April 1997)
121 McPeak interview (Apr. 7, 2013)
122 Robert Gates (2014) 128
123 Moseley interview (Apr. 1, 2014)

said.[124] Lynn, the Pentagon's Deputy Undersecretary for Advanced Programs, agreed that the USAF's resistance to the Predator was rooted in the threat it posed to USAF pilots: "The operators resisted UAVs for 50 years, the Air Force being the worst of the lot. My view was that the Air Force was afraid of UAVs somehow damaging manned flight and so they were less interested in UAVs."[125]

Bob Williams, the DARPA official who had worked on the Amber program and for Gen. Joulwan, said he knew there was a hardcore manned aircraft bias in the USAF when Big Safari responded to Gen. Joulwan's request for a UAV with a manned glider. "This illustrates how the USAF actually operates at lower levels. Pilots did not believe in 'drones' based on their experience and knowledge, so the AF working level opposed the idea," said Williams. "Many innovative ideas are filtered at that level."[126]

The USAF also signaled to the US Congress that it did not want to get involved with the Predator program. Michael Meermans, a professional staff member for US Congressman Jerry Lewis, a Predator advocate, said that he did not get a positive reaction from any military service when he surveyed them about taking over Predator management. The USAF's rejection was rooted in bias rather than rational concerns. "Let's face it, there was, and to some extent continues to be, the white scarf syndrome, where pilots like to be in the seats and push pointy nose airplanes all around the sky really fast," said Meermans.[127]

But it was not just the USAF's manned aircraft pilot community that felt threatened. While the unmanned configuration troubled the USAF's pilot leadership, the UAV's capacity to deliver FMV worried the USAF's intelligence analyst community. USAF intelligence analysts favored the longstanding practice of analyzing post hoc analysis of still satellite imagery. But the Predator design adopted a real-time FMV streaming capability, which required a change in mindset

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[124] Senior Pentagon civilian interview (March 27, 2013)
[125] Lynn interview (Apr. 23, 2013)
[126] Williams interview (Sept. 13, 2014)
[127] Meermans interview (Apr. 9, 2013)

and also generated more work for the analysts.[128] To circumvent the change, Army intelligence analysts in Bosnia initially froze images from the FMV for analysis rather than watching the FMV in real time to pick up on patterns. Cassidy, the GA-ASI CEO said that after Predator FMV became available in Bosnia in 1995, Army intelligence analysts would freeze-frame images in the FMV for analysis.

Similar to the USAF's manned aircraft pilot leadership, USAF and Army intelligence analysts saw the Predator as a threat to their existing jobs, although status was less of a concern because they did not dominate USAF leadership positions. "I would like to think that the intel guys picked up on" the Predator contribution to reconnaissance, recalled Adm. Owens, the Vice Chairman of the Joint Chiefs of Staff during this time period, "but just like we have aviators and submariners and ground-pounders, we have in the intelligence services people who love satellites and ELINT [electronic intelligence] and love what they have known from their own experience to be important."[129]

In conclusion, these findings suggest that cultural biases within the USAF provided a reinforcing context for the service's initial rejection of the Predator program. Gen. McPeak promoted a "white scarf" mentality that focused on the preservation of the jobs and status of manned aircraft and manned aircraft pilots. The acceptance of the Predator's unmanned configuration would have required the USAF to adopt a broad conception of airpower theory that allowed for competition between manned and unmanned assets. During Gen. McPeak's tenure, such a competition was unacceptable because it opened the possibility of the Predator doing some of the same jobs as manned aircraft, thereby diminishing manned aircraft pilots' status and even harming their career prospects. The USAF's intelligence analyst community similarly felt threatened, although the introduction of Predator FMV did not diminish their status as much as it threatened their job description, built around years of well-entrenched SOPs for viewing still imagery.

[128] Blackwelder interview (Aug. 13, 2013)
[129] Owens interview (Oct. 9. 2013)

2. **To what extent were judgments about the potential and cost effectiveness of the Predator based on the USAF's enthusiasm for employing new technology and to what extent was the enthusiasm outside the service?**

In his book on the history of UAVs, Richard Armitage addresses the difficulty of comparing the potential and cost effectiveness of manned and unmanned aircraft. "Because of the entirely different concepts involved in unmanned as compared to manned aircraft, no sensible balance of cost effectiveness can be drawn," he wrote.[130] Yet the inherent difficulties have not stopped generations of uniformed and civilian military officials from trying to make such comparisons, highlighting and obscuring data to suit their respective interests and biases. In the case of the Predator program, the USAF took a far more pessimistic view of the potential and cost effectiveness of the Predator program while Pentagon civilians were enthusiastic.

Diverging Views on Predator Cost Effectiveness

In terms of cost effectiveness, Pentagon civilians admitted in interviews that they lacked data to prove that the Predator would be cheaper than manned aircraft alternatives for medium-altitude reconnaissance missions.[131] Rather, their optimism about UAV costs was extrapolated from cost comparisons for high altitude surveillance aircraft. Major General Kenneth Israel, the director of DARO, compared the unmanned Global Hawk to the manned SR-71 Blackbird in a classified briefing known as "Senior Ulm."[132] He obtained the cost data directly from the military services, and the cost comparison was reviewed by the Pentagon's Cost Analysis Improvement Group (CAIG, now known as the Cost

[130] Armitage (1988) 100.
[131] Lynn interview (Apr. 27, 2013); Williams interview (Apr. 14, 2013)
[132] Lynn interview (Apr. 27, 2013)

Assessment and Program Evaluation [CAPE]). According to Lynn, who saw the study, the unmanned option came out cheaper.[133]

This comparison, while not directly applicable to the Predator program, was considered by Lynn and other senior Pentagon officials to be indicative of the relative cost effectiveness of UAVs compared to manned counterparts.[134] More important to Pentagon civilians than Senior Ulm, however, was their view that it was only common sense to believe that UAVs would be cheaper.[135] "Arguing that UAVs are more expensive than manned aircraft is nonsense," said Lynn.[136] A senior Pentagon civilian in charge of the Predator program ACTD confirmed: "It was very much a cost argument for certain missions."[137] Echoed Williams, the DARPA official who worked on the Amber program: "I really don't think that Larry [Lynn] and others gave cost much thought — they were looking for an ISR system to conduct the 'dull, dangerous, and dirty' missions, and intuitively knew that a reliable UAV would have a high cost-benefit ratio."

But the USAF did not agree that the cost data was sufficient to show that the Predator would be less expensive than manned aircraft. "Nobody could prove to me that it was cheaper," said Gen. McPeak. "For me, cost was the overriding issue."[138] Faced with a shrinking budget, Gen. McPeak was unwilling to cut into his bottom line for manned aircraft to take a risk on funding a UAV. "I didn't have enough money to buy manned aircraft, let alone unmanned," said Gen. McPeak.[139] "I didn't think it made economic sense."

Yet Gen McPeak's argument about cost rings somewhat hollow. As discussed above, the USAF would be required to pay only support costs for the Predator for the first two years while DARO footed the remainder of program costs. After two years, DARO would release Predator funding to the USAF, allowing

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133 *ibid*
134 *ibid*
135 Williams interview (Apr. 16, 2013)
136 Lynn interview (Apr. 27, 2013)
137 Senior Pentagon official (March 27, 2013)
138 McPeak interview (Apr. 7, 2013)
139 McPeak interview (Apr. 7, 2013)

the service to regain some control of its airborne reconnaissance budget. From a rational perspective, then, Gen. McPeak's argument is weakened because the USAF would only have to pay for support costs. Furthermore, the service stood to recoup the airborne reconnaissance funding that DARO had previously taken away if it kept the Predator beyond two years.

In the view of USAF outsiders, a more powerful explanation for the USAF's negative views of the costs of the Predator program was rooted in USAF culture. Maj. Gen. Israel, the USAF official running the civilian agency DARO, told the *Washington Post* in 1999 that USAF officials questioned his cost data, and they also frequently manipulated his calculations to argue for more funds for manned aircraft during his tenure at DARO from 1993 to 1998. "Critics determined that the best way to slow down a bold and innovative idea was to load it down with cultural innuendoes and inaccurate comparisons between manned and unmanned aircraft," he told the paper. [140]

Assessing the Potential of the Predator Program

Gen. McPeak also expressed reservations about the reliability of the Predator UAV, although he mentioned it as a secondary issue. "I didn't know what the accident rate was," he said.[141] To be sure, pockets of the USAF that believed UAVs had potential. One USAF intelligence officer wrote an article in 1990 for the USAF's professional journal highlighting the combat capability of UAVs as demonstrated by Israel in the 1973 Yom Kippur War and the 1982 Peace for Galilee Campaign.[142] But the USAF's leadership was more skeptical about the relative benefits of UAVs compared to manned aircraft. Gen. McPeak said that even today, he believes the capability of unmanned aircraft remains "unproven," adding "UAVs cannot beat

[140] Ricks and Squeo (1999) A1.
[141] McPeak interview (Apr. 7, 2013)
[142] Tice (Spring 1991).

manned aircraft except in highly specialized missions like going to Mars and [surveillance] photography."[143]

Gen. McPeak also was skeptical of the Predator's relevance in the emerging strategic context. In his view, the future of airpower resided with fighters performing strategic attack roles in a conventional air campaign. Reconnaissance was largely ignored during this time period. The USAF retired its workhorse tactical reconnaissance aircraft, the RF-4C, cancelled its new sensor, ATARS, and resisted lawmakers' calls to bring back the SR-71 Blackbird strategic reconnaissance plane for surveillance over Bosnia.[144] To the extent that Gen. McPeak considered reconnaissance in the USAF's strategic planning, he focused on satellites, which had provided valuable theater-wide intelligence during Desert Storm.[145] In this cultural context, there was little room for a reconnaissance UAV with a collection capability that seemed to fall somewhere between strategic and tactical reconnaissance.

Outside the USAF, however, the Predator was seen as having significant potential. Pentagon civilians and the aircraft industry expressed growing confidence in the reliability of UAV technology. "I had visited General Atomics many times, and I think somewhere along the line I got the feeling they were really going to work," said one top civilian official managing the Predator ACTD process.[146] Others, like Lynn, the Deputy Undersecretary for Advanced Technology, argued that UAV technology had been mature enough for combat as far back as the 1970s.[147]

By the early 1990s, pockets of the aircraft industry also showed their optimism by investing in long-dwell UAV development. Convinced the technological components were now available, Karem and the Blue brothers turned to Tom Cassidy, the president of GA-ASI, to lobby for UAV investment in the

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[143] McPeak Interview (Apr. 7, 2013)
[144] ACC (2006) 3; LA Times (29 November 1995) 1; Burnett (5 July 1993) 17.
[145] McPeak (1995) 207
[146] Senior Pentagon civilian (March 27, 2013)
[147] Lynn interview (Apr. 23, 2013)

Pentagon and on Capitol Hill. US lawmakers were also optimistic about the potential of UAV technology, in part because of Cassidy's aggressive lobbying. There was not one year that I did not get more money than I requested,"[148] recalled retired Maj. Gen. Israel, who ran DARO from 1993 until it was disbanded in 1998."[149]

Outsiders were also more optimistic than Gen. McPeak about the potential relevance of the Predator in future conflicts. While Gen. McPeak focused on the role of satellites collecting still imagery in a conventional conflict similar to Desert Storm, Pentagon civilians saw a need for theater–level reconnaissance capabilities, such as UAVs, for persistent monitoring in places like Bosnia, where the sporadic coverage provided by satellites was insufficient to track rapidly changing events and combatants moving among civilian populations. [150] Woolsey, the CIA director, also had developed a preference for long-dwell surveillance UAVs — "pseudolites" — over satellites, which dated back to the 1980s when he was looking for ways to monitor arms movements during his time as US Ambassador to the Negotiation on Conventional Armed Forces in Europe. Around Woolsey's office, it was common to hear colleagues say: "Whatever the problem, Woolsey thinks UAVs are the solution."[151]

Reconciling Conflicting Views

Gen. McPeak defended his pessimistic view of Predator cost and reliability as being based on rational decision-making, not in a cultural preference for manned aircraft. But he also conceded that a conservative streak tinged his view, comparing himself to Gen. Curtis LeMay, who resisted the introduction of the ICBM until its technological feasibility has been significantly demonstrated. "LeMay and I are the same," he said, "but LeMay was wrong and I was right. LeMay resisted the

[148] Wood (2015) 32
[149] Wood (2015) 32
[150] Entzminger interview (Dec. 15, 2012)
[151] Strickland (March 2013) 3

ICBM for no good reason; I resisted the UAV based on logic." Gen. McPeak argued that Gen. LeMay benefitted from ample Cold War-era funding to buy both manned aircraft and ICBMs, while Gen. McPeak was fiscally constrained and forced to make choices between manned and unmanned technologies. "Our policy was Mutually Assured Destruction, so why the hell wouldn't he buy ICBMs? The problem was I was dealing with retrenchment." [152]

But there may be less of a difference between Gen. LeMay and Gen. McPeak than the latter was willing to admit. Regardless of the budget environment, the decision to invest in a military innovation always requires trade-offs because funds are never unlimited and there are always competing priorities. Cultural perceptions shape the views of the relative costs and benefits of one military innovation versus another. There is reason to suspect that such cultural influences impacted Gen. McPeak's judgments about the Predator program because outsiders took a very different view of the UAV than he did. As Adm. Owens, the Vice Chairman of the JCS at the time, explains, the USAF had rational concerns about UAV technology, which were further reinforced by its cultural preferences. On one hand, "There was…a feeling, and I think Gen. McPeak felt this way, that the Predator was not reliable. We were having difficulty, we had crashed a bunch of them, and they were cheap but still not free," he said. But on the other hand, "I think deep down there was a feeling that manned combat aircraft were the only answer to capability in the air…the straight aviation perspective on this was 'if we do Predator, than, by God, there goes many of my missions.'"[153]

As Allison and Halperin's bureaucratic politics model predicts, assessments differed based on the position of the person making the assessment, a concept captured in the phrase "where you stand is where you sit." As the USAF chief, Gen. McPeak's instinct to protect the existing organizational structure of the USAF — built around the preeminent warrior status of the manned aircraft pilot — led him to question the potential and cost effectiveness of the Predator. However,

[152] McPeak interview (Apr. 7, 2013).
[153] Owens interview (Oct. 9, 2013)

Pentagon civilians with no stake in the USAF's existing organizational structure or the costs associated with fielding the Predator thought that UAVs offered great capability at low cost. The difference in views between the USAF and outsiders suggests the possibility that the USAF's cultural preference for manned aircraft may have influenced its assessment of the Predator's cost and potential.

3. **To what extent were USAF judgments about the employment of the Predator driven by a desire to reduce the risk to friendly personnel, and to what extent was that push from outside the service?**

As discussed in Question 1, Gen. McPeak expressed a strong preference for a narrow conception of airpower that favored manned strike aircraft, thereby affirming the special role and status of the pilot as a warrior. He saw pilots of combat aircraft — especially fighters, and to a lesser extent, the bombers, reconnaissance aircraft, tankers and other aircraft under the newly created ACC — as possessing the unusual courage and skill required to fly into harm's way. Gen. McPeak promoted a cultural view of fighter pilots as the most elite warriors in the USAF based on the idea that they possessed the unique skills to perform the most high-risk missions. These missions, such as air-to-air combat, required courage, flexibility, quick decision-making, and heightened awareness of one's surroundings.

Given the premium that the USAF placed on risk acceptance among its pilot leadership during Gen. McPeak's tenure, it follows that reducing aircrew risk was not a major concern. In Gen. McPeak's view, the raison d'etre of the USAF was the unique capacity of the USAF combat aircraft pilot — as opposed to aviators in other services — to employ the skills and courage necessary to accept the risks of entering highly contested airspace. "We've discovered we know more about penetrating air defenses with manned aircraft than you can imagine because we have been operated for 60 years independently," he told me. "How many of our pilots have been shot down lately? Not many."[154]

The priority of maintaining the risk-taking image of the combat pilot led to a reluctance to invest in UAV technology. Gen. McPeak argued that USAF combat pilots and manned combat aircraft had a proven track record of being able to manage risk and therefore UAVs were unnecessary. In fact, Gen. McPeak argued that UAVs might be *more* risky than manned combat aircraft because they lacked the situational awareness and flexibility provided by a human operator. "The argument was [the Predator] was cheaper and there was no risk," recalled Gen. McPeak. "You don't have to worry about some pilot on the ground waving his hands in the air. I have to admit, fighter pilots are obnoxious, but I didn't agree necessarily that these things were cheaper or any less risky."[155]

Gen. McPeak pointed to his personal experience in Vietnam as an example of the USAF pilot's unique ability to employ his weapon system in hostile airspace. "I flew 285 missions in the F-100 in Vietnam and I only got one little hole in the airplane floor," he said.[156] He also cited the track record of USAF combat pilots in the 1991 Persian Gulf War. "I had just fought Desert Storm and lost something like seven airplanes. People are going to tell me it's dangerous and risky to expose men in airplanes? You've got to be kidding me. And no robot is cheaper than a human brain."[157]

But the historical evidence of casualties in combat during Gen. McPeak's career suggests a clash between his beliefs and reality. The USAF's losses in Vietnam, which occurred largely as a result of flak and small arms, were significant. To be sure, the air war involved far fewer losses per sortie than in WWII, but Gen. McPeak's claim that pilot skill negated risk discounted other factors — not the least of which was luck. Gen. McPeak's experience in Southeast Asia (one little hole in the floor of his airplane) was quite different from that of the

[154] McPeak interview (Apr. 7, 2013)
[155] McPeak interview (Apr. 7, 2013)
[156] *ibid*
[157] *ibid*

pilots in the 2,562 fixed wing aircraft and 3,587 helicopters lost to enemy fire during that conflict. Taking into account noncombat accidents and other operational losses the totals climbed to 3,720 fixed wing aircraft and 4,869 helicopters.[158] Gen. McPeak's own"Misty" forward air controller unit lost 14 aircraft in the first half of 1969 alone.[159] During Desert Storm, the actual number of USAF aircraft lost was 14, not 7 as he suggested — still a small number, given the US flew against an enemy with 16,000 SAMs, 7,000 antiaircraft guns and 750 combat aircraft, but bigger than he remembered.[160]

Despite the very real risk encountered by USAF pilots during Vietnam and Desert Storm, Gen. McPeak's views of the invincibility of the fighter pilots were shared by others in the service. A 1990 *USAF Fighter Weapons Review* article titled, "The Late Great Fighter Pilot" sought to remind fighter pilots of the irreplaceable attributes that humans bring to aerial combat, which cannot be substituted with technology even when lives are at stake:

> *"Never forget it's you and not the airplane you are flying that breeds success. Your personal traits are key: aggressiveness — wanting to kill; preparation — being ready to kill; persistence — not quitting until you kill; knowledge — knowing how to kill and discipline — doing what's briefed so we can kill. Aerial victory is achieved partially through technology, but it lives or dies in the heart and soul of the fighter pilot."*[161]

Even as these views about aircrew risk pervaded the USAF, however, concerns about the political risks of wartime casualties were climbing to an all-time high outside the service. Pentagon civilians had grown particularly concerned about the risk to aircrews flying un-armed reconnaissance aircraft, which the USAF had ironically ignored in favor of fighters that were seen as being truly representative of combat risk and capability.

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[158] Lambeth (2000) 13
[159] Grant (Feb 2013)
[160] Haulman (Dec. 9, 2002) 1
[161] Smiley (Fall 1990) 31

Throughout the Cold War, the vulnerability of un-armed reconnaissance aircraft flying in hostile airspace became increasingly apparent. A total of 23 aircraft and 179 airmen were lost flying peacetime reconnaissance missions between 1946 and 1990; that does not include another 12 aircraft and 50 airmen who were lost flying peacetime reconnaissance missions over Vietnam.[162] The shoot-down of Capt. Powers' U-2 in 1960 brought public attention to the issue, causing political embarrassment and influencing US-Soviet treaty negotiations.[163] The incident had prompted the USAF to begin the series of drone surveillance programs based on the 147 Lightning Bug discussed in chapter two. Even after the USAF's involvement in surveillance UAV programs ended in the 1980s, a concern for casualty aversion continued to grow among Pentagon civilians.

Navy Secretary John Lehman said he started buying the Pioneer UAVs in the 1980s to conduct surveillance after the loss of two pilots and two surveillance jets in Lebanon. "They are cheaper. They are expendable. They fly behind enemy lines and you don't have to worry about creating a widow, or having a POW on the ground to tie the president's hands,'' Ray Coleman, an official in the Pentagon's Office of Unmanned Aerial Vehicles, told a reporter in 1991.[164]

By the time the 1991 Persian Gulf War ended, civilian defense officials assumed support for action in Bosnia depended on near-zero losses of military personnel.[165] In light of these political circumstances, Perry, Deutch, and Lynn were eager to pursue unmanned options.[166] According to one senior Pentagon civilian managing Predator development, UAVs were in a stronger position than the U-2 to undertake certain types of missions, particularly those that presented the political risks of a downed pilot being captured or killed:[167] "We were very worried about using U-2's for manned, high-altitude surveillance" in politically sensitive areas such as the 38th parallel in North Korea and areas of the Middle

162 Newcome (2004) 71
163 Newcome (2004) 71
164 Nalder and Lee (January 18 1991)
165 Barzelay and Campbell (2003) 157
166 *ibid*
167 Senior Pentagon civilian interview (Mar. 27, 2013)

East."[168] One defense official was quoted in a 1994 news report saying that the U-2 had been relegated to "strictly stand-off missions" because of the growing proliferation of long-range, high altitude Soviet-designed SA-5, SA-10, and SA-12 SAMs.[169]

The CIA shared the Pentagon civilians' concerns. The agency's Gnat-750 UAVs were bought to replace the two-man RG-8 Schweitzer powered gliders that the agency had been using for reconnaissance missions. "The agency is moving to UAVs to avoid the risk of its pilots being captured or killed in clandestine fights," *Aviation Week & Space Technology* reported.[170]

On September 10,1995, the US government decided to use the Navy's Tomahawk cruise missiles, rather than aircraft, to target Serbian air defenses in Bosnia for the first time out of a concern for reducing risk to aircrews after an SA-6 shot down Captain O'Grady in June.[171] Bosnian Serbs claimed the missiles killed civilians, and NATO leaders said the US decision to use Tomahawks was unauthorized and escalated the conflict.[172] Looking back on the decision, however, former Secretary of State Warren Christopher said that NATO's objections "were quite unconvincing when weighed against the pilot risk in those areas where we didn't have good anti-aircraft suppression." [173]

While the USAF tended to see its aircrews as uniquely qualified to handle high-risk environments, USAF outsiders were more interested in substituting UAV technology for pilot skill. The difference in opinion was based on diverging views of the relative importance of employing the unique skills of USAF pilots versus the significance of aircraft loss rates. USAF government civilians were increasingly driven to employ UAVs because of their concerns for rising expectations of zero casualties in the American public after the relatively minimal losses of the Persian

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[168] *ibid*
[169] Fulghum (July 11, 1994b) 20-22.
[170] *ibid*
[171] Schmitt (Sept. 11, 1995)
[172] *ibid*
[173] Christopher (Oct. 30, 1996)

Gulf War. The USAF under the leadership of Gen. McPeak, however, tended to view threats to manned aircraft during this time period as real but tolerable, greatly mitigated by the capacity of highly trained aircrews — and pilots in particular — to operate in high threat environments.

The USAF's view of aircrew risk reflected a cultural preference for preserving the status of the manned aircraft pilot, which was derived in part from his willingness to face risk in aerial combat. If UAVs eliminated the need to put pilots at risk, then the special skills and courage that provided the justification for their occupation of leadership positions would be diminished. USAF culture also promoted the impression that one of the most important reasons for the service's existence was that its aircrews could perform better than any other services' aircrews in the most high-risk environments. In this cultural context, the idea of using UAVs for high-risk reconnaissance missions threatened not only the jobs and status of manned aircraft pilots, but the entire rationale for an independent USAF based on the unique war–fighting capabilities of its aircrew.

4. To what extent were judgments about the Predator based on a concern about maintaining the USAF's primary control over air assets in response to competition from other civilian and military institutions?

The USAF's leaders were not protective of the Predator program — nor were the other military services — despite outside interest from the CIA in both the Gnat-750 and Predator. In his dissertation, Ehrhard found that the tendency of military services to ignore UAVs that are developed outside their purview is a completely rational phenomenon.[174] In Ehrhard's view, the decision to pass on the Predator program did not reflect a general judgment about the relevance of UAVs to the USAF. Instead, the USAF and the other military services initially rejected the

[174] Ehrhard (2000) 599-600

Predator simply because it was developed in the Pentagon without regard to any of the services' particular material interests regarding cost or combat capability.[175] In terms of cost, the USAF viewed funding for manned versus unmanned aircraft as a "zero sum game" because it was combined in DARO, putting the two aircraft configurations in direct competition. In terms of capability, the Predator's mixed operational performance in Bosnia also provided rational justification to balk at the introduction of the Predator program.

While surely rational factors influenced the USAF's decision-making, the USAF's culture influenced how these factors were perceived. First, organizations tend to compete for technologies that perform the missions they most care about — the missions that are closest to their "essence," as Halperin describes it. The USAF did not see the reconnaissance mission — the only mission performed by the Predator at this time — as being nearly as important to its essence as the missions performed by manned aircraft, especially fighters. In the view of the USAF's manned aircraft pilot leadership, the USAF did not need to compete for the Predator program because its reconnaissance mission was seen as peripheral, rather than something so central to the USAF's doctrine that it could not be ignored.

The second way that culture may influence an organization's decision to claim or ignore a technology is when the technology performs a peripheral mission that is threatening to become so important to outsiders that the USAF's lack of involvement may detract from its war-wining reputation. In that case, the USAF may see to control the technology, if only to manage its rate of growth and prevent it from interfering with what the service perceives as its central tasks. During the McPeak era, the Predator's unmanned configuration was indeed viewed as a potential threat to manned aircraft. However, the Predator's operations in Bosnia were still small-scale, confined to reconnaissance, and not yet widely appreciated across the defense community. Therefore the service saw

[175] Ehrhard (2000) 600

little risk in actively ignoring the technology; it was not necessary — yet — to stake a claim on the Predator to control its rate of growth.

While the USAF's leadership felt no pressure to compete for the Predator program, one might still expect certain sub-communities in the service to lobby for the Predator because they viewed it as part of their own core mission. Given the CIA's early interest in the Predator program, it would be logical to assume that the USAF's intelligence analyst community, which put a higher premium on reconnaissance than the USAF's fighter pilot leadership, would take a protective interest in an airborne asset designed for exploitation of valuable intelligence. Yet as discussed in Question 1, even that sub-community's cultural preferences agitated against Predator program adoption. Like the USAF's manned aircraft community, intelligence analysts did not see the Predator as essential to fulfilling their intelligence collection mission, nor did they see it as a big enough threat to their existing ways of doing business to ignite their protective instincts to control its rate of growth.

The USAF's lack of interest in asserting jurisdiction over the Predator during the McPeak era highlights both the USAF's low regard for the strategic relevance of the technology and the relative obscurity of Predator operations. The Predator's reconnaissance missions in Bosnia were not central enough to USAF doctrine, built around strategic attack, to require a campaign to control the technology. At the same time, the potential advantages of the Predator's unmanned configuration and FMV capabilities were not widely understood enough at the time to force the USAF to seek control of the Predator as a means to prevent it from raising questions about the service's reliance on a strategic airpower doctrine built strictly around manned aircraft.

Conclusion

Pentagon civilians, eager to adopt the Predator as an ISR asset, played the central role in developing the Predator program and ultimately finding a military user for the system in the Army. Throughout 1993 and 1994, the USAF actively avoided the Predator program based on their cultural perceptions of a variety of factors that impinged on Predator development.

In Gen. McPeak's view, all indications were that the Predator program was a bad investment. He believed that UAV technology was still relatively unproven; he felt that there were no compelling evidence that UAVs were cheaper than manned aircraft, a major drawback in an austere post-Cold war budget environment; and he felt that the future of strategic reconnaissance, to the extent that this peripheral mission mattered, lay with satellites rather than UAVs.

In contrast, Pentagon civilians, who had no stake in preserving the USAF's existing cultural norms nor financial responsibility for the Predator program, totally disagreed with Gen. McPeak's assessment. In their view, UAV technology was sophisticated enough to have military potential, cheaper than manned aircraft, and better-suited to the emerging strategic context as threats shifted from the Fulda Gap to MOOTW — more dynamic regional conflicts taking place amidst civilian populations. The USAF's cultural attitudes toward UAV innovation help to explain these sharply differing assessments of the Predator program's potential.

Under the leadership of Gen. McPeak, the USAF embraced a narrow conception of airpower built around the central role of manned aircraft in a conventional air campaign. Seeking to preserve the preeminence of aircraft and manned aircraft pilots in airpower theory, Gen. McPeak viewed any technological alternatives to manned aircraft, such as UAVs, as a potential threat. His cultural preference for manned aircraft over UAVs fed into pessimistic assessments about the cost, potential, and relevance of UAVs in the emerging strategic context. His preoccupation with preserving the leadership status of manned aircraft pilots, built partly on their courage in aerial battle, also led him to devalue the advantage that UAVs provided in terms of reducing risk to aircrew. Taken together, Gen. McPeak's views promoted a prevailing culture in the USAF that saw little to no use for UAVs in the service's inventory.

In closing, the findings of this chapter do not support the idea that the USAF has been open to a variety of technologies to advance the service's war-winning edge. Chapter two identified a historical cultural tendency of the USAF to favor manned aircraft over other types of technology, particularly during periods of relative peace. This pattern continued during the McPeak era. The development and expert employment of manned aircraft remained central to the USAF's justification for its existence during this time period. Reconnaissance UAVs were not yet considered even a peripheral consideration worthy of the service's attention and resources.

CHAPTER FOUR, Air War Over Bosnia: The Predator Transitions to the USAF

After initially rejecting responsibility for the Predator program, the USAF completely reversed its position in 1995, making a series of decisions in favor of the Predator that led to its formal transition to USAF control in August 1997. Ehrhard cites the leadership of Gen. Ronald Fogleman, the USAF chief from October 1994 to August 1999, as a central force behind the USAF's abrupt reversal. According to Ehrhard, Gen. Fogleman "mobilized the support of the senior generals and applied the full weight of his service to get Predator."[1]

In Ehrhard's view, Gen. Fogleman's advocacy was part of a larger historical cultural affinity within the USAF for aerospace innovations of all types. The USAF's pilot leadership has been especially enthusiastic, stepping up to make "rickety UAV programs fly efficiently"[2] because "their love of technology perhaps allowed more flexibility concerning non-standard forms of aerospace power."[3] Ehrhard cites Gen. Fogleman as one of several "visionary service chiefs" that supported UAV innovation.[4]

This chapter explores the extent to which technological enthusiasm among the USAF's pilot leadership, as well as other cultural attitudes within the service, led the USAF to adopt the Predator program. If the findings suggest that technological enthusiasm was pervasive across the USAF's pilot leadership, as Ehrhard suggests, this evidence would mark a significant cultural shift within the USAF from the years of Gen. McPeak. If, however, the findings suggest that technological enthusiasm was not widespread within the USAF's leadership, then

[1] Ehrhard (2000) 541
[2] Ehrhard (2000) 592
[3] Ehrhard (2000) 593
[4] Ehrhard (2000) 541

other cultural influences and material factors may have more power to explain why the USAF suddenly pursued management of the Predator program.

The first half of the chapter reviews the history of the Predator's transition to the USAF, examining the decision-making processes that led the USAF to pursue Predator management after 1995. The second half uses the four sub-questions identified at the beginning of this thesis to explore how USAF culture influenced the service's decisions during the Predator program's transition from DARO to the USAF between 1995 and 1997.

Transition: The USAF Claims the Predator Program

The end of the Predator's first deployment to Bosnia in late 1995 marked the last major milestone in the Pentagon's ACTD process. In anticipation of the ACTD"s conclusion in June 1996, DARO prepared to transfer responsibility for the Predator to one of the military services. The Army had agreed to deploy the Predator to test it, but that is where their commitment ended. The looming question was whether any of the military services would agree to manage the Predator as a "program of record," making a commitment to fly and maintain the aircraft as part of its force structure. Finding a military service to sponsor the Predator program was essential if it were to survive beyond the ACTD.

As discussed in chapter three, in 1993 and 1994 none of the military services wanted to adopt the Predator program. The USAF was most reluctant, limiting its participation in the Predator's first Bosnia deployment. Yet in early 1995, a sea change in thinking about the Predator washed over the Pentagon brass. The USAF suddenly joined the Army and Navy in a three-way race to control the Predator program.[5] Each military service began writing an "Operational Requirements Document" to make their case for ownership once the Predator ACTD ended in June 1996.[6]

[5] ACC History Office (Aug. 2006) 7; Blackwelder interview (Aug. 13, 2013)
[6] *ibid*

The emerging competition for the Predator in late 1995 surprised Pentagon acquisition officials. The Predator ACTD was the first to transition to a formal acquisition program. At the time, there were no precedents and no formal policy for selecting a "lead service" to manage a weapon system at the end of an ACTD.[7] Existing ACTD policy stated only that Lynn's Advanced Technology office, as the managing ACTD authority, should make a recommendation on the fate of ACTD programs to a panel of senior Pentagon officials responsible for major acquisition decisions, known as the Joint Requirements Oversight Council (JROC). The mission of the JROC, established in 1986, is to ensure that new weapons systems meet the "joint" needs of compatibility and do not overlap with other efforts. The JROC could make three types of recommendations: one service could be selected to manage the weapon system; management could be split among the services; or, the weapon system could be cancelled all together.[8] The ambiguity about how to select a service to manage the Predator program created an opportunity for the USAF to take decisive action.

Under the leadership of Gen. Fogleman, the USAF activated a new unit to fly the Predator — the 11th Reconnaissance Squadron (RS) at Indian Springs Auxiliary Airfield in Nevada —in August 1995.[9] The decision was so sudden that the service failed to inform Lynn's Advanced Technology office, the managing authority for the Predator ACTD**.** Retired Lt. Col. Donald Blackwelder, an F-111 pilot and the USAF's representative for the Predator ACTD in that office, first learned about the decision when he read the morning news. "There was no communication between the Air Force and the Office of the Secretary of Defense," he recalled.[10]

On October 17, 1995, Gen. Fogleman made another bold push for control of the Predator program, asking his generals at ACC, the command that would be responsible for Predator management, about the feasibility of accepting the UAV

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[7] Thirtle, Johnston and Birkler (1997) 34; Blackwelder interview; Poilcy guidance was issued in Dec. 1996, see Kaminski (Dec. 19, 1996)
[8] Blackwelder interview (Aug. 13, 2013)
[9] Ehrhard (2000)541;Fogleman interview (July 22, 2013)
[10] Blackwelder interview (Aug. 13, 2013)

for operations within 30 days. ACC said it would be possible, but operational use in that timeframe would require Army assistance. ACC also said that an all-USAF operation would not be possible until 1996.[11] Meanwhile, Lt Col Blackwelder, still a USAF officer detailed to work for Lynn, drafted a memo on behalf of the Advanced Technology office to request the transfer of the Predator program to his service. He did so based on his understanding from reading the newspaper that Gen Fogleman wanted control of the Predator program.[12]

Deployment Two, Operation Nomad Endeavor: The USAF Joins the Predator in Bosnia

Although the USAF still needed assistance from the Army for Predator operations, it rapidly assumed bureaucratic responsibility for the Predator program. In November 1995, Gen Fogleman told ACC that the USAF had been appointed "executive agent" of the Predator program.[13] In December 1995, the JROC, the panel responsible for reviewing the Advanced Technology Office's recommendation on the Predator program, confirmed that the UAV would be transitioned to the USAF. The head of the JROC, Admiral William Owens — the Pentagon's Vice Chief of Staff at the time — sent a version of Lt. Col. Blackwelder's memo to the Secretary of Defense, William Perry, with the JROC's recommendation.[14] Then, on February 12, 1996, the JROC confirmed that the Predator had demonstrated sufficient military utility to warrant production and requested the fielding of 16 systems.[15] Gen. Fogleman said he worked hard to shape a JROC decision in favor of the USAF, making it clear that "we were willing to take this on, and make it a success."[16]

However, the USAF's victory was not complete. USAF officials expected to rely on the Army for operational assistance during the Predator's transition, but

[11] ACC History Office (Aug. 2006) 9
[12] Blackwelder interview (Aug. 13, 2013)
[13] ACC History Office (2006) 9
[14] Blackwelder Interview (Aug 13, 2013)
[15] Israel (Mar. 7, 1997)
[16] Fogleman interview (July 22, 2013)

bureaucratic requirements solidified a longer-term management role for the other services. In an April 1996 memo, Perry, the Secretary of Defense, concurred with the JROC's recommendation to designate the USAF as the lead service, but he also cemented the Navy's role development and procurement.[17] Meanwhile, the Army was still running Predator training. Pentagon officials stopped short of consolidating Predator management solely in the USAF because of pressure from the US Congress, which had intentionally consolidated responsibility for UAVs in the US-Navy-run JPO and DARO out of frustration with the military services' failure to build UAVs on their own.[18] In light of these concerns, Pentagon officials ensured the Predator program retained "a joint flavor."[19]

The Pentagon's call for "jointness" initially left the USAF on the sidelines during the Predator's second Bosnia deployment, known as Operation Nomad Endeavor. During this tasking, Predator operations were based in Taszar, Hungary. US Atlantic Command, which was staffed by USAF officials, as well as Army and Navy officials eager to preserve "jointness," was slow to provide training slots for USAF personnel at the Army's Predator training location in Fort Huachuca, Arizona.[20] As a result, the USAF was not ready in time to run operations in Bosnia when Nomad Endeavor began in March 1996.

The same Army intelligence team that flew the Predator during its first deployment (Operation Nomad Vigil) returned with it to Taszar to support Predator operations.[21] The USAF's 11th RS did not assume management of the Predator during Nomad Endeavor until September 1996, three months after the ACTD phase had officially ended.[22] Even then, the 11th RS did not work strictly for the USAF; it also flew missions on behalf of the CIA.[23] Throughout the Nomad Endeavor deployment, which lasted until February 1998, the Predator program

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17 ACC History Office (Aug. 2006) 13
18 Fulghum (Nov. 13, 1995)
19 ACC History Office (2006) 9
20 ibid
21 Big Safari scientist (Aug. 21, 2013)
22 *ibid*
23 Coll (2004) 529

was still very much a “joint” effort despite the USAF’s designation as the lead service.

The main mission of the Predator while based in Taszar was to provide support to Operation Joint Endeavor, a NATO effort to enforce the ceasefire codified by the 1995 Dayton Accords. During the deployment, the Predator monitored belligerents that might interfere with NATO peacekeeping operations and searched for mass graves that would provide evidence of 1995 massacres.[24] The UAV’s performance in Bosnia during this second deployment was similar to its first in terms of reliability. Weather remained a problem, forcing the Predator to briefly abandon operations during the winter months. Light enough to be picked up by the nose with one hand, the UAV was buffeted about by high winds, heavy rain and cloud formations. Cold weather and clouds contributed to icing, which upset the airflow on the Predator’s wings, leading to crashes.

One analysis of the second deployment, conducted in 2003, found that of 315 missions scheduled between March 1996 and April 1997, weather and maintenance problems kept 60 percent of the Predator’s scheduled missions on the ground.[25] Of the missions that were launched, slightly less than half were aborted, mostly due to weather.[26] Another analysis conducted in early 1997, while the deployment was still ongoing, also blamed weather for reliability shortfalls, noting that out of the 210 missions that had been conducted at the time, 62 were aborted mostly because of weather.[27] Things got so bad between December 1996 and January 1997 that the Predator flew just one mission in 27 days before suspending winter combat operations in January, according to Col. James “Snake” Clark, who visited Predator operations in Taszar in 1996 on behalf of USAF leaders.[28]

While weather posed problems during the second deployment, the Predator demonstrated significant improvements in imagery collection. The UAV’s KU-band

[24] DARO (1996) 9
[25] Office of the Secretary of Defense (February 2003)7-8
[26] *ibid*
[27] Big Safari Scientist (May 9, 1997) 12.
[28] Clark (1996B)

satellite data link was employed from the start, providing the bandwidth capacity needed to deliver real-time FMV rather than the delayed still imagery provided over a UHF satellite data link during the beginning of the first deployment. When Pope John Paul II visited Bosnia in April 1996, the Predator flew two missions, transmitting imagery that was used to identify threats.[29] CIA Director Jim Woolsey also praised the quality of the agency's Predator imagery. Using the FMV technology developed by a Big Safari scientist in 1995, Woolsey was able to watch video of Bosnia from CIA headquarters at Langley, Virginia and communicate via email with Predator pilots in Taszar in real-time.[30] SAR sensors, which can see through clouds, provided a last-resort method to collect imagery on cloudy days when the weather was not so poor to keep the Predator grounded.[31]

The USAF's Assessment of the Second Deployment: Problems Persist

The USAF attributed the Predator's spotty flight record during the second deployment to the very same material factors that had led the service to reject the Predator program initially. Reliability and technological maturity were still in question. Col. Clark noted in a report to his bosses following his visit to Taszar that the UAV's reliability problems stemmed from a lack of de-icing technology and a spare parts shortage.[32]

The Predator program also suffered from other reliability problems in Bosnia, stemming from shortfalls in maintenance, training and personnel, according to Lt. Gen. Brett Dula, ACC's vice commander. He argued that these problems all could be traced to the Pentagon civilians' decision to pursue a rapid ACTD, bypassing a traditional acquisition phase known as "Engineering, Manufacturing and Development" (EMD).[33] During this phase, the Pentagon

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[29] Richardson (Sept.1997)
[30] Coll (2004) 528; Strickland (March 2013) 6
[31] Big Safari Scientist
(May 9, 1997) 13.
[32] Clark (1996B)
[33] Dula (Apr. 9, 1997)

produces small quantities of weapon systems to hone a smooth manufacturing process and refine the design. "It is ACC's opinion that the ACTD process should include a limited EMD phase to ensure a smooth transition from acquisition to operations," Lt Gen. Dula said during congressional testimony in 1997.[34] In his trip report, Col. Clark called the lack of an EMD phase "the fundamental root of the Predator problem." [35]

USAF officials also argued that the Army's and Navy's continued involvement in Predator operations was a hindrance. "Clearly the Predator's biggest problem is political," Col. Clark wrote in the trip report. The Navy-led UAV Joint Program Office, still in charge of funding and development, failed to provide spares and infrastructure to the USAF's 11th RS once it arrived in Taszar to manage the second deployment. [36] "Operational support is terrible!" Col. Clark elaborated in another set of talking points on his trip. The UAV JPO also failed to hold GA-ASI accountable for replacement parts, technical orders for maintenance and system modification requests. The Army's management of infrastructure in Taszar was also poor, noted Col. Clark. The 11th RS was living in "a harsh tent city environment" with 2000 army personnel, which had an "impact on morale." Summing it up, he said the shared power structure among the services had confused the chain of command.[37]

GA-ASI also fell under USAF scrutiny for overselling Predator capabilities, thereby raising the expectations of US lawmakers at the same time that performance problems mounted in Bosnia. GA-ASI was still a relatively small company using tailor-made production processes, which meant that modifying components like radios and engines required a 12-month lead time.[38] But Cassidy, the GA-ASI president, continued to lobby for increased production on Capitol Hill and in the Pentagon. The USAF's perception was that the company's size and the technological maturity of the Predator program were mismatched with the

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[34] *ibid*
[35] Clark (1996A)
[36] Clark (1996A)
[37] Clark (1996B: Undated)
[38] *ibid*

Cassidy's claim the company was ready to build more. "We couldn't buy the thing the way it was," recalled Gen. John Jumper, the deputy chief of staff of Air Operations June 1996 to November 1997. "It was a piece of crap reliability-wise."[39] Echoed Gen. Fogleman, "General Atomics had a lot of support on the Hill and they were really pumping this thing up big time. Once we took this thing over people expected it to perform, and what we discovered was 'gee, there was no logistics behind it.'"[40]

The Predator Program's Formal Transition into the USAF

Despite persistent problems with the Predator's operational efficiency during the second deployment, at home the USAF moved ahead with plans to manage the Predator program. "The bottom line is that, on my watch, the Air Force will embrace UAVs and work to fully exploit their potential," Gen. Fogleman wrote in a mid-1996 policy letter.[41]

As the official lead service for the Predator, the USAF took several steps to shore up its control of the UAV in 1996 and 1997. Among the considerations addressed were: how to stimulate UAV innovation with the USAF; who should fly Predator UAVs, what to call those people and how to recruit them; how to capture the remaining Predator program elements still in the Army; and how to institutionalize the Predator in the USAF's organizational structure.

Stimulating UAV Innovation in the USAF

In early 1996, Gen Fogleman took two steps to stimulate UAV innovation in the service. He first established a "UAV Battlelab" at Eglin AFB in Florida. The purpose of the battlelab was to create a formal process for spurring UAV innovation in the USAF. While research labs focus on basic science, the battlelab was to focus on

39 Jumper interview (July 30, 2013)
40 Fogleman interview (July 22, 2013)
41 Grier (July 1996)

using mature technologies in innovative ways.[42] This approach had been one of the main tenets of the Predator ACTD program. Gen Fogleman also commissioned a study, conducted by field grade USAF officers at the USAF's Air University at Maxwell AFB in Alabama, known as "Strikestar 2025." Its purpose was to determine what the USAF would need to do "to remain dominant in air and space in the future" and it focused mostly on new UAV technologies, including a notional "Strikestar" stealth aircraft that would conduct strike, reconnaissance, and electronic warfare missions.[43]

Establishing the Criteria for Predator Assignments

Also in early 1996, the USAF officially decided that only rated officers, who met standards for regular and frequent flight, would be able to fly the Predator. Airmen who flew the UAV would be called "Air Vehicle Operators" (AVOs), although they were informally known as "pilots" from the beginning.[44] At the request of Gen Fogleman, ACC defined the skills necessary to operate a UAV, including: knowledge of aerodynamics, theory of flight, meteorology, air navigation, flying directives, airmanship, aircraft operating procedures and mission tactics.[45] The USAF began to recruit manned aircraft pilots and navigators with Federal Aviation Administration (FAA) commercial/instrument aircraft ratings for three-year Predator assignments.[46]

To rapidly recruit new personnel for the 11th RS, the USAF relied on "non-volunteers." Air Force Personnel Command (AFPC) asked unit commanders to select manned aircraft pilots to fly the Predator. Knowing little about the system, commanders recruited airmen who were underperforming in the cockpit or who were passed over for promotion.[47] These manned aircraft pilots were not

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42 Neese (Nov.21 1997) 78
43 Carmichael, Devine, Kaufman, Pence, and. Wilcox (Aug. 1996).
44 ACC History Office (2006)14 and 29; Soto interview (April 18, 2013)
45 ACC History Office (2006)14
46 Tobin (June 1999) 49.
47 Anonymous source; Moseley interview (Apr. 1, 2014)

interested in the job. As of June 1997, the USAF had issued 19 non-volunteer assignments to the 11th RS, resulting in fifteen assignments and four separations, and only one volunteer on the 11th RS.[48] Even the position of squadron commander — normally a coveted spot for "fast burners" in the USAF — was shunned in the manned aircraft pilot community. When the Air Staff called pilots selected for command slots to determine their willingness to manage the 11th RS, many said they would prefer to "7-day opt," ending their USAF careers within one week, rather than be in charge of the UAV unit.[49]

One reason for the manned aircraft pilots' misgivings about a Predator assignment was the lack of flight pay. Gen. Fogleman had decided that Predator AVOs needed to have pilot skills, but the Air Force Judge Advocate General ruled that AVOs were not eligible for the monthly stipend awarded to USAF pilots.[50] The dearth of volunteers meant the USAF had to force manned aircraft pilots to fly the Predator, serving to only increase their misgivings about the UAV, as discussed in Question 1.

Assuming Full Control from the Army

In late 1996, the USAF also staked out its position in regard to several army initiatives involving Predator training and doctrine. The USAF's goal in these bureaucratic battles was to turn the Predator into an exclusive USAF asset, rather than one that was "jointly" owned.

The USAF had initially declined to take over Predator training from the Army in mid to late 1995. But after assuming control of the Predator program in April 1996, it was eager to assume the responsibility.[51] In November 1996 the USAF moved the training from the Army's Fort Huachuca to its own turf at Indian Springs, Nevada, home of its Predator squadron, the 11th RS. At this point, all

[48] *ibid*
[49] Anonymous interview
[50] Tobin (June 1999) 47-48
[51] ACC History Office (2006) 15-16

Predator assets that were not deployed in Bosnia were shipped to Indian Springs.[52]

ACC also overruled the Army's and Navy's bids to pursue the Tactical Control System (TCS), which would have allowed the other services to exert varying degrees of control over the USAF's Predator UAV, ranging from receiving data to actively operating the UAV from takeoff to landing.[53] The Army, Navy, and US Marine Corps, along with the JROC and US Congress criticized the USAF for inhibiting "interoperability", but the USAF held its ground. Secretary Perry deferred to the USAF's wishes, and the JROC — now headed by USAF General Joseph Ralston, previously the head of ACC —watered down TCS requirements, contributing to a loss of momentum that ultimately killed the program. [54]

On a related note, the USAF also successfully killed the Army's proposed Predator concept of operations, which would have allowed an Army "forward control element" to physically take control of Predator aircraft from USAF operators. The Army commanders would then be able to direct the Predator's flight path and camera angle, and transmit intelligence directly to ground commanders. But USAF officials drafted their own concept of operations that cut out the Army. Predator information would be relayed through a satellite to a joint theater commander who would then relay the information as he saw fit to the Army.[55]

Predator 911: The USAF Establishes Predator Requirements

After staking out positions vis a vis the Army and Navy, the USAF looked inward to finish the Predator programs integration into the service. In May 1997, Gen. Jumper, still Deputy Chief of Staff for Air Operations, formed a "Predator 911 Task Force" to finish work on the operational requirements document that ACC started

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52 ACC History Office (2006) 16.
53 Rosenwasser (2003) 299
54 i*bid*
55 *Inside the Air Force* (Aug, 23, 1996)

in 1995, which detailed spares provisioning, technical orders for maintenance, and further development funding.[56] The document also declared that the USAF would reduce the number of aircraft to be purchased from the JROC's 16 to just 12, due to fiscal constraints. [57] The USAF completed the requirements document in July 1997, clearing the way for the Predator's formal transition into the service.[58] In documentation shared with congressional committees, the USAF said that it would take two years to "normalize" the Predator program, a process that involved stabilizing the acquisition so that earlier problems — such as the lack of pilots, training, spare parts, and logistic issues — could be corrected. [59]

The Formal Transition

In August 1997, the Pentagon's Defense Acquisition Board (DAB) declared that the Predator program was ready to move into the USAF's formal acquisition process. [60] The DAB authorized full-rate production and operational use of the Predator, and also designated the Predator program as an "ACAT II" effort — acquisition- speak for lower documentation requirements and less Pentagon oversight than the Pentagon's biggest and most expensive weapon system acquisitions.[61] That same month, the USAF activated a second Predator squadron at Indian Springs in Nevada, the 15th RS, to handle infrastructure set-up, freeing the 11th RS to focus on training and deployments.

Between October 1995 and August 1997, the USAF's position on the Predator program had changed dramatically. As discussed chapter three, the USAF rejected the Predator program based on ostensibly rational arguments regarding its lack of technological maturity and reliability, problems that persisted between 1996 and 1997. The UAV's combat record had lengthened, but little had changed in

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56 ACC History Office (2006) 33
57 ACC History Office (2006) 21
58 Robotham (Aug. 6, 2012) 29
59 ACC History Office(2006) 28.
60 ACC History Office (2006) 26
61 *ibid*

terms of providing proof of operational efficiency and cost effectiveness. The material factors that led the USAF to reject the Predator program in 1994 were still largely in play in 1995, raising the possibility that some possible shifts in USAF culture led the service to embrace the Predator program. This prospect is explored in the four sub-questions below.

1. **To what extent did individuals or groups within the USAF resist the Predator out of a concern that their jobs or status might be threatened by it?**

The cultural biases that fueled the USAF's decision under Gen. McPeak to ignore the Predator ACTD lingered beneath the surface even as Gen. Fogleman began to campaign for Predator control in early 1995. While the chain of command complied with Gen. Fogleman's direction, the cultural preference for manned aircraft — and concerns that UAVs may pose a threat to them — sometimes bubbled to the surface on both the operational and staff sides of the USAF.

On the operational side, Gen. Fogleman's decision to recruit manned aircraft pilots to fly the Predator, a move meant to signal his commitment to UAVs, sparked tremendous anxiety within the manned aircraft pilot community. The tension was evident at the christening of the 11th RS in July 1995. A reporter who attended the ceremony quoted Lt. Col Steve Hampton, the first commander of the 11th RS, saying that UAVs would complement manned aircraft, not replace them. But that view was not universally shared. "Yep, this will be the death of us," one manned aircraft pilot assigned to the 11th RS told the reporter as he examined a Predator on static display. "We're getting replaced by R2D2."[62]

Manned aircraft pilots saw an assignment in the Predator as a major threat to their careers. "It's a little bit hard to convince rated pilots that flying a UAV is a good career path," a Predator program official told *Inside the Air Force* in 1996.[63] Aside from a lack of flight pay for UAV pilots discussed in the narrative above,

[62] Green (July 30, 1995) 1B
[63] *Inside the Air Force* (March 15, 1996)

there were three cultural perceptions that fueled the view of the Predator as a threat.

First, manned aircraft pilots forced to fly the Predator were uniformed about the system, contributing to fear of the unknown. When Capt. Bayne Meeks was non-volunteered to a Predator assignment in early 1998, his response was: "What's a Predator?...no seriously, I don't know what it is."[64]

Second, the Predator program had developed a stigma as a second-rate shop. Manned aircraft pilots forced into the Predator program saw themselves as trapped in a "leper colony" and were eager to leave Indian Springs as soon as they arrived. As a result, they failed to invest time and energy in the assignment, learning just enough to get by through hands-on experience augmented by word of mouth and confusing GA-ASI manuals.[65] The prevailing disdain that Predator pilots had for their own assignment fed into low morale.

Third, the manned aircraft pilot community viewed comrades assigned to the Predator as low-status. After completing a year of training and physical examinations to earn their wings, manned aircraft pilots assigned to the Predator had to "relinquish their membership in the fraternity of pilots," as then-Lt. Col. Houston Cantwell, a USAF officer qualified on the Predator and the F-16, explained in a 2009 journal article.[66] The rest of the manned aircraft pilot community referred to the 11th RS and 15th RS as a "leper colony" and the "land of misfit toys," according to several sources, including retired USAF Col. Bill Grimes, a former director of Big Safari, and retired Lt. Col. Brian Raduenz, who also worked for Big Safari."[67]

The perception of lost status resulted partly from the Predator's primary focus on reconnaissance. As had been the case in the era of Gen. McPeak, manned aircraft pilots tended to look down on reconnaissance because it did not directly contribute to the service's war-winning edge. "Given the stigma of surveillance

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[64] Cantwell (June 2007) 94.
[65] Cullen(2011) 218.
[66] Cantwell (Summer 2009)74
[67] Rosenwasser (2004) 282; Raduenz Interview (Sept. 3, 2013); Grimes interview (Nov. 14, 2013).

and reconnaissance missions…it is understandable why some early Predator pilots felt as if the USAF treated them like lepers," wrote then-Lt. Col. Timothy Cullen, who interviewed over 50 Predator and Reaper pilots at Creech AFB for his 2009 doctoral dissertation on the Predator's successor, the MQ-9 Reaper.[68]

The perception of Predator pilots as low-status also was a result of the Predator pilot assignment process. In these early days, the manned aircraft pilots forced into the Predator program were considered "sick, lame, and lazy" in comparison to their counterparts.[69] Lacking objective criteria to select Predator pilots, USAF commanders employed an informal tier system. Because Tier one individuals outperformed their peers, their commanders wanted to keep them in their existing weapon system. Tier twos did a solid job, so they were recommended to serve in training command as flight instructors. Tier three individuals were outperformed by their peers, so they were pushed into UAV assignments.[70]

The geographical location of Indian Springs also detracted from the status of Predator assignments. According to an urban legend, the bus that drove those early recruits from Nellis AFB more than 50 miles to Indian Springs was not air-conditioned, while convicts were bussed to a prison along the same route in climate-controlled comfort. [71]

On the staff side, the USAF's leadership at ACC did nothing to mitigate the perception that the Predator posed a threat. During the transition of Predator management from the UAV JPO to the USAF, Gen. Richard Hawley, the commanding fighter general at ACC, bluntly told UAV JPO officials in April 1996 that he dreaded convincing manned aircraft pilots to fly the Predator. "Hawley made it plain that, in his opinion, any pilot involuntarily assigned to fly this stupid thing would hate to trade soaring through the sky for sitting in a hot van for hours," according to an account in Whittle's 2014 book. When the UAV JPO officials briefed ACC staff later

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[68] Cullen (2011) 238
[69] Cantwell (April 2006) 25; Rosenwasser (2004) 283
[70] Cantwell (Summer 2009) 69.
[71] Grimes interview (Nov. 14, 2013)

that day, they were greeted with contempt and "scoffing laughs" when they showed a picture of the UAV.[72]

Many officers at ACC, the USAF's combat aviation headquarters, were promising pilots building their resumes in a staff job before returning to the cockpit. They were frequently reluctant to engage in the day-to-day dealings involved in Predator development, according to Lt. Col. Blackwelder. This was particularly true from the ranks of major to one or two-star generals, he found. "I think it wasn't the senior leaders, but rather the 'iron majors' that do all the staff work who were resistant to this thing," recalled Lt. Col. Blackwelder.

Tom Perdue, who worked as Lynn's civilian deputy in the Pentagon's Advanced Technology office, shared Lt. Col. Blackwelder's concern that bias at the field-grade level and above might limit the success of the Predator program's transition. "On the issue of Air Force reluctance to embrace UAVs early in the program, there was a general awareness of their bias against aircraft that did not have pilots," noted Perdue. "Pilots were the movers and shakers in the Air Force and they were protective of that role."[73]

In November 1997, Col. Mike Francis, who worked for DARO, said that he felt that a bias within the USAF was holding back UAV innovation, particularly in regard to the development of armed UAVs, known as unmanned combat aerial vehicles (UCAVs). "Not offending the culture is a big concern," he told *Popular Science. "*Most of us realize that [UCAVs] will ultimately happen, but no pilot wants them to happen on his watch."[74] USAF Maj. Gen. Kenneth Israel, the head of DARO, saw his promotions stall at two stars because of his UAV advocacy during a time when USAF cultural biases against UAVs were prevalent. [75] He told *Wired* magazine in 1996 that he and other UAV advocates were "like Billy Mitchell," who was court-martialed for insubordination in the 1920's for his airplane versus battleships tests but later became revered in the USAF as a maverick airpower

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[72] Whittle (2014) 112
[73] Perdue interview (Aug. 6, 2013)
[74] Sweetman (Nov. 1997)
[75] Senior Pentagon civilian; Lynn interview (April 23, 2013)

advocate.[76]

To a lesser extent, another bias against the Predator program continued to reside in the intelligence community at ACC, according to Lt Col Blackwelder. FMV was a revolutionary capability that challenged the existing ways of doing business for USAF intelligence officers. Their analytical expertise centered on still imagery. "We periodically briefed ACC on the progress trying to get their interest, and we were trying to sell them on the idea," said Lt Col Blackwelder. "Their biggest concern was that Predator, along with the Global Hawk and Dark Star [the Tier III ACTD designs] were going to collect so much imagery that we would not be able to handle it."[77] Gen. Fogleman agreed about the hesitance of the intelligence community, citing its preference for Cold War-era strategic collection assets, the U-2 and the RC-135 Rivet Joint SIGINT aircraft, as well as the distraction caused by a major reorganization ongoing at the time that was designed to more closely align intelligence analysis with pilots flying combat missions.[78]

As these findings indicate, the bias against UAVs within the USAF persisted after the service took over the Predator program. Bias seemed to be strongest among rank-and-file manned aircraft pilots, and, to a lesser extent, intelligence officers. The centers of gravity for Predator support were at the Air Staff level, under the leadership of Gen. Fogleman and Gen. Jumper, and at the squadron level, under the leadership of Lt. Col. Hampton, the 11th RS squadron commander. As one former 11th RS commander put it, "There was a squadron commander and a four-star general committed to UAVs, although no institutional buy-in or support in between those two levels of authority."[79]

Perdue, the Pentagon civilian who worked in the Advanced Technology office, elaborated on why support existed only at the top. Manned aircraft pilots vying for cockpit time were "directly affected" and therefore had "stronger opposition to unmanned aircraft than senior officers," he explained. In contrast, he

[76] Patton (March 1996)
[77] Blackwelder interview (Aug. 13, 2013)
[78] Fogleman interview (July 22, 2013)
[79] Quoted in Rossenwasser (2004) 238

noted senior officers were more likely to vie for "ownership" of airspace assets and to be the "first to recognize the value that a new capability has brought to the battlefield because they are better connected with senior officers in the conflict."[80]

2. **To what extent were judgments about the potential and cost effectiveness of the Predator based on the USAF's enthusiasm for UAV technology and to what extent was the enthusiasm outside the service?**

As Chief of Staff, Gen. Fogleman benefited from the same Vietnam-era rise of the fighter pilots that had propelled Gen. McPeak to the position. In fact, the two served together in the Misty Forward Air Control (FAC) unit in Vietnam.[81] But Gen. Fogleman thought somewhat differently about UAVs than Gen. McPeak did. On one hand, he shared Gen. McPeak's skepticism of the cost and potential of UAVs, explaining he had not seen any data proving UAVs were cheaper than manned aircraft, and that, in fact, "people were surprised" by the expense of the Predator program.[82] Gen. Fogleman also initially expressed uncertainty about the Predator's military potential. Gen. Moseley recalled that, at first, no one really knew what to do with the Predator. In 1996 he was in charge of the 57th Wing, which owned Indian Springs, home of the Predator when he got a phone call from Gen. Fogleman. "I said 'chief, what are they and what the hell do I do with them?" recalled Gen. Moseley. "He said 'I don't have a clue, go figure it out.' But I think he knew this was leading edge, it could be very interesting."[83]

On the other hand, Gen. Fogleman differed from Gen. McPeak in that he showed a willingness to look beyond the Predator program's perceived shortcomings. In Gen. Fogleman's view, the Predator presented an opportunity to serve as a symbol of significant cultural change in the USAF. He saw the Predator as a vehicle to promote the ISR mission in the USAF and also to get the service

80 Perdue interview (Apr. 11, 2013)
81 Bernstein (February 2013)
82 Fogleman interview (July 22, 2013)
83 Moseley interview (April 1, 2014)

thinking about the central role of information collection in the emerging Revolution in Military Affairs (RMA).

The Shifting Strategic Context: Gen. Fogleman Sees a Growing Role for ISR

In his dissertation, Ehrhard asserts that Gen. Fogelman spearheaded the USAF's efforts to appropriate the Predator program in part because he saw himself as a "change agent."[84] But he tried to do more than convince the USAF to control the Predator program. He used the USAF's adoption of the Predator program as a symbol of a broader effort to put reconnaissance on more equal footing with strike missions within USAF culture. His belief in the need to put greater emphasis on the reconnaissance mission was partly based on his personal experience as a "Misty" Fast FAC, flying the F-100F Super Sabre in Vietnam. The fast FAC concept was a response to the challenge of identifying targets in the midst of a mounting SA-2 SAM threat in North Vietnam. The fast-moving F-100F quickly identified targets with smoke rockets before making its escape, whereas the slow-moving Predator loitered in relatively uncontested airspace. But Gen. Fogleman did see a parallel in terms of surveillance capabilities. "We were the Vietnam surrogate for Predator, if you will," he told me.[85]

In viewing his Vietnam experience as a partial justification for a greater focus on tactical reconnaissance, Gen. Fogleman took a different stance than Gen. McPeak, who cancelled the USAF's tactical reconnaissance programs and ignored the Predator while he was chief, as discussed in chapter three. "Two people can go through the same experience and come away with very different views," Gen. Fogleman explained.[86] Gen. Fogleman embraced a broader conception of airpower than Gen. McPeak in the sense that he viewed reconnaissance as a core mission and Gen. McPeak did not.

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[84] Ehrhard (2000) 541
[85] Fogleman interview (Oct. 22, 2013)
[86] *ibid*

But Gen. Fogleman also noted the defense community was still in the early stages of trying to understand the strategic context emerging in the wake of the Cold War. But by the time Gen. Fogleman was chief, there was a lively discussion in the defense community and academia regarding the implications of the 1991 Gulf War including the possibility of an emerging RMA. Under this concept, "information age" technology, such as the Predator, combined with new doctrine and training, would allow a smaller US military to protect America's national security prerogatives.[87]

The defense community was still debating the implications of the RMA for conflicts short of a full-scale war, known as "MOOTW" or "gray area phenomena."[88] However, Gen. Fogleman saw RMA technologies built around the concept of "information dominance," as having major strategic potential in "gray wars" like the air campaign in Bosnia that required tracking fleeting targets in civilian population areas. He based this view on the writings of Adm. William Owens, the Vice Chairman of the Joint Chiefs of Staff from 1994 to 1996.

"I was a big believer" in Adm. Owens' views said Gen. Fogleman, "particularly as he talked about information warfare."[89] In Adm. Owens believed information was at the center of the RMA, which would involve an emerging network of sensors that would provide the US military with the information needed to strike increasingly fleeting targets on the battlefield quickly and precisely. This level of situational awareness, combined with the use of precision-guided weapons, would allow the US military to take the initiative on the battlefronts of the future. "If you could see the battlefield in great detail, and the enemy could not, you would win," Adm. Owens told me. "That was the essence of the RMA."[90]

Heavily influenced by Adm. Owens' writing, Gen. Fogleman sought to make "information dominance" a central USAF mission, declaring it a "core competency"

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87 Metz and Kievit (June 27, 1995) iii
88 Mets and Kievet (July 25, 1994) v
89 Fogleman interview (Oct. 22, 2013)
90 Owens interview (Oct. 9, 2013)

of the USAF at the fall 1996 Corona conference, a regular gathering of the USAF's three-and four-star generals to discuss USAF policy. Although he knew that UAVs were already causing cultural upheaval in the USAF, Gen. Fogleman issued a directive statement at Corona calling on airmen to aggressively pursue UAV development. Principals attending Corona that year recalled that "UAVs stood as an object lesson in allowing the Air Force's culture — centered on manned aviation —to dictate technological choices." Gen. Fogleman used UAV technology to make the point that the USAF needed to embrace innovation in order to perform core missions, including ISR, even if that meant breaking with historical cultural preferences.[91]

Gen. Fogleman continued to press the case for UAV development as a means to achieve strategic effects at an October 1996 Air Force Association conference. He argued that the link between intelligence and operations was becoming tight enough that "it will become possible to find, fix, or track, and target anything that moves on the surface of the earth." He argued that what made the USAF unique was its ability to "hit centers of gravity directly," thereby delivering strategic effects, while also operating at the operational and tactical levels of war. [92] "I actually got ridiculed by some so-called forward thinkers in the other services for making that comment, but the fact of the matter is that it came through," said Gen. Fogleman. Although he did not discuss the idea of putting a weapon on the Predator, his remarks on closing the loop between intelligence collection and target prosecution foreshadowed what was to come. "The tools were starting to be developed [for the RMA], and the Predator became one of those tools."[93]

Outsider Views of the Predator's Relevance in the Emerging Strategic Context

Gen. Fogleman was "absolutely critical" in spurring the USAF to adopt the Predator program, according to Adm. Owens. But he also had help from USAF outsiders who

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[91] Barzelay and Campbell (2003) 65
[92] Fogleman interview (Oct. 18, 1996)
[93] .Fogleman interview (Oct. 22, 2013)

believed the Predator had growing relevance in the emerging strategic context. [94] Two long-time Predator program advocates supported his appointment to USAF chief: Secretary of Defense William Perry and Deputy Secretary of Defense John Deutch.[95] As the first USAF general to command both US Air Mobility Command and US Transportation Command, Gen. Fogleman showed a willingness to develop airpower assets outside his own fighter background. His candidacy for chief therefore had strong appeal to Perry and Deutch, who wanted to pursue new, low-cost technologies, such as UAVs, to improve the USAF's effectiveness. Together, Adm. Owens, Gen. Fogleman, Lynn and Deutch worked with the JCS to dramatically cut the US military's peacetime force structure while boosting expenditures on ISR and precision-guided munitions. "I think that was a critical time in DoD," recalled Adm. Owens. "It was a time when we did, in some ways, shift the theory of war from 'mass' to mass knowledge and mass precision."[96]

Other Pentagon officials also showed support for the Predator program based on a perceived shift in the strategic context in which ISR may become more critical. "We received an inkling of what combat will look like in the 21st century during Desert Storm and more recently in our support of NATO action in Bosnia. In both cases, unmanned aerial vehicles have demonstrated the ability to provide continuous real-time battlefield surveillance," Paul Kaminski, the Pentagon's top acquisition official, told a House subcommittee in October 1995.[97] In November 1996, DARO provided an annual UAV report to lawmakers calling UAV deployments to Bosnia the "UAV success story" of the year.[98]

Pentagon support was further buoyed by growing congressional interest, in part due to the effective lobbying of GA-ASI president Tom Cassidy. He was lobbying lawmakers for the rapid procurement of more airplanes – often to the point of annoying people with his aggressive stance. "His force of will, his force of

[94] Fogleman interview (Oct. 22, 2013) Owens interview (Oct. 9, 2013)
[95] Fogleman interview (Sept. 17, 2015)
[96] Owens interview (Oct. 9, 2013)
[97] Quoted in DARO (1996) 9
[98] DARO (1996) 7

presence, was clearly a component to the success of the Predator," recalled Meermans, the congressional staffer for Rep. Lewis.[99]

All of this outsider enthusiasm for the Predator, which had been viewed by Gen. McPeak as a burden in a constrained budget environment, became an opportunity for Gen. Fogleman to win even more funding. Responding to the enthusiasm of Pentagon civilians and industry, US lawmakers added "plus up" funding above the president's budget request for the Predator program every year.[100] With Congress so eager to fund the Predator, the USAF did not have to seek funding for the aircraft in its annual budget request or plan for it in its five-year budget plan, known as the Program Objective Memorandum.[101] This meant that the Predator program actually presented an opportunity for the USAF to grow its budget share, rather than forcing trade-offs between manned and unmanned aircraft programs as Gen. McPeak had feared.

Acquisition Culture: A Divide Between the USAF and Outsiders

While the USAF's leaders shared a similar outlook with Perry and Deutch on the importance of developing ISR capabilities, they were far more cautious about the cost and potential of the Predator program. Gen. Fogleman and Gen. Jumper believed that the UAV needed to be incorporated into standard USAF acquisition processes, which emphasized a gradual, regimented approach. But outsiders, including the US Congress, Perry, and Deutch, wanted to speed UAV development.

From the USAF's perspective, "normalization" of the Predator program, through vehicles like the Predator 911 Task Force, was the best way to integrate the UAV in USAF culture.[102] As Gen. Jumper explained it, normalization was "so important" to make the Predator a "reliable" part of the USAF force structure.[103] ACC needed to systematically test the UAV to develop training and safety

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[99] Meermans interview (Apr. 9, 2013)
[100] Raduenz interview (Sept. 3, 2013); Cantwell (April 2006) 20
[101] Raduenz interview (Sept. 3, 2013)
[102]Rosenwasser (2004)291
[103] Jumper interview (July 30, 2013)

procedures and to prepare for gradual modifications over a considerable period of time. None of these goals had been accomplished thus far because the Predator was developed by the Pentagon civilians as an ACTD.

Some outsiders saw the USAF's insistence on process as a cultural bias against UAVs, but Gen. Jumper said the USAF simply believed that the Predator program needed to take on the USAF's acquisition philosophy. "All these normal logistical and operational considerations were coming into play, but they were being interpreted in many funny ways, like 'we hated the Predator," said Gen Jumper. To the USAF, the reality was that the Predator UAV was poorly prepared for operational use. "It had warts, it was put together sloppily," he said.[104]

Gen. Fogleman concurred that any slow-down of the process of integrating the Predator into the USAF resulted from acquisition problems that cropped up during the ACTD rather than a bias against unmanned technology. Initially, he said, the USAF did not fully appreciate the logistics challenge involved in integrating the Predator into its standard operating procedures. "We inherited one hell of a problem when we took this thing," he said. "It was maybe bigger than we realized at the time because it had been a real success in Roving Sands, and that is because people were making it a success, but if you're going to operate a lot of these systems over a long period of time you've got to build a foundation to support it." [105]

But others saw the USAF's acquisition approach as being so unreasonably slow that it defied logic. Lt. Col. Blackwelder, the USAF representative in the Pentagon's Advanced Technology Office, recalled that ACC had concerns about the Predator because it was "not a full program," to which he responded: "duh, it's an ACTD. We had it flying in the Balkans in 18 months and it's not perfect because it's not meant to be."[106] He also recalled attending meetings with an 11th RS commander, whom he said complained that he could not effectively set up the squadron because the UAVs were still deployed to Bosnia. "This guy was whining

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104 *ibid*
105 *ibid*
106 Blackwelder interview (Aug. 13, 2013)

about how he doesn't have all the ACTD assets but he has all these people [in the squadron]. Well whose fault is that? You stood up a squadron and manned it and you didn't have an airplane yet? If we hadn't given them the ACTD assets, they would have had nothing." [107]

The Pentagon's senior leadership agreed with Lt. Col. Blackwelder that the military services should not try to completely "normalize" ACTD programs. Indeed, the whole point of the ACTD was to accelerate acquisition and to produce less than a 100 percent solution. In the case of the Predator ACTD, Pentagon civilians went out of their way to avoid long requirements lists that would sidetrack development.[108] In 1996, Kaminski, who had replaced John Deutch as the Pentagon's top acquisition official, confirmed in a guidance memo on ACTD programs that the goal of the military services should not be to completely "normalize" the ACTD, but to take some "non-traditional" approaches, such as using contractors for logistics instead of military members.[109]

In closing, the USAF's senior leadership saw the Predator program as a symbol of a cultural shift toward ISR, which they believed represented a core USAF mission in the emerging strategic context. USAF outsiders shared senior USAF leaders' views of the potential importance of the Predator as an ISR platform, but sharply disagreed with the USAF's acquisition culture, which slowed things down to the point that it created the impression that the USAF did not support the Predator program.

3. To what extent were USAF judgments about the employment of the Predator driven by a desire to reduce the risk to friendly personnel, and to what extent was that push from outside the service?

In keeping with the era of Gen. McPeak, reducing aircrew risk was not a major concern in the USAF during Gen. Fogleman's tenure as chief. The USAF's manned

[107] *ibid*
[108] Perdue interview (Apr. 11, 2013)
[109] Kaminski (Dec. 19, 1996)

combat aircraft pilots were still seen as possessing unusual courage and skill that generally kept them safe when flying in harm's way. Asked whether reducing risk to aircrew was a consideration in the decision to pursue the Predator program, Gen Fogleman said: "It certainly wasn't in the Air Force."[110]

The USAF's Misty FAC unit in Vietnam, in which Gen. Fogleman and Gen. McPeak both served, saw seven pilots killed, four captured and 34 shot down over the three-year life of the organization.[111] Misty pilots eagerly embraced the risk involved in flying F-100F aircraft over the Ho Chi Minh Trail in North Vietnam and Laos to interdict men and materiel moving south toward the fighting. Flying over hostile territory armed with 20 mm cannons, they would quickly mark targets with smoke to guide strike aircraft before exiting the hostile area. The job involved constant low-level flying and "jinking," the practice of abruptly changing flight direction to dodge anti-aircraft fire. "Pilots wanted to come to Misty so they could fly north of the border," the first Misty commander, retired Col. George E. "Bud" Day, told *Air & Space Smithsonian Magazine*. "We attracted every studly young guy in Southeast Asia." [112]

While Gen. Fogleman's Vietnam experience led him to value reconnaissance more highly than Gen. McPeak, he shared Gen. McPeak's view that aircrew risk was part of the job of being a USAF pilot and did not see UAVs as being particularly advantageous in terms of driving down that risk. Gen. Fogleman said the Predator was not practical for reducing aircrew risk in hostile air environments because it simply lacked the defensive measures and situational awareness of a pilot in the cockpit, both preconditions he regarded as a necessary for successfully completing reconnaissance or strike missions under enemy fire.[113]

As the US shifted its focus from the Cold War to regional conflicts in which US vital interests were not clearly at stake, however, a new cultural preference for using UAVs to reduce casualties began to emerge. The USAF's top commander in

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110 Fogleman interview (July 22, 2013)
111 Bernstein (February 2013)
112 *ibid*
113 Fogelman interview (July 22, 2013)

Bosnia, Gen. Michael Ryan, said that both politics and a feeling of personal responsibility shaded his decisions about putting aircrews in harm's way. In terms of personal risks to aircrew, Gen. Ryan noted that while the average fighter pilot in the USAF certainly is not worried about flying into danger zones, an air campaign commander is extremely concerned. "Aircrews don't worry about it much, but commanders worry about it a lot," reflected Gen. Ryan, who flew the F-4 in escort and strike roles in Vietnam. "You are responsible for those crews and their safety as well as the mission and you have to balance that a bit. If you have never been a commander or a shooter, I don't think you think about that a whole lot." Given these concerns, Gen. Ryan said he made every effort to substitute Tomahawk cruise missiles or UAVS for manned aircraft in Bosnia.[114]

In terms of the political reasons to reduce risk to aircrew, Gen. Ryan cited the June 1995 shoot-down of Capt. O'Grady's F-16 by a Bosnian Serbian SA-6. "It was my fault that O'Grady got shot down," he said, noting that the fighter orbits had grown too predictable. "Having him on the ground changes a lot of what you are doing," he said, referring to the necessity to shift from operations against the Bosnian Serbs to a rescue mission.[115]

Another USAF leader impacted by Capt. O'Grady's shoot-down was Maj. Gen. Michael Kostelnik, a USAF test pilot serving as director of plans at Air Force Materiel Command (AFMC) between 1995 and 1997 and an important player in Predator weaponization, as discussed in chapter five. "In Vietnam, we lost one hundred a week, and that was the price of doing business," he said. "But then you watch the O'Grady affair, and the whole war stops because one guy gets shot down and we don't know where he is. That should have been a lesson."[116] Maj. Gen. Kostelnik acknowledged his view of aircrew risk was unusual for a USAF pilot, and he attributed it to working outside the career field as a test pilot and acquisition official. "You have this technology emerging and growing, and sometimes the

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[114] Ryan interview (June 18, 2014)
[115] *ibid*
[116] Kostelnik interview (Feb. 26, 2014); The US actually lost 136 military personnel per week in Vietnam. See Record and TerrilL May 2004) 11-12

warfighters can't see the forest through the trees," he said. "But developers like myself are sitting on the sidelines, looking in."[117]

Outside the USAF, Predator advocates continued to see UAVs as a valuable tool for reducing risk. Maj. Gen. Israel, the USAF official running the civilian agency DARO, told *Air Force Magazine* that "the nation held its breath" when Capt. O'Grady was shot down, but when two Predators were lost on the first Bosnia deployment, "the president didn't call."[118] He told *Wired* Magazine in 1996: "In the next century, we will definitely rely more on pilotless aircraft to place people out of harm's way."[119] Col. Francis, the DARO official, told *Popular Science* in 1997 that UAVs should be built to be "attritable," able to survive for several missions but also cheap enough to be expendable in airspace that is too dangerous for manned aircraft. [120]

Media sentiment also was increasingly in favor of reducing aircrew risk. Capt. O'Grady's shoot-down prompted *Aviation Week & Space Technology* to write an opinion article lamenting the failure to deploy the Predator UAV sooner. "Three Predator Tier 2 medium-altitude unmanned aerial vehicles with sensors for day and night reconnaissance and U.N. monitoring have been ready since Christmas for deployment with a ground station," the editorial stated. "But the Predator has been kept in the U.S. because of over-cautiousness for fear of a technological misstep, competition among various programs for limited UAV funding and fixed-wing operators' resistance to unmanned aircraft. With the F-16 downing emphatically driving home again that allied pilots are flying in a war zone, the Pentagon should give free rein to its technology."[121]

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[117] *ibid*
[118] Grier (July 1996)
[119] Patton March 1996)
[120] Sweetman (Nov 1997)
[121] *Aviation Week & Space Technology* (June 12, 1995) 224.

Aircrew Risk: The Predator as a Challenge to Pilot Identity

As the introduction of the Predator spurred a growing divergence of opinion over the wisdom of substituting technology for manpower, it also launched a growing debate about pilot identity. Historically, what had made the USAF's manned aircraft pilots unique was their piloting skills and their capacity to operate effectively in the dangerous medium of the air. But manned aircraft pilots assigned to the Predator would not meet the second criterion. Because airmen assigned to the Predator did not share this aspect of a pilot's duty, there was a considerable debate over what to call them. Had they earned the right to be called pilots?

Gen. Fogleman made a point to acknowledge that airmen flying the Predator needed to have special piloting skills to ensure the Predator program's success. "If Predator fails, it won't be because of our pilots," he said.[122] But the airmen flying the Predator were not exposed to the risks of the air environment. Recognizing this, Gen. Fogelman stopped short of waging a campaign to force the pilot community to accept Predator operators as one of their own. Although airmen informally referred to Predator operators as "pilots," Gen. Fogleman left the decision to choose a formal duty title up to the 11th RS commander. The commander chose "AVO" rather than "pilot" because Predator UAV flyers were "more a monitor than a pilot."[123] His views were widely shared: "Many within ACC felt the term 'pilot' was inappropriate" because it did not accurately describe the job of the person flying a Predator UAV, according to the ACC history of the Predator program.[124]

The debate over what to call Predator operators hinted at a larger cultural concern regarding pilot identity. Predator pilots did not accept the same level of personal risk as manned aircraft pilots. By asking manned aircraft pilots to fly the Predator, the USAF was expanding pilot identity to include missions that did not demand courage in the air medium. This role presented a potential identity crisis

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122 Erhard (541)
123 *ibid*
124 ACC History Office (2006) 15

for the manned aircraft pilot community, which had built its case for dominance of the USAF on the courage and skill of its members in aerial combat.

In conclusion, the USAF's views of the value of the Predator to reduce aircrew risk were in a state of flux Gen. Fogleman believed that manned aircraft pilots were still willing, able, and uniquely qualified to handle high threat environments. However, he took a comprehensive and pragmatic view of airpower theory that saw the value of reconnaissance and the employment of the Predator as a practical means to perform the mission. Others in the USAF, however, including Gen. Ryan and Gen. Kostelnik, saw the potential of the Predator to reduce aircrew risk as having significant value in and of itself as the strategic environment shifted to one in which US interests were not at stake and therefore interest in minimizing casualties was high.

4. **To what extent were judgments about the Predator based on a concern about maintaining the USAF's primary control over air assets in response to competition from civilian and military institutions?**

Inter-service competition between the USAF and the Army was an important force behind the USAF's sudden decision to pursue the Predator program. The competition was intense. Col. Clark noted in his memo that the Army had established a paper trail to stake its claim, keeping a tally of "Predator support/non-support" in Bosnia to establish that the USAF's Predator operations had not provided adequate support to ground forces.[125]

The USAF had DARO to thank for spurring the inter-service competition that led it to adopt the Predator. In his dissertation, Ehrhard claims that DARO was a "rousing failure" because it built UAVs without taking into account the services' unique functional requirements.[126] The Predator program was such a poor fit for the USAF's mission set, Ehrhard argues, that Gen. Fogleman only sought to control

[125] Clark (1996A)
[126] Ehrhard (2000) 631

it as an inroads to asserting jurisdiction over Global Hawk and Dark Star, higher-flying UAVs for strategic reconnaissance[127] But Ehrhard's appraisal is far too harsh. Although the Predator was not developed with the USAF in mind, the service under the leadership of Gen. Fogleman saw the Predator as an having potential strategic value in its own right, as discussed in Question 2. It was Pentagon civilians and DARO who ensured the Predator developed to the point that the USAF could find it useful.

The USAF's Rationale for Embracing the Predator Program

There was a rational element to interservice competition for the Predator program, since all the services stood to gain financially due to growing congressional interest in supporting the program.[128] But two competing cultural trends also led the service to push for control over the Predator. First, there was a genuine belief that the Predator program would advance the USAF's war-winning capacit, fitting with its newfound commitment to the ISR mission and its focus on centralized command and control. In stark contrast, the second cultural element was a cynical perception that the USAF needed to control the Predator's UAV to ensure it did not encroach on manned aircraft programs.

In terms of the first cultural trend, there was a genuine desire within the service to invest in the Predator as part of a broader effort to capitalize on what Gen. Fogleman saw as the USAF's unique capacity to conduct strategic reconnaissance. As discussed in Question 2, he believed that ISR was a core mission of the USAF and he saw his bid to adopt the Predator as a symbol of that. But he also believed that the USAF was uniquely qualified to fly the UAV, as opposed to the other military services. In his view, the Predator was best suited to the USAF's operating environment. The army's high crash rates with the Hunter UAV bothered him, and he though the USAF could do better. "When I got into looking at why they had such a lousy record, to me it came down to the fact that

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[127] Ehrhard (2000) 600
[128] *ibid*

they saw these things not as aerospace vehicles, but as just another piece of equipment, like trucks in a motorpool," he said.[129] In another indication of Gen. Fogleman's commitment to making the Predator program a success, he recruited manned aircraft pilots — officers with the command authority, airmanship skills and status to maximize the Predator's potential. "If this program fails, it won't be because of our pilots," he later told Col. Ehrhard in 1999."[130]

On a related note, the USAF also believed that its approach to command culture, based on centralized control and de-centralized execution, was most appropriate for the Predator as an air asset with potentially strategic value. For this reason, the service fought the Army's plans for the TCS, which would have given the Army the ability to control the Predator at the tactical level. Aside from rational opposition to the Army's control of a system that it was not paying to develop, the USAF also opposed the TCS on the doctrinal ground that it violated the USAF tenet of centralized control.[131] The USAF used the same doctrinal argument to kill the Army's proposed Predator concept of operations, which would have allowed forward air controllers to operate the Predator.

A second cultural influence that led the USAF to compete for control of the Predator UAV was more cynical. To some in the USAF, the real prize was gaining control over an air asset that potentially threatened manned aircraft.
Cultural biases against UAVs, described in chapter three, continued to linger beneath the surface in 1994 and 1995, as discussed in Questions 1 and 3 above. Several interviewees said that although there was no evidence of widespread support for the Predator in the USAF, there was nevertheless a sense that the USAF needed to control it, if only to crush it so it couldn't threaten other missions. The view was particularly prevalent in the USAF's leadership ranks, led by the pilot community.

"I don't think there was any enthusiasm for the mission," recalled Tim Owings, the deputy project manager for the Army's Unmanned Aircraft Systems

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129 Fogleman (July 22, 2013)
130 Ehrhard (2000) 593
131 Rosenwasser (2003) 300

office, who attended regular meetings on UAVs with his Air Staff equivalents during this time period. “[USAF] People wanted to own it, and I will tell you, they were loath to add anything new. They wanted these things to stay dumb.” [132]

Other USAF outsiders said that ACC was a specific source of resistance. Navy Capt. Alan Rutherford, who worked in the UAV JPO, recalled coming away from his briefing at ACC with a sense that the USAF might just want the Predator UAV to keep another service from making something of it.[133] Colonel William Grimes, the Big Safari director at the time, said he got a similar reaction from ACC. “They really didn’t want it. They treated it like a stepchild,” he recalled. “They imposed a lot of things on it that really weren’t necessary that sucked up money and time but avoided them having to make overt use of it.” [134]

A Big Safari scientist closely involved with Predator development agreed. “I heard that the Air Force was basically ‘volunteered’ into taking on the Predator. There was even a rumor that the only reason the Air Force took on Predator was to quash it,” he recalled. “At the time, there seemed to be far more adversaries than advocates for Predator, mostly in the pilot community who apparently felt threatened by a high capability aircraft that did not require a human pilot.”[135]

Oddly enough, these competing cultural trends within the USAF — one, a genuine concern for improving the USAF’s strategic edge, and the other, a cynical ploy to protect manned aircraft— both served to bolster support for the USAF’s control of the Predator program. One example of how these competing cultural tensions co-existed can be found in the case of the UAV Battlelab. Gen. Fogleman established it to aggressively pursue UAV concepts, but in practice it was constantly marginalized by ACC. Rather than making substantive progress toward UAV innovation, the battlelab was no more than a sop to the US Congress and other external actors who wanted to see UAV innovation move forward in the USAF. As

[132] Owings interview (Feb. 25, 2014)
[133] Whittle (2014) 112
[134] Grimes interview (Nov. 14, 2013
[135] Big Safari scientist interview (Aug. 21, 2013)

one USAF officer involved in Predator development put it, the battlelab was "a toothless appeasement to the dark forces of the unmanned imposter."[136]

The contrast between these competing cultural elements also came to light when I asked Gen. McPeak about the later success of the Predator program. Would he have pursued the UAV in hindsight, knowing it would eventually boast healthy congressional support and garner operational success? "If I thought the Army was going to go make something out of it, I would have told them it was ours," said Gen. McPeak. "This is airpower! You're poaching on my territory!" Gen. McPeak's view was in line with the cynical cultural undercurrents that still pervaded the USAF's pilot leadership under Gen. Fogleman. Gen McPeak saw the Predator as a threat to manned flight, and chose to ignore it as long as it doing so did not pose an even bigger threat to the USAF's core missions. If it had posed such a threat, he would have advocated for it. In contrast, Gen. Fogleman took on the risk of the Predator program because he genuinely believed that it meshed well with his doctrinal vision for the service – not because he wanted to keep it from succeeding in another service.

Regardless of the cultural influences that led the USAF to adopt the Predator, it was clear by now that the UAV would raise difficult questions about pilot identity, and, ultimately, service identity. As mentioned in Question 3, Predator operators did not face the same level of risk as manned aircraft pilots and there were questions about whether flying a Predator required unique piloting skills, given that the other services used enlisted crews to fly UAVs. Gen. Fogleman and other Predator advocates argued that pilot skills were needed to make UAVs a success, but others inside the USAF's manned aircraft pilot community were wary.

Percolating internal debates about pilot identity grew sharper due to external pressure. Lawmakers periodically questioned the USAF about whether enlisted personnel could fly the Predator,[137] putting the service in the awkward position of defending the use of manned aircraft pilots while internally confronting its own misgivings about the prospect. If the USAF agreed to use enlisted

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136 Raduenz interview (March 12, 2014)
137 ACC Predator study (2006) 30

personnel, then it would basically be admitting that its officers brought no special war-winning edge to UAV employment. Given Gen. Fogleman's position that the USAF was uniquely qualified to take on the Predator, as discussed above, this was not an option. But by choosing to use rated officers for a job that did not fully utilize the skills and bravery of manned aircraft pilots, the USAF —perhaps inadvertently — raised difficult questions about pilot identity and whether it was changing with the arrival of the Predator program.

Conclusion

The USAF embraced the Predator program between 1995 and 1997 to increase its budget share, but cultural factors also played a powerful role. The service remained skeptical of the Predator's cost and potential, but perceptions of the Predator's relevance in the emerging strategic environment were changing. There was a growing sentiment in the USAF that reconnaissance was becoming a more central part of warfighting and that reducing aircrew risk was becoming more important as the US entered a period of "gray" conflict that included fleeting targets and the mixing of combatants and civilians in the battlespace. Acting as what Farrell describes as a "norm entrepreneur, " Gen. Fogleman attempted to enact a cultural shift in the USAF through a top-down process of "planned change."[138] He saw the emergence of the Predator as an opportunity to reinforce a broad conception of USAF doctrine that included reconnaissance as a core competency.

The impact of Gen. Fogleman's attempt at cultural change was limited. By insisting that manned aircraft pilots fly the Predator to give the UAV the best chance of success, he ironically fueled a cultural undercurrent in the USAF's manned aircraft pilot community that saw the UAV as a threat to their jobs and status. As a result, a second motive for adopting the Predator emerged within the

[138] Farrell (2005) 13

USAF as members of the manned aircraft pilot community sought to control the UAV only to manage its rate of growth.

In his dissertation, Ehrhard argues that Gen. Fogleman's support for the Predator program was part of a broader enthusiasm for UAVs across the pilot community. This chapter supports Ehrhard's view that Gen. Fogleman played a central role in the decision to adopt the Predator program. Contrary to Ehrhard, however, I found that support for UAV innovation was far from universal. The USAF's manned aircraft pilot community still expressed a cultural preference for manned aircraft, and the intelligence community also struggled with the changes to imagery that the Predator introduced.

In closing, Gen. Fogleman's decision to adopt the Predator program between 1995 and 1997 launched a cultural upheaval in the USAF. The air campaign in Bosnia provided an early indication of the blurring of the lines between war and peace in the post-Cold war era. The phenomenon created more ambiguity about what kinds of weapon systems and missions were central to the USAF's capacity to organize, train, and equip for future conflicts. Predator advocates perceived a shift in the strategic context toward "gray" conflicts, threat environments in which they believed long-dwell reconnaissance and reduced risk to aircrew were increasingly important priorities that could be met through greater employment of UAVs.

But this leadership emphasis on unmanned platforms and reconnaissance created tension within the USAF's manned aircraft pilot community, which had long built its preeminence around its central importance in winning wars. The introduction of a new UAV, which the USAF leadership believed had potentially strategic relevance, launched the beginning of a complicated Predator innovation process that would force the USAF to reexamine its cultural norms, while at the same time striving to develop the Predator in such as way that it meshed with at least some of the USAF's existing cultural preferences.

CHAPTER FIVE, The Hunt for bin Laden: Innovation in the Predator Program

After taking responsibility for the Predator program in the mid-1990s, the USAF pursued three major changes to mold the UAV to the service's combat requirements. The changes included the installation of a laser designator, the weaponization of the Predator with the Hellfire missile, and the development of a new ways to employ the Predator, known as split operations, along with a follow-on concept, remote split operations (RSO).

This chapter explores to what extent the USAF was responsible for these innovations. It also examines how USAF culture influenced the service's capacity to bring these innovations to fruition, and, in turn, how these innovations impacted USAF culture. Chapter four discussed how Gen. Fogleman attempted to shift USAF culture in favor of UAV innovation, but faced significant undercurrents of cultural resistance from the manned aircraft pilot community. This chapter will explore whether and how these cultural dynamics changed between 1998 and September 11, 2001. The first half describes the Predator innovations themselves, and the second half explores their cultural implications.

Transforming the Predator into a USAF Weapon System

Once the USAF established control over the Predator program, USAF officials continued to institutionalize the UAV, dealing with matters related to funding, acquisition, and Predator pilot assignments.

Strong congressional support ameliorated USAF concerns about Predator funding. Any lingering financial concerns dissipated by the fall of 1997 when the US Congress passed the fiscal year 1998 defense authorization law, which dissolved DARO and returned its funding to the military services.[1] The USAF was

[1] *Inside the Air Force* (April 24, 1998)

able to reclaim $33.9 million previously lost to DARO. This figure had constituted nearly 80 percent of DARO's budget.[2] As of August 1998, ACC assumed full control over the UAV budget, but the command was not a generous benefactor.[3] ACC's answer was, apparently, not too much. There were only sixteen Predator air vehicles in the USAF's inventory by the beginning of 2001. The service was buying so few, in fact, that GA-ASI discussed laying off ten employees.[4]

Although funding was tightly controlled by ACC, the USAF did move acquisition responsibility away from ACC management to Big Safari located at Wright Patterson AFB in Ohio. The unit worked closely with GA-ASI, setting up a unit at the company's headquarters in San Diego known as Operating Location-Detachment 4. Retired USAF Colonel William Grimes, the commander of Big Safari from 1986 to 2002, put then-Captain Brian Raduenz in charge of the detachment.[5]

The USAF also started to change its recruiting strategy for Predator pilots in the 11th and 15th RS at Indian Springs AFB, still controlled by the 57th Operations Group at Nellis AFB. To make a UAV assignment more appealing, the 57th Wing commander, then-Brig. Gen. Moseley, successfully pushed to make the Predator duty into a temporary assignment known as an ALFA (air liaison - forward air control -Air Education and Training Command) tour, an option the USAF approved in December 1996.[6] ALFA tours are typical in a manned aircraft pilot's career, providing a chance to gain experience outside the cockpit, but with a promise of returning to it.[7] Then-Brig. Gen. Moseley also ensured that UAV pilot's exploits would receive official recognition, awarding the first Air Force Aerial Achievement Medal to a UAV pilot, Capt. Greg Harbin, who managed to safely land a UAV after its engine seized in a populated area in Bosnia-Herzegovina.[8]

Despite some USAF efforts to improve Predator operations, however, Predator pilots continued to train on outdated equipment. There were three

[2] Rosenwasser (2004) 314
[3] Thirtle, Johnston and Birkler (1997) 34-35
[4] Whittle (2014) 218
[5] Grimes interview (Nov. 14, 2013); Raduenz interview (Sept. 3, 2013)
[6] Tobin (1999) 49
[7] Moseley interview (April 1, 2014)
[8] Munro (Dec. 1, 1997); Moseley interview (April 1, 2014)

configurations of the Predator system in the first five years of the program. The 11th RS trained on the first configuration, known as the RQ-1A, which included a single ground control station and two unmodified aircraft left over from the ACTD.[9]

Innovation One: the Laser Designator

In the midst of all this activity at home, Predator deployments abroad continued. The aircraft was deployed, along with 50 to 60 personnel, to Ali Al Salem AB in Kuwait in 1998 for Operation Southern Watch. The aircrews flew missions over Iraq, observing Iraqi forces and facilities to ensure compliance with UN resolutions enacted after the 1991 Gulf War.[10]

But it was the Predator's third deployment to the Balkans that highlighted a pressing need for further innovation. On March 24, 1999, the USAF and CIA started to operate Predator ground control stations and air vehicles from Tuzla AB in Bosnia in support of NATO's 78-day air campaign in Kosovo, known as Operation Allied Force.[11] To be sure, the Predator continued to earn praise from commanders. "We're getting fabulous imagery of Serb forces, refugee movements, and battle damage assessments," said one NATO commander.[12] USAF commanders, who were running the Kosovo air war out of the service's Combined Air Operations Center (CAOC) in Vicenza, Italy, were also impressed. [13] But the Predator program also continued to face serious limitations.

First, the distance between the ground control station and the Predator air vehicle continued to be limited not only by aircraft range but also by satellite coverage. Predators took off from runways next to their ground control stations, co-located under the same satellite footprint to allow for real-time imagery transmission and limited beyond line-of-sight navigation. NATO forces would have

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[9] Cullen (2011) 213
[10] Gibbs (2005)1
[11] Frisbee (June 2004) 9
[12] Becker (June 3, 1999)
[13] Newman (March 2002)

preferred to operate the Predator from a less politically sensitive location than Bosnia, but could not do so because of these range limitations.[14]

Second, weather problems and the threat environment limited the capabilities of all deployed aircraft. NATO mandated that air assets, including the Predator, remain above 15,000 ft. to avoid Yugoslav man-portable air defense systems and anti-aircraft artillery.[15] The order was prompted after an SA-3 SAM shot down an F-117 Nighthawk on the fourth night of combat operations.[16] The altitude floor meant that aircrews often could not see below the cloud deck, and the Predator's SAR, which could theoretically see through clouds, provided only fuzzy imagery.[17]

Third, relaying the Predator's targeting information to strike aircraft proved to be a complex process. Strike aircraft pilots did not have access to the Predator's FMV feed, so they relied principally on voice communications with the CAOC to locate targets based on its analysis of Predator imagery. CAOC planners used their access to the FMV feed, combined with the GPS position of the Predator and digital terrain mapping programs, to get a rough idea of the location of the Predator relative to the target.[18] They then verbally relayed this targeting information to the strike aircraft or an airborne forward air control aircraft — usually the A-10 Thunderbolt II — to provide a general longitude and latitude and a description of the geographical location of the target using landmarks and terrain.[19] But this method, known as "talking on," was far from precise and proved frustrating for the strike pilots.[20]

Gen. Jumper, then the USAFE commander, told Gen. Ryan, the USAF chief from October 1997 to September 2001, about the targeting dilemma.[21] Gen. Ryan

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[14] Becker (3 June 1999) 15
[15] Lambeth (2000) 183; Jumper interview (July 30, 2013); Smaller UAVs could fly below 15,000 feet, see Lambeth (2000) 195
[16] Lambeth (2000) 200
[17] Porter (26-28 April, 1999) B24-3
[18] Raduenz interview (March 12, 2014)
[19] Newman (March 2002); Jumper interview (July 30, 2013); Shiner (May 2000)
[20] Boyne (July 2009) Jumper interview (July 30, 2013); Haave and Haun (2003) 211
[21] Jumper interview (July 30, 2013)

acted immediately, asking Big Safari to devise a solution. The group responded with the idea of mounting a laser designator on the Predator.[22] Gen. Ryan tasked one of his special projects personnel, Col. Clark, who had written the report on the Predator's second Bosnia deployment, to ensure the laser designator concept came to fruition.[23] The USAF's acquisition office directed Big Safari to modify the Predator and install the laser designator within three weeks.[24]

After evaluating several designs, Big Safari settled on Raytheon's An/AAS 44 (V) forward looking infrared (FLIR) sensor turret, which was already flying on Navy helicopters. After meeting the three-week deadline to install the laser designator, Big Safari started flight tests. [25] The laser showed promise, but availability was limited. Col. Clark sprung into action, persuading the Navy to give the USAF four of its Raytheon laser designator turrets.[26]

Always eager to test weapons in a combat setting, Big Safari rushed to deploy the laser-equipped Predator to Bosnia for operations over Kosovo. Normally this process involved transferring responsibility to the warfighting command, in this case, ACC. But ACC refused to accept the laser-equipped UAV, which came to be known in Big Safari as the WILD Predator, short for Wartime Integrated Laser Designator Predator.[27] The command was concerned about the safety of sending an unproven Predator variant directly into combat, and it also worried about the cost of doing so.[28] To circumvent ACC, Big Safari took the WILD Predator to Bosnia on a provisional basis, referred to as "depot status," under the auspices of AFMC, using its own handpicked pilots and sensor operators.[29]

Three WILD Predator vehicles, officially designated RQ-1L, were delivered to Tuzla AB in Bosnia in late May.[30] Big Safari seconded personnel from the USAF's

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[22] Grimes (2014) 330; C4ISR Journal (Nov. 1, 2004) 14
[23] Grimes interview (Nov. 14, 2013); Raduenz interview (Sept. 3, 2013)
[24] Grimes (2014) 330
[25] *ibid*
[26] Frisbee (2004) 61
[27] Grimes interview (Nov. 14, 2013)
[28] Grimes (2014); Jumper interview (July 30, 2013)
[29] Grimes interview (Nov. 14, 2013)
[30] Frisbee (2004) 62-63

11th RS and 15th RS to fly more than a dozen sorties of the WILD Predator as Operation Allied Force started winding down.[31] But it was not until June 2, just as Operation Allied Force was ending, that ACC allowed the WILD Predator to test the laser designator against a simulated target.[32] There would be no operational missions for the WILD Predator in Kosovo because ACC was unwilling to fly the unproven system in combat.[33] Nevertheless, the demonstration proved worthwhile. The Predator was able to effectively "buddy lase," shining its laser on an old shed or an old tank (there were conflicting reports on the nature of the target) so that an A-10 equipped with a laser spot tracker, the Pave Penny, could detect it.[34]

The Predator's performance in Kosovo was ultimately considered a success, despite four losses over enemy territory, three to hostile fire and one to an unknown cause.[35] The UAV had once again provided real-time FMV for bomb damage assessment and surveillance of Serbian activity. These successes notwithstanding, ACC ordered the immediate removal of the laser designators from the WILD Predators after they returned to the continental United States.[36] At the time, Gen. Jumper, still at USAFE, was not informed of ACC's decision. He later came to find out that ACC justified the order to remove the laser designators as an attempt to reduce "unprogrammed" costs.[37] Big Safari fought ACC's order for several weeks, but ultimately acquiesced.[38]

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31 Raduenz interview (Sept. 3, 2013)
32 *C4ISR Journal* (1 Nov. 2014) 14; Raduenz interview (Sept. 3, 2013); Whittle (2014) 141;
33 Swanson interview (Nov. 17, 2014); Grimes interview (Nov. 14, 2013)
34 Whittle (2014) 141; Haave and Haun (2003) 211
35 DoD (Nov. 1, 2001); Dixon (Feb.8, 2000)
36 Raduenz interview (Sept. 3, 2013); Grimes interview (Nov. 14, 2013); Jumper interview (July 30, 2013)
37 Jumper interview (July 30, 2013)
38 Raduenz interview (Sept. 3, 2013)

Innovation Two: The Hellfire Missile

From a technological perspective, weaponization of the Predator was an obvious next step. The laser designator provided a means for the Predator to track targets with precision. Armed with precision-guided munitions, the Predator would be able to act on that targeting information quickly, presenting a potential solution to the challenge presented by moving targets in Bosnia, and now, Kosovo.

From a strategic perspective, however, the costs and benefits of Predator weaponization were far less clear. Armed with precision-guided munitions, the Predator would be able to act on that targeting information quickly, thereby closing the sensor-to-shooter loop — a USAF leadership priority in the type of "gray" conflict the USAF faced in Bosnia and Kosovo. Yet the long-term strategic benefits of weaponization were still unclear because there was a sense, particularly at ACC, that even a weaponized Predator would be ill-suited for the future threat environment, given the perceived likelihood of a high intensity conflict in which the Predator would easily be shot down. In light of these uncertainties, the events that initially led to Predator weaponization were more serendipitous than part of a deliberate plan to develop a strategic capability.

For its part, GA-ASI started thinking seriously about weaponization in late 1999 when it built the Predator's successor, the Predator B — later designated the MQ-9 Reaper — funded by its own internal research and development money.[39] The Predator B was designed from the start as a "hunter-killer," able to strike time-sensitive targets with a variety of onboard munitions. It housed a 750-horsepower engine that was much larger than the Predator's 101-horsepower four-cylinder design, enabling it to fly faster, higher, farther, or carry more munitions, depending on mission requirements.[40]

The USAF was not involved in Predator B development. The USAF's own weaponization activity began in late 1999, when Maj. Gen. Michael Kostelnik, commander of the new Air Armaments Center at Eglin AFB in Florida, started

[39] Cullen (2011) 263
[40] Cullen (2011) 41

looking for a test aircraft to demonstrate a new, small, precision-guided munition, the Small Smart Bomb (SSB).[41] Given the favorable publicity, operational success, and limited payload capacity of the Predator, Gen. Kostelnik decided it would make an ideal demonstrator for the lightweight SSB.[42] He asked his deputy, then-Brig. Gen. Kevin Sullivan, to brief the idea at a March 2000 Air Armaments Summit, an invitation-only event to discuss the latest weapons developments.

The generals were particularly keen to find an audience with Gen. Jumper. Not only was he responsible for equipping the Predator with the laser designator before he left USAFE in February 2000, he was now in charge of ACC, the command responsible for Predator management. After a briefing from then-Brig. Gen. Sullivan at the summit, Gen. Jumper soon agreed to support Predator weaponization as long as it could be done without additional funding.[43] Gen. Jumper worried about costs because ACC's Aerospace Command and Control, Intelligence, Surveillance, and Reconnaissance Center (AC2ISRC), responsible for Predator program requirements, had balked at weaponization on the basis that there was no funding to support it.[44]

The Air Armaments Center formulated a plan involving other government agencies and industry to drop a live weapon from the Predator in May 2001.[45] But Big Safari's parent organization, Aeronautical Systems Command, insisted that Big Safari should handle weaponization because of its experience developing the laser designator.[46] Driven by Big Safari's focus on the rapid delivery of combat capability, the emphasis of the weaponization effort quickly shifted from an SSB demonstration to an all-out attempt to weaponize the Predator for operational use. In light of these developments, Gen. Jumper sent a message to senior USAF leaders on May 1, 2000, announcing that ACC was "moving on to the next logical

[41] Kostelnik interview (Feb. 26, 2014); Frisbee (2004) 70
[42] Kostelnik interview (Feb. 26, 2014)
[43] Sullivan interview (March 4, 2014)
[44] Jumper interview (July 30, 2013); Frisbee (2004) 73.
[45] Frisbee (2004) 72
[46] Kostelnik interview (Feb. 26, 2014)

step…weaponizing UAVs."[47] Shortly thereafter, Maj. Gen. Kostelnik relinquished control to Big Safari, which began its weaponization efforts in June 2000.[48]

Planning was now moving forward, but the USAF's original timeline was not aggressive. White House and CIA officials were under the impression that the USAF did not plan to field a combat-ready armed Predator until 2004.[49] This was in part because none of the weapons options were quick fixes. Big Safari provided Gen. Jumper with three possibilities: two still in development — the SSB and the Low Cost Autonomous Attack System (LOCAAS) — and a third, the Army's Hellfire missile.[50] The Hellfire was the only one that could be integrated in less than five to ten years, still a lengthy time horizon.[51]

Yet while the USAF was pursuing Predator innovation cautiously, CIA and Pentagon officials were growing desperate for a solution to the real-world problem of tracking Osama bin Laden. Fear of US casualties and collateral damage had thwarted several attempts during the 1990s to target the al Qaeda leader.[52] The CIA, the lead agency for the bin Laden manhunt, needed time-sensitive intelligence collection to target bin Laden with confidence.[53] The White House came to the same conclusion and began to search for ways to improve intelligence collection.[54]

In the spring of 2000, Richard Clarke, the top counterterrorism official on the National Security Council (NSC), proposed "Afghan Eyes," a CIA-led Predator deployment to track bin Laden. He had learned about the Predator from officers on the Joint Chiefs of Staff. By August 11, 2000, NSC principals authorized the CIA to conduct an unarmed Predator mission in Afghanistan.[55]

Around June 2000, Gen. Jumper became aware of the CIA's interest in using the Predator to track bin Laden. The CIA asked the Pentagon if it could provide

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[47] Whittle (2014) 169
[48] Kostelnik interview (Feb. 26, 2014); Frisbee (2004) 73
[49] Clarke (2004) 221; Crumpton (2012) 155-156; Rosenwasser 2004)363
[50] Sullivan interview (March 4, 2014)
[51] Big Safari Predator program manager interview (July 24, 2013)
[52] National Commission on Terrorist Attacks Upon the United States, known as "9/11 Commission" from this point forward (2004) 117, 131, 137, 140-141
[53] 9/11 Commission(2004)142
[54] 9/11 Commission (2004)189; Coll (2004) 526-527
[55] 9/11 Commission (2004) 189

operations support for the first Predator deployment to Afghanistan. The Joint Chiefs of Staff took the request to Gen. Ryan, the USAF chief.[56] Gen. Ryan asked both ACC and the Air Staff's Air and Space Operations Directorate if they would be willing to participate in the Predator's first deployment to Afghanistan.[57] Both organizations declined the request, citing the technological immaturity of the Predator system.[58]

Although ACC distanced itself from the un-armed Predator deployment, Gen. Jumper took actions to speed up Predator weaponization after learning of the CIA's interest. First, he chose to weaponize the Predator with Hellfire, the most readily available weapon.[59] Second, he ordered the re-installation of the laser designator that ACC had removed after Operation Allied Force.[60] Third, in July of that year, Gen. Jumper ordered Big Safari to accelerate the timeline for Predator weaponization, telling GA-ASI that ACC would pay the company $3 million to arm the Predator in three months. [61]

While Gen. Jumper was accelerating the Predator weaponization effort, the CIA moved ahead with Afghan Eyes. After meeting resistance when he asked ACC and the Air and Space Directorate for Predator support, Gen. Ryan — with the support of Gen. Jumper — next turned to Col. Ed Boyle, the Director of Intelligence for USAFE. On June 24, 2000, Gen. Ryan asked Col. Boyle if he would be willing and able to deploy the unarmed Predator on behalf of the CIA. Col. Boyle came back 24 hours later with a team that was ready to take on the Predator's first Afghanistan deployment. The team would later become known notionally as the 32nd Expeditionary Air Intelligence Squadron (EAIS), but at the time the title did not exist on paper. [62] In that first year, it reported to USAFE, but it continued to use Big Safari's handpicked pilots and test aircraft under the auspices of AFMC. [63]

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[56] Boyle interview (Feb. 11, 2015)
[57] *ibid*
[58] *ibid*
[59] Big Safari Predator program manager interview (July 24, 2013)
[60] Raduenz interview (Sept. 3, 2013)
[61] Jumper interview (July 30, 2013)
[62] Boyle interview (Nov. 20, 2015)
[63] Boyle interview (Nov. 20, 2015)

During the 32nd EAIS' first deployment to Afghanistan from September to mid-November, the unarmed Predator flew approximately 15 missions.[64] Clarke, the counterterrorism advisor, and CIA officials would watch the Predator's FMV feeds from CIA headquarters in Langley Virginia in the middle of the night, as the UAV flew missions in Afghan daylight to provide the clearest imagery.[65] On September 7, 2000, CIA officials observed a tall man in flowing white robes surrounded by a security detail at his compound, Tarnak Farm, outside Kandahar.[66] CIA officials spotted the figure, believed to be bin Laden, again on 28 September.[67] Clarke said he spotted bin Laden at least three times during the CIA's first Predator deployment. [68]

To the great frustration of the 32nd EAIS, the CIA had no way to conduct a timely strike on bin Laden. Though CIA officials were confident that the Predator was obtaining images of the al Qaeda leader, they had few targeting options except to pre-position the Navy's submarine- launched cruise missiles, an unreliable option given bin Laden's constant movements.[69] As the brisk fall weather moved in, the Predator again struggled to fly in high winds and icing conditions, and the deployment ended. By the fall of 2000, the stakes involved in Predator weaponization were clear. Senior USAF officials, including Gen. Jumper, were shown a video of bin Laden taken during the Afghan Eyes deployment.[70] Predator weaponization presented the clearest opportunity to find, fix, and finish bin Laden in a single mission.

By now, the USAF had begun initial work on Predator weaponization, including the development of a new sensor, the Multi-Spectral Targeting System (MTS) and structural changes to the Predator so it could withstand the force of a Hellfire launch.[71] But several external factors were slowing progress.

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[64] Coll (2004) 532; Benjamin and Simon (2003) 322; 9/11 Commission (2004)190
[65] Clarke (2004) 220; King and Cloud (November 2001) A1; Coll (2004) 532
[66] 9/11 Commission (2004) 190
[67] Tenet (2007) 127
[68] Clarke (2004) 221
[69] Tenet (2007) 127
[70] Wood (2015) 38; Whittle (2014) 179
[71] Grimes (2014) 332

First, no onboard modifications of the Predator could begin until the USAF received congressional approval for a "New Start Notification." USAF lawyers issued a legal opinion prohibiting "touch labor" until the USAF received permission to weaponize the Predator from the U.S. Congress.[72] The USAF resolved the issue by September 21, 2000, but only after a 10-day shutdown of weaponization work.[73]

Second, there was a debate about whether Predator weaponization violated the 1987 Intermediate Range Nuclear Forces Treaty banning the development of new ground-launched cruise missiles. Big Safari was ordered to stop Predator weaponization on October 17, 2000 and could not resume until receiving word in December 2000 that General Jumper and the CIA had convinced a panel of interagency experts that an armed Predator did not constitute a treaty violation.[74] Once Predator manufacturer GA-ASI re-opened in January 2001, Big Safari resumed work and conducted the first successful Hellfire was shot from a laser-designator–equipped Predator in February 2001.[75]

Third, the Predator program was slowed down by the kind of technological hurdles that typically affect weapons development programs. There was the question of how to mount two Hellfire missiles on the flimsy Predator airframe without blowing it apart.[76] Once that problem was resolved, Big Safari had to deal with CIA requests for major technical changes. The original Hellfire was designed to destroy tanks, but the CIA needed a warhead optimized to eliminate human targets.[77] It also needed a new concept of operations that would allow weaponized Predators to be flown from the US, as discussed in the next section.

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72 Whittle (2014) 177.
73 Frisbee (2004) 69.
74 Jumper interview (July 31, 2013); Frisbee (2004) 69.
75 Frisbee (2004) p. 76.
76 Grimes (2014) 332
77 9/11 Commission (2004) 211.

Innovation Three: The CIA Adopts Split Operations and RSO

The concept of RSO emerged in the late 1990s. The same Big Safari scientist who enabled FMV operations introduced the idea at an annual communications conference at Indian Springs, the Predator's home base. He suggested that ground control stations could be based at one safe central location in the US, while only the aircraft and ground-based satellite earth station operated in foreign countries. "I hadn't called it RSO yet, but I pitched the concept, saying there is no reason why we have to have individual ground control stations all over the place, sending all these people out there — crews, pilots sensor operators. We have the technical capability to do all that remotely," he recalled.[78]

The USAF initially rejected the concept. "We'll never operate that way," a USAF colonel told the Big Safari scientist at the time.[79] As a result, during the Predator's 1990's deployments, the three main elements of the Predator system — the ground control station, the satellite earth station and the air vehicles — all operated from the same location. This conspicuous arrangement required Predator systems to take off and land in friendly countries within the satellite footprint of the Predator mission.

The political concerns of host nations made this arrangement increasingly difficult during the 1990s. Soon after Afghan Eyes, the first CIA-led Predator deployment, began in the fall of 2000, it became apparent that a new concept of operations would be needed. At first, all of the Predator equipment was based in Uzbekistan, a government facing its own Muslim insurgency supported from Afghanistan.[80] But after the deployment started, Uzbekistan's president, Islam Karimov, began to worry that the Predator's presence would further inflame political resistance to his own leadership.[81]

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78 Safari scientist interview (Aug. 21, 2013)
79 *ibid*
80 King and Cloud (Nov. 23, 2001) A1
81 Coll (2004)531

Big Safari quickly developed a solution that would minimize the CIA's footprint in Uzbekistan. The Big Safari scientist again suggested RSO, and the CIA agreed to it. While the idea had potential in theory, however, in practice it was not a ready-made solution. It required some technological problem-solving to move the Predator's ground control stations all the way back to the United States. To deal with the immediate political problem in Uzbekistan, the Big Safari scientist recommended "split operations." The Predator aircraft and a small crew for launch and recovery operations stayed in Uzbekistan, while the satellite earth station, ground control stations, and majority of the USAF's aircrews moved to Germany.[82] Big Safari referred to their support to the CIA's Afghan Eyes deployment as the Summer Project."[83]

Split operations provided a quick solution to deal with the political problems in Uzbekistan, but would not work for a second weaponized Predator deployment in 2001. Flying a weaponized Predator from outside the United States was a diplomatic non-starter. White House and CIA officials worried that even a close ally like Germany would balk at the prospect of a Predator pilot or CIA operative hitting the "monkey switch" — the nickname for the Predator's weapons release function— from a ground control station in their country.[84] An NSC lawyer first raised the problem at a summer 2001 NSC meeting at the White House.[85] Bush administration officials convened another meeting to discuss the problem, warning that it would jeopardize the entire effort to use armed Predators against bin Laden. The Big Safari scientist again suggested RSO, promising to set up an operation that would allow the US to fly the Predator over Afghanistan from ground control stations in the United States within six weeks.[86]

By mid-August 2001, the Big Safari scientist had a workable concept. It involved splitting up the Predator's network once again. The satellite earth station remained in Germany, under the same satellite footprint as Afghanistan. Predator

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[82] Big Safari scientist interview (Aug. 21, 2013)
[83] Grimes interview (Nov. 14, 2013)
[84] Campbell Interview (April 4, 2014)
[85] *ibid*
[86] Big Safari scientist interview (Aug. 21, 2013)

launch and recovery operations remained in Uzbekistan. But the ground control stations were moved back to the United States, housed in double-wide trailers on the CIA's headquarters campus at Langley, Virginia.[87] The move back to the United States was made possible because the Big Safari scientist had been able to connect the ground control stations to the satellite earth station in Germany via a long fiber optic cable owned by the Pentagon's Defense ATM Network Services (DATUMS). [88]

The USAF Delivers a Weaponized Predator

The ongoing plan to fly a weaponized Predator over Afghanistan had been formalized on July 11, 2001, when Deputy National Security Advisor Stephen Hadley directed the deployment to begin by September 1, 2001. The USAF was feverishly working to overcome the obstacles to Predator weaponization in time for this deadline. GA-ASI received a new contract to modify two more existing Predators to carry MTS sensors and Hellfires.[89] But ongoing bureaucratic disputes, largely outside the USAF's control, prevented the weaponized Predator from meeting Hadley's deadline. Had the deadline been met, armed Predators would have been operational in Afghanistan before the September 11 attacks.

Though Gen. Jumper wanted the USAF to play a prominent role in future weaponized Predator operations, the DoD was more reserved. Neither Pentagon officials nor the CIA were eager to take legal responsibility for authorizing Predator strikes or for launching a Hellfires from a UAVs because to do so would raise questions about command and control and financial responsibility.[90] The issues were hotly debated at a September 4, 2001 meeting of the NSC Principals Committee, but they were not resolved. Instead, the principals decided to forgo an

[87] Whittle (2014) 214-217and 237
[88] Big Safari scientist interview (Aug. 21, 2013)
[89] Whittle (2014) 217
[90] *ibid*

attempt to strike bin Laden with an armed Predator until their issues could be worked out.[91]

By then it was too late. The Big Safari scientist was on the second day of a successful testing schedule for RSO in California when he saw the World Trade Center towers fall on television. Hours later, he got a call from Grimes, the director of Big Safari, who told him "the customer has just declared your system operational."[92] Predator 3034, along with a laser designator, Hellfire missile, and new concept of operations, RSO, was finally on its way to Afghanistan.

In closing, it is clear there were changes in the material factors surrounding the Predator program between 1998 and September 2001. The Predator's growing combat record, bolstered by its relative success in Kosovo, made it more difficult to dispute its technological maturity and combat capability. Meanwhile, the CIA's desperate hunt for bin Laden constituted a shift in the threat environment that ultimately compelled the USAF to act. Initially, however, the USAF seemed to maintain its peacetime footing despite these changes, pursuing Predator innovation at a measured pace. The four sub-questions below explore how USAF perceptions of the Predator program influenced the pace of Predator innovation, and how these Predator innovations, in turn, influenced the USAF.

1. **To what extent did individuals or groups within the USAF resist the Predator out of a concern that their jobs or status might be threatened by it?**

As was the case during Gen. Fogleman's tenure, support for Predator innovation existed at the highest echelons of the USAF under the leadership of the chief, Gen. Ryan, and Gen. Jumper, the ACC commander. But concerns about the Predator's impact on the pilot community remained pervasive at lower ranks. "I got the sense that the chief understood it, but the lower down you got, there was more

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[91]The 9/11 Commission (2004) 214.
[92] Big Safari scientist interview (August 21, 2013)

resistance," explained Mark Cooter, a retired colonel who was a USAF major when he left his Air Staff job to deploy with the 32nd EAIS during Afghan Eyes.[93]

Many saw ACC staff as the center of gravity for culturally-based obstruction of innovation in the Predator program. "All of the initiatives that really occurred in the early years of the Predator were in spite of ACC, not because of it," said retired Col. Grimes, the former Big Safari director. ACC cited the Predator's technological immaturity and cost considerations as the driving factors behind their decisions to remove the laser designator and to decline responsibility for the CIA's Afghan Eyes deployment. But a preference for manned aircraft was a central force driving the resistance, said one Predator program manager who worked for Big Safari. "They were very much against it until the boss said 'you will do it', and then they didn't go cooperatively but at least they got to the end state," he recalled. "There was a big pushback across the board — that's the last thing we need is that aircraft flying around without any pilots in it. Not that they did anything derogatory, but they just used derogatory language on a regular basis. That you expect, and some of it is fun. But it does permeate a sense of the attitude in the organization we were dealing with."[94]

Another cultural bias against Predator innovation prevalent amongst ACC staff was skepticism of the Predator's capabilities and concept of operations, which in turn led to slow and highly regimented procedures for pursuing Predator innovations, as discussed in Question 2. The two biases tended to "feed upon each other," according to Scott Swanson, who flew the Predator as a USAF captain with the 32th EAIS. "You can combine the two and it makes four times the stink instead of two. It builds momentum for the idea of 'no, not in my world.'"[95]

ACC's initial refusal to adopt RSO in the late 1990s provides a striking example. ACC initially rejected RSO because it clashed with existing USAF doctrine and long-established procedures, both built around manned aircraft operations. A central tenet of USAF doctrine is the concept of "centralized control and

[93] Cooter interview (May 26, 2014)
[94] Big Safari Predator program manager interview (July 13, 2013)
[95] Swanson interview (Feb. 2, 2015)

decentralized execution." Manned aircraft pilots typically take orders from a CAOC, but they make their own minute-to-minute decisions. RSO moved Predator pilots close to centers of power, where generals could easily intervene in a Predator pilot's day-to-day decision-making. In this way, RSO challenged the centrality of the independent pilot in USAF doctrine. It also threatened to generate a major bureaucratic overhaul, hardly appealing given ACC's cautious approach to change.

"What bothered [ACC] was they would have to make significant changes to their whole operational doctrine. All of the wheels were greased for sending people forward and putting people in airplanes, and the entire structure was set up that way, their paperwork, their concepts of operations, their orders," said the Big Safari scientist who invented RSO. But, he noted, even more unpalatable to ACC was the prospect of making all these changes to accommodate a UAV that fundamentally threatened the manned aircraft around which USAF doctrine was built. "Basically the Predator UAV threatened the Air Force in the same way that aircraft carriers threatened the old time admirals who were all raised and made their marks in battleships," he said.[96]

On the operational side, manned aircraft pilots continued to see the Predator as a sideshow that could hurt their career prospects if they got close to it. "I think they just thought of it as a niche capability, and they just didn't want to have anything to do with it," said retired Col. Cooter.[97] Retired Maj. Gen. Kevin Sullivan, who had been Maj. Gen. Kostelnik's deputy at the Air Armaments Center, said his experience briefing USAF officials on UAVs also led him to believe that the pilot community was highly suspicious of the Predator. " I think it was perceived more as a threat – this nasty little airplane is here, and now it's going to stay," he recalled.[98]

Then-Brig. Gen. Moseley had hoped that making the Predator assignment a temporary ALFA tour would offer a light at the end of the tunnel and improve

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96 Big Safari scientist interview (August 21, 2013)
97 Cooter interview (May 26, 2014)
98 Sullivan interview, (March 4, 2014)

morale.[99] The USAF personnel office increased the percentage of fighter pilots in Predator assignments from 50 percent to 75 percent after weaponization, hoping they would capitalize on their expertise to employ the strike UAV.[100] But pilots of all stripes continued to resist assignments to the Predator as the stigma surrounding the UAV continued to grow. "Keep in mind, we were taking guys out of F-16 cockpits and putting them in Predators," said retired Maj. Gen. Sullivan. "You can't blame a guy, really. He thought he was coming into the Air Force to fly an airplane and now he's going to be sitting in a box."[101]

The degree of the stigma surrounding a Predator assignment became even more apparent when then- Brig. Gen. Moseley, still the 57th Wing Commander at Nellis AFB, awarded an Aerial Achievement medal to a UAV pilot, Captain Harbin. It was an effort to elevate the status of UAV pilots, but it was met with derision inside and outside the service. He received numerous phone calls, emails, and media criticism for his decision. "The entire world came down on me," he recalled.[102]

The stigma surrounding a Predator assignment only increased as Predator pilots were forced to train on an old Predator system. ACC insisted that GA-ASI update its technical manuals before allowing Predator pilots to train on a newer system[103] But GA-ASI took over a year to produce the manuals, which by then were out of date because the Predator system was constantly undergoing modification. Without the manuals, the informal, word-of-mouth approach to training continued, which detracted from a professional atmosphere. In his 2009 dissertation, then-Lt. Col. Cullen explained how poor training damaged the Predator pilots' reputations: "The ignorance of Predator operators negatively affected individual and group performance, and it exacerbated isolation of Predator crews and the resignation of Predator pilots, who were the human component of Predator with the highest

[99] Moseley interview (April 1, 2014)
[100] Cantwell (2007) 90
[101] Sullivan interview (March 4, 2014)
[102] Moseley interview (April 1, 2014)
[103] Cullen (2011) 218-219

power and status to restructure the system and to distribute knowledge among the community."[104]

Manned aircraft pilots drafted to a Predator assignments worried about their promotion prospects, given the stigma. "Some of the guys in the unit at Creech – Indian Springs at the time – were definitely fighting to get promoted because they were a Predator pilot and not an F-16 pilot," said the Big Safari Predator program manager.[105]

Predator draftees also worried about the lack of flight pay, which they saw as fundamentally unjust. After visiting the 11th RS in September 2001, then- Lt. Col. Cantwell said that frustrations were at an all-time high. "Many wondered how the USAF could require Predator pilots to take Form 8 checkrides with the threat of going to a flight-evaluation board (FEB) and not award gate credit."[106]

Given these concerns, manned aircraft pilots recruited to the Predator program started dropping out. Pilots chosen for Predator duty could "7-day opt," refusing the assignment and leaving the USAF if their service commitments were shorter than the length of the assignment. "They lose a lot of pilots like that," one Predator pilot, Tom Reagan, told the *Smithsonian Air & Space Magazine* in 2001. "I volunteered, but after three other pilots had seven-day opted out. We counted up in my training class, and we think 17 or 18 pilots left the Air Force."[107]

Weaponization: A Threat to the Intelligence Community

Interestingly, another community that saw the armed Predator as a potential threat was the USAF's intelligence officers. Once the service's intelligence analysts became aware of the increased situational awareness the Predator could provide, they were keen to maintain control of it. The decision to arm the Predator

[104] Cullen (2011) 222
[105] Big Safari Predator program manager interview (July 24, 2013)
[106] Cantwell (June 2007) 88. Form 8 checkride failure can mean loss of flight status.
[107] Shiner *(*May 2001).

threatened to break their monopoly on what up until now had been strictly a reconnaissance asset.

Intelligence personnel at ACC's AC2ISRC, which had balked at spending for Predator weaponization, had both rational and cultural reasons to resist arming the Predator UAV. On a rational level, weaponization would create new training and qualification requirements that would drive up cost. From a cultural perspective, arming the Predator UAV posed a threat to the USAF intelligence community's monopoly over the Predator UAV for reconnaissance missions. "The intelligence community was just beginning to rail against the whole notion that these things were armed and it took away from the intelligence priority of surveillance," recalled Gen. Jumper.[108] Echoed the Big Safari Predator program manager: "Reconnaissance was being usurped by weaponization…. When we went the way of weapons and such, the core mission of the renamed MQ-1 was targeting. At the time, folks believed (rightly so) they wouldn't be able to perform their primary task of reconnaissance and surveillance anymore."[109]

The tension was apparent at the CAOC at al Udeid during operations for Iraq's no-fly zone. Col.Gary Fabricius, former commander of the 15 RS, recalled several times when a senior intelligence director within the ISR cell at the CAOC restricted weapons employment because it would detract from ISR collection efforts.[110]

In keeping with the findings of Chapter 4, biases against UAVs within the USAF among the pilot community and the intelligence community persisted even as innovations in the Predator program progressed. Bias continued to be strongest among rank-and-file manned aircraft pilots, although it lessened to a degree as a result of weaponization, as discussed in Question 2. Conversely, intelligence officers' own biases became stronger once the Predator was armed.

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[108] Jumper interview (July 30, 2013)
[109] Big Safari predator program manager interview (March 28, 2014)
[110] Cantwell, (June 2007) 64

2. **To what extent were judgments about the potential and cost effectiveness of the Predator based on the USAF's enthusiasm for employing new technology and to what extent was the enthusiasm outside the service?**

The USAF's most senior leaders continued to support Predator integration between 1998 and September 11, 2001. Gen. Ryan, the USAF Chief, gave Gen. Jumper free rein to pursue the laser designator and Predator weaponization. As the former commander of NATO Southern Forces during the Bosnia campaign, Gen. Ryan understood as well as anyone the potential for Predator innovation to fill major gaps in the USAF's targeting accuracy.[111] In a show of support to Gen. Jumper, Gen. Ryan continued to allow Col. Clark, the bureaucratic fixer who had assisted Gen. Fogleman's efforts to develop the Predator, to help Gen. Jumper expedite Predator innovation.[112] "From the most senior levels — and I had more than my share of opportunities to be in front of a bunch of them — they were fully onboard with doing it and getting as much capability as they could," recalled the Big Safari Predator program manager.[113]

Big Safari and the 32nd EAIS were also important sources of internal enthusiasm for the Predator program. The acquisition culture in Big Safari was predisposed to develop the UAV quickly. "Big Safari is the fastest way to do innovation anywhere," summed up retired Col. Ed Boyle, who was the commander of the 32nd EAIS during Afghan Eyes. That squadron was staffed with highly driven people who either had enough experience with the Predator to see its value or were very open to learning about it. "They were innovators, type 'A' personalities, people who did not know the meaning of the word 'no,'" recalled retired Col. Boyle.[114]

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[111] Ryan interview (June 18, 2014)
[112] *ibid*
[113] Big Safari Predator program manager interview (July 24, 2013)
[114] Boyle interview (Nov. 20, 2015)

Outside these USAF organizations, pessimism about the Predator still permeated the USAF. Brian Raduenz, now a retired USAF Lt. Colonel, recalled a story that highlighted the lingering bias beneath the level of senior leadership. As a USAF captain working for Big Safari, Raduenz attended a USAFE headquarters briefing about the laser designator prior to the Kosovo air war. USAFE generals were dismissive, doubting a UAV would be ready to make a meaningful contribution in Kosovo. One gave a "speech about how dumb this was and about how UAVs are not ready for prime time."[115] But those same generals reversed their position the next day when they received the same brief in front of their boss, Gen. Jumper. "You could tell they were just appeasing the general, they didn't believe it at all," recalled retired Lt. Col. Raduenz. "That was my first taste of the inter-Air Force battle. The majority view was it was just a toy and had no use to them."[116]

USAF enthusiasm for the Predator program seemed to increase somewhat after Kosovo. "I went into this with a lukewarm approach to UAVs…and I came out of this conflict an enormous fan," said Lt. Gen. Michael C. Short, the commander of allied air forces in Kosovo.[117] Outside the USAF, already strong Predator support grew stronger. Secretary of Defense William Cohen issued a memo in August 1999 calling for a "strong, renewed commitment" to UAV development. Although UAVs had experienced technological growing pains, their contributions to "information superiority and risk reduction for our pilot force demanded continued investments in UAV spending, force structure, plans and exercises," he said.[118] Government civilians also were optimistic about cost. Jane Alexander, the acting director of DARPA in 2000, said she expected the unit cost of a new UCAV to be "one third that of the Joint Strike Fighter," the USAF's newest manned stealth fighter, and that "operations and support costs, compared to a current manned fighter squadron, will be reduced by 75 percent."[119]

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[115] Raduenz interview (Sept. 3, 2013)
[116] *ibid*
[117] Quoted in Rosenwasser (2004) 356
[118] Quoted in Rosenwasser (2004) 357
[119] Kennedy (October 2001)

Acquisition Culture: Tension Between ACC and Big Safari Over Technological Maturity

Despite the Predator's perceived success in Kosovo, there was continued skepticism in the USAF regarding the Predator's technological maturity, particularly at ACC. The transition of the Predator program from traditional acquisition procedures to Big Safari in 1998 exacerbated tensions between the two organizations. Big Safari actively lobbied the US Congress to gain control of Predator program development in 1998 because the director, Grimes, worried that the regular USAF would not be able to fully appreciate or exploit the Predator's potential.[120] For its part, ACC fought to retain a tight grip on management, seeking to control the pace of Predator development in keeping with the USAF's traditional acquisition culture.

The prime example of the tension between ACC and Big Safari was the innovation process that led to the installation of the laser designator. The WILD Predator deployed with Big Safari, but ACC refused to fly it in combat because technical orders were not yet available for the laser designator. On a practical level, ACC personnel worried that the lack of technical orders would jeopardize safety. The commander of the 11th RS was concerned because the WILD Predator software had to be flown in "maintenance mode" because the aircraft was still in testing. It was unclear how this mode might affect in-flight programming. The 11th RS commander also worried about the lack of a method to see and verify where the laser designator was pointed, as a small pointing error could increase collateral damage.[121]

Aside from the technical risks, the ACC officials saw the laser designator as an unfunded project for an airplane that was not yet an official Air Force program with an official budget. This concern explains why ACC officials were so quick to remove the laser designator after Kosovo, according to Gen. Jumper, who had championed its integration. "It's not that you hated the Predator for the mission,

[120] Whittle (2014) 123-125
[121] Anonymous interview

but it was that all these bills are coming in," said Gen. Jumper. "They thought, 'Here comes Gen. Jumper over in USAFE trying to put a laser designator on there. We'll put a laser on there, but we won't make it a permanent part of the Predator because it just costs too much money."[122]

But Big Safari officials felt that ACC's concerns went far beyond practical safety and cost considerations. ACC's preference for regimented acquisition processes was so culturally engrained that it clouded its ability to facilitate innovation and support non-standard acquisition processes when they might speed a valuable weapon system to the battlefield. At Big Safari, there was a sense that ACC was treating the laser designator like a "science project," according to Grimes.[123] "When Kosovo ended, ACC took the laser designator off the vehicle as if it were a deadly parasite," he recalled. "They really didn't want it and it was no skin off their tail if it didn't get out there, so consequently, whatever they imposed on it was fine," he said.[124]

The unconventional nature of the Predator program generally annoyed ACC. Consequently, it was not eager to accelerate technological improvements. Grimes recalled an incident in 1999 when a problem was discovered with the Predator's landing gear was rubbing against the fuselage. Big Safari used a piece of three-inch plywood as a spacer to prevent the chaffing, but ACC would not allow it on the aircraft. "We had to do a complete test on it and they actually sent us a message and told us — this is around 1999 when everyone is all puckered about Y2K — that we had to certify to these folks that the piece of plywood was Y2K compliant."[125]

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[122] Jumper interview (July 30, 2013)
[123] Grimes interview (Nov. 5, 2013)
[124] *ibid*
[125] *ibid*

Weaponization: Gen. Jumper Molds the Predator to Fit USAF Culture

While pessimism regarding the Predator's technological maturity remained prevalent within the USAF, Predator weaponization helped to shift cultural attitudes in favor of the UAV. Gen. Jumper, in his positions as commander at USAFE and ACC, played a central role in this cultural shift. Like Gen. Fogleman and Gen. McPeak, Gen. Jumper grew up in the Vietnam era as a Fast FAC, flying a successor to the F-100, the F-4D. But he shared Gen. Fogleman's commitment to a broader vision of airpower not principally wedded to fighter aircraft. Reflecting on his time as a cadet at the Virginia Military Institute, he said he would have still joined the military even if he could not be a pilot like his father had been.[126] He was also an enthusiastic technologist. As a USAF captain, he developed a method to increase the range of the "dive toss" bombing tactic to reduce risk to aircrew, and published frequently in *Fighter Weapons Review*, the fighter pilot's tactics bible.[127] His open-minded approach put him in a position to be receptive to the Predator program.

Following his experience as USAFE commander in Kosovo, Gen. Jumper knew that the Predator had the potential to play an important doctrinal role. He had become increasingly frustrated with the inability of the USAF to target and engage transient targets, from mobile Scud missile launchers in Desert Storm[128] to tanks in Kosovo. As ACC commander in 2000, he called on the USAF to develop capabilities for the destruction of targets in "single-digit minutes."[129] He saw the installation of the laser designator and the Hellfire missile on the Predator as a means to achieve this doctrinal goal.

Compared to Gen. Fogleman, Gen. Jumper enjoyed greater success selling Predator innovation to the manned pilot community. Gen. Fogleman acted as a norm entrepreneur, embracing the Predator program to shift USAF culture toward a broader focus on the ISR mission. But Gen. Jumper went in the opposite direction,

[126] Loring (Oct. 5, 2010) 3
[127] Anderegg (2001) 63-65; Loring (2010) 15
[128] For more on Scud hunt, see Rosenau (31 Dec. 2001) 29-44
[129] Hebert (March 2003) 50

molding the Predator to fit the existing cultural norms within the USAF, which placed a high value on strike assets as opposed to reconnaissance. While biases against UAVs persisted, the prospect of weaponization as a means to advance the cause of time-sensitive targeting broadened the Predator's support base. Arming the Predator "clearly shifted this technological system towards the Air Force's cultural core," John Davis argued in his 2007 dissertation on the USAF's airborne reconnaissance systems. "These efforts also altered the service's perception of the value of this system developed to conduct military missions it considered peripheral."[130]

Far from seeing weaponization as a threat to manned strike aircraft, the manned pilot community largely viewed it as an opportunity to expand the USAF's war-winning capacity to strike targets anytime and anyplace. "Was there anybody who sort of bristled when they saw the Predator shoot the bad guy? Sure, you could bristle, except we couldn't get the [manned] airplane to where that Predator was, and that was the whole idea," said Gen. Jumper.[131] Gen. Moseley, who left his post as 57th wing commander to work at the USAF's legislative liaison office during this time period, confirmed Gen. Jumper's view. "Watching something is good, it may lead to something," he said. "But wacking something — and that' s a policy term for creating kinetic effects from the domain — now that gets people excited. It's our job."[132] Even at ACC, weaponization led to a softening of attitudes toward the Predator program. "It wasn't really until the Predator was armed and could strike on its own that the establishment in ACC could see the value in it," said retired Col. Grimes."[133]

Predator weaponization also appealed to the USAF's pilot community because weapons employment required the special skills of a manned aircraft pilot — or at least someone with training to make life-or-death decisions. Then-Lt. Col. Cullen, an F-16 pilot, explained the logic in his dissertation: "Predator pilots

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130 Davis (2007) 231
131 Jumper interview (July 30, 2013)
132 Moseley interview (April 1, 2014
133 Grimes interview (Nov. 5, 2013)

became decision-makers, and Predator's weapons transformed Predator pilots and sensor operators into war fighters—Predator crews could create effects on the battlefield they could observe, evaluate, and adjust."[134] Gen. Jumper shared a similar view with Adam Rosenwasser in his 2004 dissertation on UAVs and governance structure, noting that weaponization meant Predator operators would need training that gave them warrior status:

> "…We had to stop considering this a thing that could be flown by sort of anybody, that's going to sort of passively surveil, into a system that is going to carry all the burden and weight of being able to put bombs on target and all the responsibility that comes with that. And in the Air Force, the people who hold that responsibility are credentialed warriors, who have to go through training…."[135]

Outsider Support for Weaponization

Outside the USAF, there was also considerable support for weaponization. GA-ASI had long been interested in the possibility, and lawmakers also were aware of the prospect based on a 1996 Air Force Scientific Advisory Board study commissioned by Gen. Fogleman, which suggested that an advanced, armed, Unmanned Combat Aerial Vehicle would be able to perform like a fighter at half the cost.[136] The House Armed Services Committee sponsored legislation in 1996 calling for the arming of the Predator and the Army's Hunter UAVs, but the Pentagon viewed the Predator strictly as a reconnaissance asset and opposed the initiative.[137]

Congressional support for weaponization continued as the fall of 2001 approached. The House Armed Services Committee asked the USAF to investigate purchasing a fleet of GA-ASI's hunter-killer Predator B UAVs in a report

[134] Cullen (2011) 245
[135] Rosenwasser (2004) 356
[136] Rosenwasser (2004) 233
[137] Geer and Bolckom (2005) CRS-3

accompanying the fiscal year 2001 Defense Authorization Bill.[138] Rep. Randy "Duke" Cunningham, an F-4 pilot in the Vietnam War, wrote a private letter to Secretary of Defense Donald Rumsfeld in the summer of 2001 urging him to buy the Predator B immediately.[139] GA-ASI served as a major influence on lawmakers' support for UAV spending. Cunningham received at least $35,000 in political contributions from GA-ASI between 1998 and 2006.[140] From 2000 to 2006, GA-ASI spent $600,000 —more than any US company — to pay for 86 congressional junkets to company facilities and overseas locations.[141]

In the CIA and White House, there was mixed support for an armed Predator. The USAF was clearly feeling CIA pressure to move quickly on weaponization in the spring of 2000. That pressure mounted after the Afghan Eyes deployment. Clarke, the White House Counterterrorism advisor, along with CIA officials including Charles Allen, the assistant director of central intelligence for collection, Cofer Black, head of the CIA's Counterterrorism Center, and his deputy, Edward Crumpton, were eager to arm the Predator after the UAV located bin Laden but was powerless to take direct action.[142]

Conversely, others in the CIA, including the director, George Tenet, and James Pavitt, the Deputy Director of Operations, worried about the legal consequences of the CIA covertly arming a UAV to assassinate a foreign national.[143] The Pentagon had similar concerns, hesitating to launch a Hellfire strike on bin Laden in a non-wartime scenario.[144] This conflict within the CIA and between the CIA and the Pentagon led to conflicting outcomes. Although advocates in the CIA were a source of pressure on the USAF to weaponize quickly, the CIA and Pentagon's indecision about weapons release contributed to delays in the deployment of a weaponized Predator to Afghanistan.

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[138] Wolfe (May 16, 2000)
[139] Selinger (July 17, 2001)
[140] Hennigan (Sept. 12, 2010)
[141] *ibid*
[142]Crumpton (2012) 156
[143] Crumpton (2012) 159
[144] Campbell Interview (April 11, 2014)

Strategic Motivations for Pursuing Predator Development

While weaponization broadened USAF support for the Predator, it by no means eliminated resistance at ACC. Already predisposed to balk at Predator innovation because of its preference for manned aircraft and regimented acquisition procedures, ACC seemed almost willfully ignorant of the connection between Predator innovation and the manhunt for bin Laden.

In the summer of 2000, Gen. Jumper began to grasp the strategic implications of using the Predator to hunt bin Laden. But his own command, ACC, continued to take a cautious, bureaucratic, obstructionist approach to weaponization. Before Afghan Eyes began, Grimes, the Big Safari director, briefed a group of ISR staff at ACC on the upcoming Predator deployment. He went in to the meeting "foolishly thinking" that ACC would support the effort once they understood the national security stakes, "but they scoffed at it."[145] After the deployment was underway, retired Col. Cooter said he prodded ACC to send some officials to the CIA's Predator ground control stations in Germany to see how "split operations" worked. He also constantly encouraged ACC to ask Big Safari for updated technical data so that acquisition hurdles to weaponization could be quickly surmounted. But "none of the ACC staff guys embraced it," he recalled. "Hell, they probably still don't embrace it today."[146]

Even when Afghan Eyes ended as the winter approached, ACC continued to take a pessimistic view of the Predator's strategic potential. At that time, then-Major Cooter, the 32nd EAIS director of operations, was so frustrated with the failure to strike bin Laden that he wrote a letter to his superiors warning that it would be pointless to continue Predator operations if it were not armed.[147] But his sense of urgency was not matched at ACC. That fall, he debriefed several USAF officials on Afghan Eyes, including the Air Warfare Center commander, the wing commander and squadron leadership at Nellis AFB, as well as ACC's directors of

[145] Grimes interview (March 18, 2014)
[146] Cooter interview (May 26, 2014)
[147] Cooter interview (May 26, 2014); Whittle (2014) 180

intelligence and operations. General officers on the Air Staff prepped him for the ACC brief, warning him to expect questions about why ACC was not directly involved in the hunt for bin Laden and how they could be more involved in the future.[148] But those questions never came. After learning about the bin Laden sightings, ACC's operations director was only interested in how to reduce Predator accident rates. "I thought ACC was going to say 'this is our mission, and we are going to take it," recalled retired Col. Cooter. "They did not."[149]

In closing, there was clearly growing support for the Predator program within the USAF between 1998 and September 11, 2001. Gen. Jumper's effort to weaponize the Predator meshed with existing USAF culture, helping to broaden the base of support for the UAV. Big Safari and the 32nd EAIS also were important sources of enthusiasm. However, pessimism about the potential of the Predator persisted, manifesting itself most obviously in ACC's extremely cautious approach to Predator innovation and failure to acknowledge the broader national imperative of weaponization as a means to target bin Laden. The tension between ACC versus Big Safari and the 32nd EAIS over acquisition procedures and the strategic motivation for Predator innovation represented a major divide within the USAF between those who saw the Predator as a means for airpower to make an important strategic contribution and those who were far more pessimistic about its military potential.

3. **To what extent were USAF judgments about the employment of the Predator driven by a desire to reduce the risk to friendly personnel, and to what extent was that push from outside the service?**

As discussed in chapter four, Gen. Ryan, now the USAF chief, felt that reducing risk should be a top priority for any commander as a means to minimize loss of life and political fallout arising from aircrew capture of death. But by and large, that

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148 Cooter interview (May 26, 2014)
149 *ibid*

sentiment was not a motivating factor behind Predator innovation in the USAF during this time period. If anything, USAF officers tended to view reducing aircrew risk as a threat. These attitudes were evident in the service's initial reaction in 1999 to the Big Safari scientist's proposal for RSO.

The USAF rejected the idea partly based on a concern for preserving a doctrine built around manned aircraft, but also because it threatened the warrior ethos. As discussed in chapter four, the Predator system was already raising complex questions about manned pilot identity because it minimized physical risk by taking pilots out of the cockpit. The idea of moving the control station outside the combat zone put an even finer point on the issue of whether Predator operators deserved the title of "pilot," given the further removal of any risk. Consequently, there was a reluctance to do it. As the Big Safari scientist explained: "People don't wear silk scarves in ground stations. They don't wear flight goggles either."[150] The tensions that RSO raised over pilot identity would only grow sharper as it became standard practice in the USAF, as discussed in chapter six.

Outsider Attitudes Toward Reducing Aircrew Risk

Outside the USAF, attitudes toward reducing risk were very mixed. The USAF's perennial concern with preserving the warrior ethos was under threat from some retired, but highly influential, members of the military. During his bid for president in 2000, Senator John McCain complained that the Clinton administration "wins ugly" because it kept the altitude floor at 15,000 feet, too high, in his opinion, to drop bombs accurately, therefore risking civilian casualties.[151] (Airpower historian Phillip Meilinger has countered that bomb accuracy was actually improved at higher altitudes[152]). Retired US Marine Corps Lt. Gen. Bernard Trainor claimed the USAF lacked honor for conducting an "immaculate" air campaign. "High-tech weaponry permits pilots to fly high out of harm's way while visiting destruction

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150 Big Safari scientist interview (July 24, 2013)
151 Dudney (May 2000); Klein (2002) 76-77
152 Meilinger (April 2009)

below," he wrote, adding that he found it "troubling" that the USAF had demonstrated in Kosovo "the ability to drive an enemy to his knees without shedding a drop of the bomber's blood."[153]

However, other outsiders saw the capacity for airpower to reduce both physical and political risk as an important asset in the wake of Operation Allied Force. In terms of political risk, casualty aversion reached an unprecedented level by the late 1990s, as the public came to assume that precision-guided and standoff munitions would minimize both aircrew risk and civilian casualties. In his book on Allied Force, Benjamin Lambeth refers to this time period as an era of "cruise missile diplomacy" because the Clinton administration often opted for the use of TLAMs over risking aircrew.[154] US lawmakers, already supportive of UAVs, ramped up their advocacy in 1999 and 2000 because of the political risks of downed aircrew. Senator John Warner sponsored statutory language requiring that one third of deep strike aircraft be unmanned within 10 years and one third of ground combat vehicles be unmanned within 15 years.[155] He was concerned that the death of friendly forces in Bosnia or Iraq could expose the country's inability to tolerate casualties. "When you look at the history of casualties…in my judgment this country will never again permit the armed forces to be engaged in conflicts which inflict the level of casualties we have seen historically."[156]

In terms of reducing physical risk, senior Pentagon officials were now heavily weighing the potential loss of friendly forces in their operational planning. The Pentagon released an "after action" statement on the Kosovo air war lauding the capability of UAVs to reduce risk to friendly forces, noting that the loss of 15 UAVs in the conflict had been well worth it.[157] When it came time for Henry H. "Hugh" Shelton, Chairman of the Joint Chiefs of Staff, to evaluate an option to use Special Operations Forces to track bin Laden in the late 1990s, he rejected options to use ground forces because the risk of US casualties was too great. The 9/11

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153 Dudney (May 2000)
154 Benjamin Lambeth (2001)179
155 US Senate Armed Services Committee (March 12, 2000)
156 Wilson (4 Dec 2001)
157 Cohen and Shelton (Oct. 14, 1999)

Commission report noted: “Shelton told us that such operations are not risk-free, invoking the memory of the 1993 ‘Black Hawk Down’ fiasco in Mogadishu.’”[158]

Given these concerns about physical risk to ground forces in the bin Laden hunt, it is not surprising that the White House and CIA turned to the Predator as a potential solution. While physical risk was an issue, however, the main concern once the Afghan Eyes deployment began in the fall of 2000 was political risk. The CIA had become increasingly risk averse because of congressional scrutiny of its covert activities, including a plan to assassinate Fidel Castro and the Bay of Pigs, a failed attempt to assist Cuban rebels in the dictator’s overthrow.[159] CIA officials told the Big Safari scientist there “was just too much high risk involved” in basing the ground control stations in Uzbekistan, given the political explosion that might occur in the host country if people realized that the CIA was there.[160] Split operations allowed the CIA to reduce its footprint during Afghan Eyes to ground control stations and take off and landing elements, while the rest of the operation could be stationed in Germany.

As the CIA geared up for Predator weaponization, reducing political risk became even more important. RSO was the only way to avoid the political fallout that might result if a host nation, such as Germany, discovered that the Predator’s so-called “monkey switch” was flipped within its borders. The US needed to either explicitly alter its status of forces agreement with Germany to allow for Hellfire strikes from its territory, or the ground control station had to be based elsewhere. RSO provided a means to base the stations in the US, where diplomatic problems could be minimized and the operation had a better chance of staying covert.

In conclusion, the USAF continued to worry about the impact of the Predator program on the warrior ethos of its pilot community. Manned aircraft pilots assigned to the Predator were informally referred to as “pilots,” but people inside and outside the USAF had begun to question whether advancements in aviation technology had begun to diminish aircrews’ warrior role. The

[158] 911 Commission (2004)130
[159] 9/11 Commission (2004) 89-90
[160] Big Safari scientist interview (Aug. 21, 2013)

introduction of split operations and RSO only intensified the USAF's fear that the Predator program was diminishing the warrior ethos, and, ultimately, reinforcing outsiders' claims that the service was making war too "immaculate," as retired Lt. Gen. Trainor warned. Despite the CIA's growing interest in using the Predator to reduce political risk, the USAF remained hesitant to embrace this benefit through the use of RSO, preferring to focus on a doctrine that put the aircraft and aircrews in one place, as it had done with manned aircraft for decades.

4. **To what extent were judgments about the Predator based on a concern about maintaining the USAF's primary control over air assets in response to competition from civilian and military institutions?**

The USAF initially pursued innovation in the Predator program during this time period without any outside prodding. Initially Gen. Jumper had a relatively parochial interest in weaponizing the Predator as a means to fill the USAF's gap in time sensitive targeting capability. He told Jon Rosenwasser in an interview for his 2004 dissertation on UAV innovation: "We were doing this for the Air Force, not for anybody else."[161] His rationale resonated fairly well with the USAF's pilot community, which began to see the laser designator and weaponization as operationally useful and highly compatible with USAF culture.

But Gen. Jumper adopted an even more broadly-conceived rationale for pursuing Predator innovation in the summer of 2000. During this time, he sped up the timeline for weaponization and worked to overcome various bureaucratic obstacles in an effort to support the national objective of hunting down bin Laden. Working with the White House and the CIA, he played a significant role in overcoming arms treaty restrictions blocking Predator weaponization late 2000.[162]

In addition to recognizing the Predator's strategic potential in the emerging threat environment, Gen. Jumper was additionally motivated to pursue Predator

[161] Rosenwasser (2004) 362
[162] Jumper interview (July 30, 2013)

weaponization to stake the USAF's claim on the UAV. He was not about to let another agency take credit for a successful Predator strike against bin Laden, given the potentially strategic implications of the strike and the central role airpower would play. He became worried when he heard that the CIA was going to insist on "owning" weaponized Predator operations and did not intend to share operational details with the DoD, even though the USAF-operated 32nd EAIS would be flying the missions, at least initially. "I remember Gen. Jumper being very annoyed at a meeting in which I told him I didn't think CIA was going to allow the CAOC to control, or even be cognizant of, Predator missions," recalled retired Lt. Gen. John Campbell, who at the time was the senior USAF officer on the CIA staff.[163]

Still in his position as ACC commander, Gen. Jumper also had some serious doctrinal concerns about a CIA-led deployment of an armed Predator. Although the US was not yet at war, Gen. Jumper was "wary of establishing a precedent" of the CIA managing an airborne weapon system, recalled Lt. Gen. Campbell.[164] The USAF's doctrine of centralized control and decentralized execution dictated that the Joint Forces Air Component Commander (JFACC) — responsible for running a national wartime campaign — should have command and control of any air assets in the theatre of operations. Gen. Jumper argued that the JFACC, not CIA headquarters, was in the best position to assume command and control of a weaponized system in an area where US ground forces could potentially be engaged.

In closing, it is clear that Gen. Jumper recognized that a weaponized Predator might become a symbol of the strategic potential of airpower. As a result, he took a series of steps to ensure the USAF would be at the center of armed Predator operations. But his views of the potentially strategic importance of the Predator still were not widely shared in the USAF, as discussed in Questions 1, 2, and 3. Many who were aware of the weaponized Predator program seemed content to let the CIA control it. "You can talk all day about General Jumper wanting to do the Hellfire, but I think you will find that in all the layers between

[163] Campbell interview (June 4, 2014)
[164] Campbell interview (June 4, 2014)

the guys doing the testing and bringing it online and Jumper, in those layers in between they just didn't want to do it. They just didn't want to arm the Predator," said retired Col. Cooter, the director of operations of the 32nd EAIS during Afghan Eyes. "At least all the colonels I ran into."[165]

Conclusion

Changes in material factors helped to spur innovations in the Predator program between 1998 and September 11, 2001. The Predator's performance in the air wars in Bosnia and Kosovo began to represent a significant combat record demonstrating that UAVs could contribute to the USAF's military capability. The White House's and CIA's growing involvement in Predator weaponization also provided an external source of pressure on the USAF to pursue UAV innovation.

Gen. Jumper, who had a reputation for taking a comprehensive view of airpower theory, recognized the Predator's strategic potential in the changing threat environment. The USAF was no longer running an air campaign in Kosovo, but Gen. Jumper nevertheless continued to focus on improving the USAF's ability to operate in "gray" conflict zones. The Predator provided a time-sensitive targeting capability that Gen. Jumper saw as having major strategic potential as the lines between war and peace blurred with the rise of non-state actors such as al Qaeda and bin Laden.

As a result of Gen. Jumper's advocacy, cracks in the USAF's walls of cultural resistance to the Predator program started to emerge. Gen Jumper's support for the laser designator and weaponization increased the USAF's base of support because these innovations were compatible with existing USAF culture, which highly prized the warrior ethos. That the USAF initially rejected RSO — a concept that moved Predator pilots even further from conflict — further underscores the central importance of molding the Predator to conform to the USAF's existing cultural norms. Gen. Jumper was able to turn the centrality of the warrior ethos in

[165] Cooter interview (May 26, 2014)

USAF culture into an asset to support Predator innovation.

Although the USAF's resistance to UAV innovation appeared to lessen, however, there was still substantial cultural resistance within various USAF communities. The USAF's reluctance to support Predator innovation was fueled by by the pilot community's preference for manned aircraft and, in the intelligence community, a preference for reconnaissance versus weaponization. Other sources of cultural reluctance included ACC's doubts about the Predator's technological maturity and long-term strategic potential, and the pilot community's concern for preserving the warrior ethos. Taken together, these biases fueled the USAF's view of the Predator as a niche capability, leading many USAF officials to largely ignore its strategic potential in the hunt for bin Laden — even when it became clear that the CIA was seeking control of a weaponized Predator for that very purpose.

The patterns of military innovation in this chapter reflect both Farrell's model of cultural change and Posen's civil-military model. In terms of Farrell's model, Gen. Jumper's support for the laser designator and weaponization is an inverted example of the "norm entrepreneur" concept. Instead of trying to change USAF culture to accommodate the Predator program as Gen. Fogleman had done, Gen. Jumper acted as what one might call a "norm exploiter," promoting innovations that matched up with existing cultural norms in the USAF. The fact that Gen. Jumper was able to broaden support for the Predator program suggests that it might be easier to increase cultural acceptance of innovation by molding the innovation to fit with the existing culture, rather than trying to change that culture.

Yet despite Gen. Jumper's success, his support for Predator innovation was insufficient to change cultural attitudes across the board. As Posen's model predicts, the White House and CIA's growing interest in the Predator program spurred Gen. Jumper to take steps to ensure the USAF stayed involved in the Predator program. But even outsider pressure and Gen. Jumper's support for Predator innovation failed to spark a widespread shift away from the cultural biases against the UAV that still lingered within the service.

Ultimately, the USAF can take credit for taking the technical steps to weaponize the Predator. But the service's existing cultural preferences for manned aircraft, relatively pessimistic views of its potential, and concerns about preserving the warrior ethos prevented it from immediately embracing the Predator program full-speed in response to changes in the threat environment. On the eve of September 11, 2001, USAF culture remained very much divided regarding the strategic potential of the Predator program.

CHAPTER SIX, Wartime Predator: A Short-Term Innovation Focus

Before the September 11 attacks, the USAF's uniformed leadership pursued innovation in the Predator program with limited support from various officer communities. Many continued to see the Predator program as a niche capability. A cross-cutting theme in chapters three, four, and five has been that cultural biases among ACC staff, manned aircraft pilots and intelligence officers led many in these communities to take a pessimistic view of the Predator's potential in the emerging strategic context.

But the invasions of Afghanistan and Iraq forced even the most critical Predator skeptics to revisit their assumptions. Demand for the UAV, which had deployed continuously starting in 1996, exploded in 2001. "All the CINCS [commanders in chief] are begging for more Predators," a senior defense official remarked during an October 2001 press conference.[1] This chapter explores how the shock of the September 11 attacks and the subsequent US-led invasions of Iraq and Afghanistan influenced the relationship between USAF culture and the Predator program. The first half provides an overview of the USAF's approach to technological and operational changes in the Predator program during wartime. The second half explores how USAF culture influenced the service's response to the wartime demand, and how the Predator program's success in combat, in turn, shaped USAF culture.

Wartime Predator

Confirmed as the new USAF chief less than a week before the September 11 attacks, Gen. Jumper continued to advocate for the Predator program. He immediately ordered the 32nd EAIS to deploy, recognizing the weaponized

[1] DoD (Nov. 1, 2001)

Predator presented a unique opportunity to employ time-sensitive targeting in a wartime setting.[2]

Col. Boyle, now ACC's chief of intelligence, had spent the summer of 2001 building an expanded squadron, which became known as the ACC EAIS but retained the mandate to conduct missions on behalf of the CIA in the event of a weaponized Predator deployment.[3] The squadron also retained its flexibility to adjust to dynamic operations quickly; ACC was in its chain of command, but the squadron was still part of a Big Safari test program, which helped to minimize red tape.

By September 15, the ACC EAIS launch and recovery element and three weaponized Predators — tail numbers 3034, 3037, and 3038 — arrived in Uzbekistan in a USAF C-17 Globemaster III, thanks in part to Col. Clark, who retired from active duty on May 1, 2001 but stayed on as a Pentagon civilian and the Predator program's main bureaucratic fixer.[4] Meanwhile, the ACC EAIS Predator pilots, including then-Maj. Cooter, still the squadron's director of operations, were positioned in ground control stations at CIA headquarters. [5] President Bush quickly cleared up legal ambiguity about using the Predator for targeted killings in a Sept. 17 Memorandum of Notification that authorized the CIA to kill any members of al Qaeda or other terrorists, including Americans, on a "high value target list."[6] He signed legislation granting the Authorization for the Use of Military Force against those responsible for the Sept. 11 attacks the next day.[7]

The First Hellfire Launch in Combat

The first flight of a weaponized Predator over Afghanistan took place on September 18.[8] Ten days later, the NSC established rules of engagement that gave a central role to CENTCOM and the CIA in Predator operations. However, there was

[2] Whittle (2014) 233
[3] Boyle interview (Feb. 11, 2014)
[4] Whittle (2014) 240
[5] Whittle (2014) 240
[6] Wood (2015) 49
[7] 107th Congress (Sept. 18, 2001)
[8] Cooter interview (May 26, 2014): Whittle (2014) 244; Runkle (2011) 2-3

no formal role at all for the USAF's CAOC, which was supposed to be running the air war from Saudi Arabia.[9]

As discussed in chapter five, Gen. Jumper saw the USAF playing a central role in armed Predator operations and worried about encroachment from the CIA and White House. To assuage his concerns in the run-up to the air campaign over Afghanistan, Lt. Gen. John Campbell, the USAF's top officer at the CIA, had called a meeting between the CIA, the Pentagon, and the USAF. Based on the outcome of the meeting, the USAF expected the Joint Forces Air Component Commander (JFACC), the USAF officer responsible for the air war, to be briefed on Predator strikes.[10] Despite these assurances, however, Gen. Jumper's fears were realized on October 7, the first night of the air campaign. Then-Lt. Gen. General Charles Wald, the JFACC, was left in the dark as the ACC EAIS, acting on behalf of the CIA, fired the first Hellfire in combat from Predator 3034 at Mullah Omar, the head of the Taliban — and missed.[11]

Command and control relationships became smoother as Operation Enduring Freedom (OEF) progressed. The ACC EAIS Predators, conducting missions on behalf of the CIA, were added to the CAOC's daily Air Tasking Order, a document that coordinates air operations over a 24-hour period, including information about call-signs, aircraft types, mission types, and deconfliction.[12] When Gen. Moseley replaced Gen. Wald as the JFACC in November 2001, he received authority to approve air strikes on behalf of the CIA, provided that he minimalized collateral damage.[13]

But the most important way the USAF ensured its central role was to stand up its own Predator operations, initially consisting of un-armed air vehicles, some of which were still lacking a laser designator.[14] Then-Maj. Peter Gersten, Gen. Wald's aide-de-camp, mapped out the plan for USAF Predator operations on a

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[9] Whittle (2014) 245; Woodward (2002) 166
[10] Campbell interview (June 4, 2014)
[11] For a detailed narrative description of strike, see Whittle (2014) 247-264.
[12] Wald (Feb. 13, 2015)
[13] Whittle (2014) 283
[14] Wood (2015) 41

whiteboard at the CAOC. Since the USAF had not yet adopted RS0, the scheme was modeled after the "split operations" concept that the CIA used before 9/11. Within days, Predator crews from the 11th RS and 15th RS deployed to Predator ground control stations in Pakistan and Kuwait and to Afghanistan to launch and recover the USAF's Predators.[15]

The USAF also increased Predator production, doubling the number of Predators they would buy in 2002 to two per month. The service also began to retrofit all Predators with laser designators and Hellfire missiles in December 2001 in response to a US Central Command request. Also that month, the USAF designated the new weaponized Predators "MQ-1" rather than "RQ-1, reflecting their multi-mission role.[16]

Predator Innovation Efforts

As the USAF streamlined Predator operations in Afghanistan, changes were also afoot in the United States to expand and evolve the Predator's capabilities. But on this front, progress was much slower. Short-term adaptations for wartime, as well as longer-term innovations, fell by the wayside or moved forward incrementally because the Air Staff and ACC did not take initiative, leaving innovation to other organizations within the Air Force and to GA-ASI.

The main example of the USAFs' struggle to push Predator innovation was the Predator B, the bigger, faster, and more heavily-armed successor to the Predator. In early 2001, Cassidy, still president of GA-ASI, showed a video of a Predator B to Gen. Jumper, still at ACC, who agreed to buy two demonstrator aircraft.[17] Following the September 11 attacks, Big Safari purchased three Predator B aircraft and completed prototype testing in 2003.[18] But just as the USAF allowed the CIA to deploy the Predator to Afghanistan first, it once again stood on the sidelines while the agency, with help from Big Safari and GA-ASI, conducted the

15 Wald (Feb. 13, 2015) ; Wood (2015) 41;
16 Whittle (2014) 292
17 Anselmo (May 30, 2005) 50
18 Cullen (2011) 261

first Predator B missions over the war-torn nation.[19] The USAF did not begin flying the Predator B — which was designated the MQ-9 Reaper in September 2006[20] — in Afghanistan until the new 42nd Attack Squadron at Creech AFB (formerly known as Indian Springs) began operations on September 25, 2007.[21]

Another Predator innovation that was pioneered by actors other than the Air Staff or ACC was the Remote Operational Video Enhanced Receiver (ROVER). In response to a wartime request from USAF gunship crews in October 2001, the ACC EAIS worked with Big Safari to develop a mechanism to enable Predator FMV to be streamed to gunships in real-time.[22] Big Safari worked with US Special Operations Forces (SOF) to develop ROVER II, which delivered the Predator's FMV feeds directly to hand-held devices for ground forces clearing hostile and remote areas in the mountainous regions of Afghanistan.[23]

Finally, between 2003 and 2006, Predator crews themselves began to undertake minor modifications to improve Predator ground control stations. GA-ASI used proprietary software, but the crews added new displays and mounted equipment on racks to accommodate the improvements. One major change involved the addition of classified computers with access to programs such as Falconview, a program developed by fighter pilots to plan and track their missions. Another innovation consisted of the addition of mIRC-chat, open source software to enable text-based chatting with intelligence analysts and ground forces.[24]

Predator Normalization: 2001-2005

During his tenure as chief, between 2001 and September 2005, Gen. Jumper continued to support ACC's focus on "normalization" of the Predator program. The idea was to integrate the existing Predator system into the USAF force structure,

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19 GA-ASI senior executive
20 LaFranchi (Sept. 15, 2006)
21 *Defense Daily International* (Oct. 19, 2007); Dumboski (Nov. 17, 2006)
22 Boyle interview (Nov. 20, 2015)
23 Manuel interview (Oct. 11, 2013); for narrative details of ROVER II see Grimes (2014) 336-337 and Whittle (August 2011) 25-28
24 Mindell (2015) 144

rather than forcing the USAF to make ad hoc, disruptive adjustments in a chaotic wartime context.

In March 2002, Gen. Jumper ordered the transition of the ACC EAIS from Big Safari test program status to ACC-regulated combat-coded operations.[25] Until this point, ACC nominally controlled the squadron, but it flew missions on behalf of the CIA from the agency's headquarters, using hand-picked Big Safari crews and test-coded aircraft. With the squadron's operations tempo so high, however, the USAF decided to formalize the squadron's ad hoc structure to improve efficiency.[26] In response, the CIA began to acquire its own UAVs because it wanted to maintain flexibility at the tactical and operational level. [27] But it continued to rely on the ACC EAIS, renamed the 17th RS, to fly and maintain the aircraft.[28]

The USAF staffed the 17th RS with manned aircraft pilots who had been flying Predators with the 11th and 15th squadrons, already under full ACC control.[29] Former ACC EAIS squadron aircraft became "combat coded" instead of "test coded."[30] The only vestige of the old organizational structure was its continued support to the CIA and its ongoing dependence on the Predator Special Program Office (SPO) at Big Safari, which remained responsible for Predator program acquisition until 2006.[31]

The USAF undertook a second normalization effort in early 2002 when it adopted the RSO concept in preparation for Operation Iraqi Freedom (OIF), which began in March 2003.[32] Although this concept clashed sharply with existing USAF doctrine, practical reasons overruled cultural concerns. In the opening days of the war in Iraq, RSO allowed the Predator to play a role immediately, at potentially

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[25] Swanson interview (Feb 2, 2015) Boyle interview (Nov. 20, 2015); Grimes interview (Nov. 14, 2013)
[26] Swanson interview (Feb. 2, 2015); Boyle interview (Dec. 4, 2014); Grimes interview (Nov. 5, 2013)
[27] Boyle interview (Nov. 20, 2015);
[28] Woods (April 14, 2014)
[29] Air Force Research Historical Agency (Apr. 15, 2012); Swanson interview (Nov. 17, 2014)
[30] Boyle interview (Dec. 4, 2014)
[31] Boyle interview (Nov. 20, 2015); Robotham,(Aug. 6, 2012) 10.
[32] Cooter (Jan. 27, 2015)

less expense, because the burgeoning requirements for infrastructure, logistics, and manpower would be met in the continental United States.[33]

The USAF's first RSO site was the Predator Operations Cell at Nellis AFB in Nevada. At the time, Indian Springs, the pre-9/11 home of the 11th RS and 15th RS, lacked the communications infrastructure to support RSO.[34] The 15th and new 17th reconnaissance squadrons flew a small number of operational Predator combat air patrols (CAPs), each consisting of four air vehicles providing 24- hour coverage, from Nellis. As of the spring of 2003, the 11th RS was relieved of its warfighting responsibilities to focus on Formal Training Unit duties at Indian Springs.[35]

These early OIF missions marked the first time that Predator pilots operated from the continental United States on behalf of USAF missions rather than CIA ones. Investigative journalist Chris Wood asserts that USAF-owned Predators were not armed until 2004,[36] but further research indicates they had limited strike capability from the start.[37] Initially, the most common Predator missions involved identifying and striking mobile Scud missiles targeted at Israel, as well as other mobile targets from anti-aircraft guns to SAMs.[38]

The USAF's third normalization effort involved adjustments to USAF personnel policies to make Predator assignments more attractive. First, in 2002, USAF Secretary James Roche re-interpreted a USAF legal ruling on gate credit to allow UAV pilots to receive flight pay.[39] That adjustment came on the heels of a 1999 decision to shorten the length of Predator ALFA tours to two years and promise pilots a follow-on assignment in the manned aircraft of their choice.[40] Second, senior USAF leaders began to debate the creation of a separate career field for Predator pilots. Gen. Jumper, still the chief, proposed the creation of a "Combat

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33 Swanson interview (Oct. 28, 2015); predator pilot # 1interview; Big Safari Scientist interview
34 *ibid*
35 ACC History (2011) 188.
36 Wood (2015) 75
37 Boyle interview (Nov. 20, 2015); Fulghum (Apr. 7, 2003)
38 *ibid*
39 Cantwell (2007) 88; *Aviation Week* (Oct. 21, 2002) 21.
40 Cantwell (2007) 95

Systems Officer" (CSO) career field for Predator pilots in 2003. He wanted to introduce Predator training as a separate career track for navigators, who had been relatively enthusiastic about Predator assignments, as discussed in Question 2.[41]

Other USAF leaders called for more manned aircraft flight training. They proposed a 17XX career field, which would require students to pass the USAF's Initial Flight Screening (IFS) and the first half of Undergraduate Pilot Training (UPT), including both academics and flying the T-6 Texan trainer aircraft, before completing UAV training. Some debate remained about how much flight instruction the 17XX students should receive, however, so in 2005 an MQ-1 Training Test program was initiated with three student volunteers.[42]

Finally, before leaving office, Gen. Jumper approved the stand-up of the 3rd Special Operations Squadron (SoS), which would be managed by AFSOC and would exempt from standard USAF procedures. Originally based at Nellis AFB, the squadron later subsumed the USAF's 15th RS at Creech AFB and moved to Cannon AFB in New Mexico.[43] It was stood up in response to a request from then-Maj. Gen. Stanley McChrystal, head of Joint Special Operations Command (JSOC), a military unit that operates outside the normal chain of command, reporting only to the president and the Secretary of Defense.[44]

The Army's Response to UAVs in the Battlespace

As the USAF focused on normalization at home, the Army ramped up two ground wars that demanded more Predator ISR support. By 2004, the USAF had five operational CAPs.[45] Each CAP provided 22 hours of continuous coverage but required significant resources, including four air vehicles and 186 personnel, ranging from aircrews at ground control stations and launch and recovery

41 Cantwell (2007) 97-98
42 *ibid*
43 Allison (Oct. 9, 2008)
44 Woods (2015) 72
45 Stein (March 10, 2015)

elements to intelligence analysts at the USAF'S Distributed Common Ground Stations.[46]

Almost immediately after OEF began, the Army wanted to buy its own version of the Predator known as the Warrior Extended Range/Multipurpose (ER/MP).[47] In 2004, Army officials formally pitched requirements for a new UAV to the Pentagon through the Joint Capabilities Integration Development System (JCIDS) process, an acquisition procedure meant to eliminate redundant weapons development. Given the Army's demand for more USAF Predator support, the obvious candidate for the ER/MP acquisition was some version of the GA-ASI Predator, although the Army did consider a Northrop Grumman offering.[48] Despite its similarities with the Predator, the ER/MP successfully navigated the JROC process. In the summer of 2005, the Army awarded GA-ASI a contract for the ER/MP, known in the prototype stage as the "Warrior Alpha" and later, the MQ-1C Gray Eagle.[49]

The USAF opposed the Army's encroachment into the world of Predator-class UAV acquisition. The service began to lobby the Pentagon to become the "executive agent" for UAVs in the winter of 2005.[50] Gen. Moseley, the vice chief, was the driving force behind the effort. In a March 2005 memo to the Vice Chairman of the Joint Chiefs of Staff, Admiral Edmund Giambastiani, Gen. Moseley suggested that the USAF wanted some degree of control over *all* the military's UAV programs.[51]

The JROC ultimately rejected the USAF's executive agency proposal after the Army, Navy, and Marines opposed it as a power grab that might diminish their ability to establish their own UAV programs, including the Army's ER/MP**.**[52] But the matter was far from closed. Gen. Moseley would continue his push for executive agency in his role as USAF chief from September 2005 to July 2008.

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[46] ACC History Office, *(2011) 184*
[47] *Jane's Defence Weekly* (Apr. 12, 2002)
[48] *Jane's Defence Weekly* (Jan. 6, 2005)
[49] *Jane's Defence Weekly*(Aug. 11, 2005.
[50] Butler and Fulghum (March 7, 2005)
[51] Moseley (March 11, 2005)
[52] Butler and Fulghum (March 7, 2005)

The Moseley Era

Gen. Moseley undertook some efforts to continue the “normalization” process, started during Gen. Fogelman’s tenure. In July 2006, the USAF transitioned Predator acquisition management from Big Safari to a new 658th Aeronautical Systems Squadron (AESS).[53] The USAF also stood up its first UAV Wing, the 432nd Wing at Creech AFB.[54]

But Gen. Moseley’s biggest policy change, related to UAV manning, directly undermined the normalization concept, which aimed to methodically integrate the UAV into the USAF. In December 2006, the USAF’s plans to create a separate 17XX training pipeline were abruptly cancelled.[55] Instead, the USAF continued to insist on sending fully trained manned aircraft pilots to ALFA tours for Predator assignments. The tension between the manned aircraft pilot community and the wartime demands for the Predator became sharper as a result.

A new Predator pilot career field might have relieved some pressure on the manned aircraft pilot community. Instead, ALFA tours were lengthened to three or four years and assignment freezes were enacted, voiding the USAF’s promise to put manned aircraft pilots back in their manned aircraft of choice after a Predator assignment. The non-volunteer Predator pilots were asked to work 12-hour shifts, six days a week and to sacrifice annual leave.[56]

The service’s struggle to keep pilot training in pace with demand headed toward a crisis point. The 2006 Quadrennial Defense Review called for 21 Predator CAPs by 2010, but ground commanders in Afghanistan and Iraq wanted a faster increase.[57] On January 10, 2007, President Bush announced the US would deploy 30,000 additional troops to Iraq.[58] Shortly after US Army General David Petraeus

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[53] Robotham (2012) 14 and 59
[54] Air Force (undated) Fact Sheet: 432nd Wing Air Expeditionary Wing
[55] Cantwell (2007) 98-99
[56] ACC History Office (2011) 188
[57] GAO (Apr. 2014) 12
[58] *Washington Post* (Undated Surge Timeline)

assumed command of military forces in Iraq in February 2007, he began lobbying Secretary of Defense Robert Gates for an emergency increase in Predator orbits to support the surge.[59] US Navy Admiral Eric Olson, head of Special Operations Command, told the US Congress in 2008 that US Central Command and SOCOM needed 30 Predator CAPs. [60]

Between July 2007 and February 2008, Secretary Gates ordered the USAF to surge Predator and Reaper capacity three times.[61] In his autobiography, he claimed that by mid-2007 the USAF only had eight Predator and Reaper CAPs in the air, although the USAF's own records show there were over 15 at this time.[62] Secretary Gates' underlying assumption was that the USAF's Predator and Reaper programs should be expanding far more quickly than the Army's nascent ER/MP program. In April 2007, there were only 10 Warrior Alpha prototypes flying in Iraq.[63]

The USAF responded to Secretary Gates' orders with several steps to boost CAPs quickly. First, the service asked GA-ASI to build more aircraft in 2007 and 2008, prompting the company to expand its production facilities.[64] Second, the USAF took draconian steps to shore up the Predator pilot pool. It extended existing Predator assignments, mobilized pilots from the ANG and Air Force Reserve, and, in October 2007, started Transformation Aircrew Management Initiatives for the 21st Century (TAMI-21).[65] That effort required commanders of over-manned traditional aircraft units to select less-experienced pilots with limited flying hours to be re-assigned to UAVs with no promise of returning to the cockpit.[66]

As Secretary Gates' pressure mounted, Gen. Moseley went on the offensive. He renewed the USAF's bid for executive agency in a March 5, 2007 memo to the

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[59] Ehrhard (2009) 32
[60] Hoffman (April 28, 2008)
[61] Moseley (Feb. 28, 2008)
[62] Gates (2014) 129; Air Force Public Affairs (March 10, 2015)
[63] Harrington (April 5, 2007)
[64] Kasitz (Feb. 10, 2015)
[65] GAO (Apr. 2014) 12-13 and Randolph (May 29, 2007)
[66] Randolph (May 29,2007)

service chiefs and US lawmakers.[67] He called for the CAOC to control UAVs flying above 3,500 feet, which included the Army's ER/MP, in any warfighting theater.[68] The other service chiefs again rejected the plan, but the Army was most vocal because it would lose command of its own UAV asset, the ER/MP, in combat.[69] Secretary Gates ultimately overruled the USAF proposal and continued to berate the service for failing to produce more Predator and Reaper orbits.

Gen. Moseley responded with brinkmanship, offering to break the training pipeline to meet Secretary Gates' requirements. In December 2007, he proposed closing Creech's Predator schoolhouse to free up almost 100 percent of aircraft and pilots for deployment, thereby increasing the number of CAPs in the Middle East to 36 by August.[70] The 432nd Wing Commander, Col. Chris Chambliss, publicly warned that the concept would put the USAF's UAV fleet on the same ruinous path as the German Luftwaffe, which cut back training in World War II to get more pilots in the air and suffered increased losses as a result.[71] Not surprisingly, Secretary Gates rejected the offer, but he continued to press for CAP increases.[72]

The tension between Secretary Gates and Gen. Moseley over the rate of UAV orbit increases was emblematic of a much larger philosophical divide over strategy, discussed in Question 2 below. As a result of the divide, the two men clashed over a variety of issues ranging from UAVs to the USAF's management of the nuclear arsenal. Gates fired Gen. Moseley and Secretary Michael Wynne on June 5, 2008, shortly after nuclear missile fuses were accidentally shipped to Taiwan.[73]

Reflecting on this early post-9/11 period, it is clear that there was finally a widespread perception in the USAF of a shift in the strategic context toward conflict in the "gray zone." As a result, the service pursued several innovations related to the Predator program, including the Rover and the Reaper, and also dramatically boosted UAV orbits in Afghanistan and Iraq. Between 2007 and 2008

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67 Moseley (March 5, 2007); Butler (March 26, 2007)
68 Butler (Aug. 6, 2007)
69 Butler (Apr. 2, 2007.
70 Spiegel (March 21, 2008)
71 *ibid*
72 Moseley interview (April 1, 2014)
73 Barnes and Spiegel (June 6, 2008)

the number of CAPs exploded from 19 to 34.[74] Outside the USAF, however the perception of a USAF failure to aggressively pursue UAV innovation despite combatant commanders' demands remained widespread. The four questions below will explore how USAF culture influenced the service's capacity to respond to wartime demands, and how the Predator program's success in combat in turn shaped USAF culture.

1. **To what extent did individuals or groups within the USAF resist the Predator out of a concern that their jobs or status might be threatened by it?**

After the September 11 attacks, external pressure forced the USAF to aggressively pursue innovation in the Predator program. In their positions as USAF chiefs, both Gen. Jumper and Gen. Moseley encouraged a cultural shift to support the wartime demand for UAVs. But it was difficult for USAF leaders to reconcile two competing imperatives: first, to rapidly field Predator CAPs and second, to foster cultural acceptance of the Predator through a gradual process of "normalization." The service's failure to manage these competing priorities fostered a growing antipathy toward the Predator at ACC and in the manned aircraft pilot community.

Manned Pilot Community Attitudes Toward the Predator Program

The USAF's personnel policy choices, influenced by wartime pressures, worsened Predator pilot morale. Predator assignments continued to be filled with disgruntled non-volunteer manned aircraft pilots, still frequently recruited from the bottom of their class. Then- Brig. Gen. Charles Lyon recalled that about 22 out of 100 of his Predator pilots were "passed over" for promotion while he was commander of the 57th Operations Group at Nellis AFB from 2002 to 2004.[75]

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[74] Stein (March 10, 2015)
[75] Cantwell (2007) 85

Personnel policy changes, including the decision to give flight pay to Predator pilots, reduce the ALFA tour length, and promise a follow-on assignment, did not increase volunteer rates. The manned aircraft pilot community's continued distaste for a Predator assignment was apparent in a 2006 survey of nearly 400 military officers in aviation specialties: 34 percent of USAF manned aircraft pilots said they would leave the service rather than accept a UAV assignment.[76]

Morale worsened in the Predator pilot community in the mid-2000's as Predator demand increased. The USAF reneged on its promises to Predator pilots. "The snowball kept getting bigger so that we couldn't let people go because we couldn't grow fast enough. That three-to-four year ALFA tour turned into an assignment freeze," said one Predator commander. "Now we had people in this weapon system that had been in here for six or seven years with no end in sight and we kept giving them false promises."[77] Morale was so "awful," according to one Predator flight commander in the 15th RS from 2005 to 2006, that "I was actually booed by my flight. I was trying to do something to create morale, but they were just so bitter and angry."[78]

Morale approached the meltdown stage during Gen. Moseley's tenure, as he continued to insist on using fully trained manned aircraft pilots to meet Secretary Gates' surge requirements for UAVs. Most notably, Gen. Moseley's TAMI-21 initiative posed a direct threat to the manned aircraft pilot community. TAMI-21 candidates were newly minted manned aircraft pilots, mostly from the fighter community, who were forced into a UAV with poor prospects of returning to a cockpit. The idea was to infuse the UAV community with young, highly skilled pilots, but some were bitter about losing the chance to fly. USAF commanders, even UAV advocates, were sympathetic. "Morale was crushed," recalled Col. James Cluff, 432nd Wing commander from May 2013 to June 2015. "It's the Hotel California analogy. You check in and you're never going to check out."[79] Other commanders

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[76] Mahnken and FitzSimonds (June 26, 2006)
[77] ACC History Office (2011) 188
[78] *ibid*
[79] Cluff (Apr. 28, 2014)

agreed that the morale-crushing impact of TAMI-21 was not worth it. "When I first heard about the program I thought it was complete bullshit," said Col. Cantwell, served as a UAV commander at Creech AFB from 2012 to 2014.[80] Retired Lt. Gen. David Deptula, the former USAF ISR chief and a major UAV advocate during Gen. Moseley's tenure, agreed that TAMI-21 was a "horrible mistake," because it precluded pilots from returning to the cockpit.[81]

The Demand for More UAV Orbits: Foot-Dragging at ACC

Although the USAF pursued drastic measures such as TAMI-21 to field more UAV capability, there was still an external perception of USAF obstructionism. In his autobiography, Secretary Gates accused the USAF of failing to embrace UAVs because it was mired in the pro-pilot bias of the Gen. McPeak era.[82] In April 2008 he gave an infamous speech at Maxwell AFB in Alabama, the USAF's intellectual home, saying it had been "like pulling teeth" to get the military services to deploy more ISR assets.[83]

Gen. Moseley said the remark was aimed personally at him and Secretary Wynne.[84] As discussed in Question 2, however, Gen. Moseley was not personally opposed to increasing UAV capability and he even cautioned his senior officers to squelch any pro-pilot bias that Secretary Gates described. In a Feb. 28, 2008 email, he warned combatant commanders and the Air Staff not to foster the perception of the USAF as a culturally hidebound institution. "Despite our continued efforts to deliver more combat capability, there is a perception the Air Force is withholding capability," he wrote. "That is not the way we do business and it is not part of our culture."[85]

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80 Cantwell interview (March 6, 2014)
81 Deptula, (June 2, 2014)
82 Gates (2014) 128
83 Gates (Apr. 21, 2008)
84 Moseley interview (April 1, 2014)
85 Moseley (Feb. 28, 2008)

Despite Gen. Moseley's admonition, ACC continued to serve as the center of gravity for Predator resistance. ACC staff saw the Predator as a niche capability that was starting to threaten support for manned aircraft programs. "I can absolutely and adamantly tell you that there were a lot of general officers between him [Gen. Moseley] and lowly Creech AFB that had a huge vested interest in not having anything to do with a little rubber band propeller-driven airplane that doesn't have anybody sitting in it," said one former UAV commander involved in communications between ACC and Creech AFB at the time.[86] Pace, then vice president of GA-ASI, said ACC staff officers slow-rolled the Predator program, hoping it would go away so they could focus on manned aircraft. "The Air Force didn't want this as their priority," he told me. "Even today, they don't want it as their priority. Now, the Big Air Force, ACC, would rather it just went away; send it off to special ops."[87]

ACC's bias manifested itself in the command's management of the Predator pilot training pipeline. At the direction of Gen. Moseley, Lt. Gen. Deptula, the chief of USAF intelligence, was doing "everything I could to increase the number of orbits." But ACC undermined those efforts. The former ISR chief said he relied on ACC to produce accurate data on how quickly UAV orbits could be made available without breaking the training pipeline by pulling instructor pilots back into operations. But when Lt. Gen. Deptula showed that data to the Office of the Secretary of Defense, analysts in that office would tell him that more orbits were available than ACC was reporting. "I got burned twice by using ACC data," said the retired three-star. "I trusted them," he said, but "they were dragging their feet."[88]

If anything, it seems that the biases against UAVs in the manned aircraft community and at ACC grew stronger in response to wartime pressures. Gen. Moseley's insistence on continuing to use manned aircraft pilots to fill Predator assignments worsened the problem. Manned aircraft pilots' morale sank into a

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86 Former UAV Commander (May 4, 2014)
87 Pace interview (Sept.1, 2014)
88 Deptula interview (June 2, 2014)

morass as they were assigned to the Predator, and ACC actively stalled Predator combat operations when they were pressured to increase capability.

2. **To what extent were judgments about the potential and cost effectiveness of the Predator based on the USAF's enthusiasm for employing new technology and to what extent was the enthusiasm outside the service?**

The USAF's most senior leaders, including Gen. Jumper and Gen. Moseley, continued to show support for boosting UAV CAPs after the September 11 attacks. Across the USAF, however, judgments about the cost and potential of the Predator program were heavily influenced by diverging perceptions of the Predator's potential combat capability in current and future conflicts.

Diverging Views of the Predator's Potential in Ongoing Conflicts

ACC's cautious and regimented acquisition culture fed into continued skepticism of the Predator's technological maturity. As a result, the command took a passive approach to UAV innovation in wartime. One example of ACC's reservations about the technological maturity of UAVs was evident in its decision to wait until March 2006 to field the Predator B.[89] The command had to see the Reaper in action with the CIA before it could believe that the weapon system was worth the cost. "When they saw what the airplane can do in a combat situation, they kind of melted and embraced it," explained Cassidy, GA-ASI's president until 2010.[90]

The pessimistic view of the Reaper among staff officers contrasted with the attitudes of Reaper pilots in the 42nd Attack Squadron. While ACC had the luxury of watching the CIA's Reaper operations evolve, the Reaper pilots that started flying the UAV in 2007 had no choice but to exploit its full potential in a combat setting. To do so, they approached the UAV with the same "tactical" mindset they used to

[89] DoD Inspector General (Sept. 30, 2014) 3
[90] Cassidy interview (August 21, 2012)

fly fighters. The Reaper pilots sought to transform operations from "low status missions of gathering and disseminating data to higher status tasks of creating information and participating in the decision-making processes used to locate, observe, and kill insurgents and other threats."[91] Predator and Reaper pilots developed not only new tactics, but also on-the-fly innovations such as the addition of Falconview and mIRC chat to improve battlespace effectiveness.

ACC's lack of involvement in ROVER development is another example of how its acquisition culture prevented it from assuming risks to pursue wartime UAV innovation. The command stood by while the ACC EAIS, Big Safari and SOF perfected ROVER capability in combat. In contrast to ACC, these organizations were focused exclusively on delivering wartime capabilities rather than developing a perfect technological solution. If the Predator was not working, these organizations were inclined to *make* it work rather than to debate the merits of continuing on.[92] Given this mindset, the ACC EAIS was quick to oblige when USAF AC-130U "Spooky" gunship crews asked for a way to see hostile actors in a target area before the gunships arrived on site. Col. Boyle called the Big Safari scientist, who was able to attach a new antenna to the gunship that could pick up Predator FMV.[93]

Big Safari also played a critical role in the development of ROVER II, a hand-held version for ground forces. Chris Manuel, an Army Chief Warrant Officer -2 (CW02) with Special Operations Forces, asked Grimes, the director of Big Safari, to help him find a way to give his fellow green berets access to Predator FMV while hunting Taliban and al Qaeda fighters in Afghanistan.[94] Grimes turned to the Big Safari scientist, who came up with ROVER II, a system that would allow SOF-embedded JTACs to see a target area up to 100 miles away via Predator video feeds displayed on a handheld device. [95]

The ROVER II did not become available to conventional forces until another

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[91] Cullen (2011) 43.
[92] Boyle interview (Feb. 11, 2015)
[93] *ibid*
[94] Manuel interview (Oct. 11, 2013)
[95] Big Safari scientist interview; Manuel interview (Oct. 11, 2013)

innovative organization within the USAF sprung to action. After his retirement, Col. Clark became director of the Office of Simulation and Integration. In this role, he remained the invisible hand moving Predator innovation forward. Shortly after taking office in 2005, Secretary Wynne became a champion of ROVER II after receiving briefings from Clark's office.[96] At the time there were less than 200 ROVER kits in the field, but today over 10,000 have been fielded.[97]

One last example of ACC's slow approach to UAV innovation in wartime was the command's handling of the transition of the ACC EAIS from a Big Safari test program to an ACC combat-coded program.[98] As a test squadron under Big Safari, the ACC EAIS had been able to quickly accommodate rapid innovation. For example, if the CIA asked the squadron to operate a Predator below 10,000 feet to ensure a 100 percent success in an air strike, the squadron could just say yes. But once the squadron became combat-coded under ACC, the request to fly at such a low altitude had to be run through the chain of command, a process that took too much time.[99] It was this red tape that led the CIA to start buying its own organic UAV assets, which could be flown by the USAF but controlled at the tactical and operational level by the agency.[100]

ACC's continued skepticism of UAV innovation was particularly remarkable because of the growing support for the Predator that had begun to emerge across the USAF as early as 2001. Gen. Jumper remained a Predator advocate, although his attention was more divided as USAF chief.[101] The Predator also gained support from the USAF's test community based on its lengthening combat record. The Air Force Operational Test and Evaluation Center (AFOTEC) conducted a favorable review of the Predator program in 2001, noting that the system was effective despite some reliability and maintainability problems. "I think that the Predator proved its case in Kosovo, and I think if you spoke to the [regional commanders]

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96 Menza interview (Dec. 1, 2014)
97 Barnes (Sept. 13, 2007); Menza interview (Dec. 1, 2014)
98 Cooter interview (January 27, 2015)
99 Boyle interview (Nov. 20, 2015)
100 ibid
101 Jumper interview (July 30, 2013)

they [would tell you that they] thought it was a useful capability," a senior USAF official said during a 2001 press briefing on the AFOTEC report.[102]

USAF navigators were also enthusiastic about the Predator's wartime potential, seeking out opportunities to fly the aircraft in wartime. The target group for Gen. Jumper's new CSO career field, navigators tended to seek out Predator assignments because it gave them more responsibility, with the potential to become an aircraft commander in wartime rather than serving an aircrew support function. Navigators jumped through hoops to win Predator assignments, personally paying for training to acquire an FAA commercial/instrument license to qualify. Between 1995 and 2006 five of the first 18 Predator squadron commanders came from navigator or weapon systems operator backgrounds.[103]

Outside the USAF, the Predator's early performance in OEF fueled robust support for the UAV among ground commanders who agreed that UAVs were emerging as a critical capability for counterinsurgency. The seminal moment came in 2002 at the Battle of Takur Ghar, a mountain in Afghanistan sometimes known as Roberts Ridge. During the battle, the ACC EAIS kept an armed airborne Predator on station over eleven hours as a downed CH-47 Chinook aircrew faced Taliban and al Qaeda fighters.[104] The squadron's Predator provided laser designation for Navy fighters to drop bombs on the enemy forces, and also fired a Hellfire on a Taliban bunker, destroying it.[105] "We were a sideshow up until that point in time," said retired Col. Boyle, the ACC EAIS squadron commander. "After that, Predator became what is today. Nobody ever doubted us again."[106]

Diverging Perceptions of the Predator's Potential in Future Conflicts

While the USAF remained divided over the Predator's potential in ongoing conflicts, the question of the Predator's role in future conflicts proved even more

102 Tiron (Dec. 2001)
103 Cantwell (2007) 79-80
104 Grimes (2014) 333
105 Whittle(2014) 297;
106 Whittle, (2014) 298

divisive. In Afghanistan and Iraq, relatively defenseless UAVs operated free from the risks posed by enemy SAMS and fighters. But a prevalent perception inside the USAF was that the service needed to prepare to deter and fight a future high-intensity conflict for which the Predator would be ill-equipped. Ehrhard questioned whether the Predator program had enough military utility to remain in the USAF's force structure, in part because it was vulnerable to radar-guided air defense systems. "This $600 million program has so many combat limitations that its long-term viability remains in question," he wrote.[107] An October 2001 report from the Pentagon's Office of Test and Evaluation (OT&E) found that the Predator was not "operationally effective or suitable " based on the USAF's own criteria, which included a requirement for "operations in areas where enemy defenses have not been adequately suppressed."[108]

The heart of the pessimism about the strategic potential of UAVS was ACC, which continued to view the UAV as a niche capability. The command focused much of its energy on the next war with a "near-peer" such as Russia or China, which would require sophisticated weapon systems to operate in contested air environments. Counterinsurgency, for which the slow-moving, comparatively simplistic Predator and Reaper were well-suited, was not seen as a lasting priority. "I think the Air Force wanted to have business as usual," said Pace, who became president of GA-ASI in 2010. "They wanted to build fast-moving jets and they wanted the world to be like it used to be."[109]

ACC's pessimistic view of the Predator's long-term potential was reflected in its attitude toward the conversion of the test-coded ACC EAIS to the 17th RS in the spring of 2002. ACC officials were hesitant to add another squadron to the combat air force, since it threatened funding for their top priority: manned fighters to confront a near-peer adversary. "This didn't come naturally for ACC," said retired Maj. Swanson, who was on the squadron during the transition. "It wasn't an F-22 or an F-35. It was a huge cultural change. The leadership in the Pentagon was

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[107] Ehrhard (2000) 546
[108] Quoted in Tiron (Dec. 2001)
[109] Pace (Sept. 1, 2014)

getting it, but the middle manager types and the folks at ACC headquarters were kicking and screaming."[110]

The tension between ACC and the former ACC EAIS over the role of UAVs in the emerging strategic environment reached a boiling point when it came time to choose the first 17th RS commander. Col. Boyle, who retired in April 2002, recommended his former ACC EAIS deputy, then-Lt. Col. Mark Cooter, for the position.[111] But senior USAF leaders, including Gen. Hal Hornberg, the head of ACC from Nov. 2001 to 2004, felt that the USAF was not culturally prepared for an intelligence officer with significant UAV counterterrorism experience to run a combat-coded ACC squadron.[112] ACC instead selected a former fighter pilot who was initially unfamiliar with counterterrorism or UAV operations "He rolls into town with three or four guys that are ex fighter guys, and sat down in a room and briefed us," recalled retired Maj. Swanson. "His opening remark was: 'the pros are here.' At that point, the attitude of the whole team was: 'well fuck you too.'"[113]

ACC's reluctance to embrace the role of UAVs in a long-term counterterrorism mission also created problems with other Predator customers. JSOC's frustration with the ACC mindset of many Predator pilots led to Maj. Gen. McChrystal's 2005 request to create the new 3rd SOS under AFSOC. The USAF's ACC-owned Predator pilots were focused on racking up kills in support of ground forces. While this mission was critical — especially in the eyes of Army infantry units — SOF forces were more interested in typical counterinsurgency operations: long-loiter surveillance missions to establish patterns of life, which after weeks might lead to a single strike against a specific terrorist.[114]

In contrast to ACC, outsiders were enthusiastic about the long-term potential of UAVs. Bush administration officials showed enthusiasm for UAV innovation even before the September 11 attacks. James Roche, who became the USAF secretary in January 2001, and Dick Cheney, the Vice President and a former

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[110] Swanson interview (Feb 2, 2015)
[111] Boyle interview (Nov. 20, 2015) Cooter interview (Jan. 27, 2015)
[112] Boyle interview (Nov. 11 2015 and
[113] Swanson interview (Nov. 17, 2014)
[114] Wood (2015) 76-80

Secretary of Defense, both backed Gen. Jumper for the chief position in part because he was seen as “the warfighter guy who was known to have embraced the UAV dimension.”[115] Soon after the September 11 attacks, President Bush praised the Predator’s capacity to find, fix, and track targets in dynamic counterinsurgency environments, and he predicted a lasting change in the strategic context that would require more UAVs in the future. “We’re entering an era in which unmanned vehicles of all kinds will take on greater importance — in space, on land, in the air and at sea,” he told cadets at the Citadel in December 2001.[116]

These diverging views of the long-term relevance of UAVs were a major source of tension between Secretary Gates and the USAF under Gen. Moseley and Secretary Wynne. Gen. Moseley became chief in 2005 in part because his view of the emerging strategic context matched the vision of Donald Rumsfeld, the Secretary of Defense from 2001 to 2005. Both men saw the need for “transformation” — the pursuit of high-tech force modernization to hedge against a range of threats across the spectrum of conflict, to include high-intensity clashes.[117] Gen. Moseley agreed to accept the nomination to be chief based on Secretary Rumsfeld’s support for modernization plans, which included continue F-22 Raptor stealth fighter production and a range of other priorities.[118] UAVs were not a centerpiece of transformation, but Gen. Moseley showed an interest in them to the extent they supported that vision. In 2009, for example, he offered to consider an “optionally manned” configuration for the USAF’s next-generation bomber. [119]

When Secretary Rumsfeld left office in 2005, however, Gen. Moseley found that his strategic outlook clashed sharply with Rumsfeld’s successor. Secretary Gates felt that the USAF’s focus on high-end force modernization, particularly F-22 production, led to extravagant spending on weapons optimized for high-intensity force-on-force conflicts that were unlikely to occur. In 2009, he wrote an article

[115] Jumper interview (Sept. 20, 2015)
[116] Bush (Dec. 11, 2001)
[117] Rumsfeld (May/June 2002)
[118] Moseley interview (Oct. 26, 2015)
[119] Harrington (Oct. 17, 2007)

predicting “hybrid and more complex forms of warfare.”[120] The US was far less likely to fight a war with China or Russia than it was to encounter low-intensity, asymmetric conflicts involving non-state actors, he argued. As such, there was no need to pursue sophisticated, multi-billion dollar weapon systems when low-tech, inexpensive ones, like the current generation of UAVs, would do. [121]

These competing perceptions regarding the long-term strategic relevance of UAVs may have influenced Secretary Gates’ decision to fire Gen. Moseley and Secretary Wynne. In his autobiography, Secretary Gates claimed he dismissed the two strictly over lapses in the USAF’s nuclear safety protocols. But Secretary Wynne felt that the nuclear incidents were only a catalyst. “He really disagreed with our push for continued investment in future conventional war capability," Secretary Wynne told me in 2009. "He saw this investment as coming at the expense of irregular warfare, but we didn't."[122]

In closing, the USAF’s perceptions of the Predator and Reaper’s wartime potential varied. ACC remained skeptical of the Predator’s technological maturity, but supporters including Big Safari, the UAV pilots themselves, were able to steer innovation forward to meet combat requirements. The USAF’s perceptions of the long-term strategic potential of UAVs were heavily influenced by USAF leaders who took a longer view of force planning that emphasized preparation for a range of threats to include a high-end clash against a near-peer adversary. As a result, they tended to view UAV innovation cautiously. ACC saw UAVs as a niche capability without long-term relevance, while Gen. Moseley saw UAVs as having strategic impact in future conflicts only to the extent that they could operate in high-threat environments.

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[120] Gates (Jan/Feb 2009)
[121] *ibid*
[122] Harrington (Oct. 17, 2008)

3. **To what extent were USAF judgments about the employment of the Predator driven by a desire to reduce the risk to friendly personnel, and to what extent was that push from outside the service?**

Although the USAF abruptly embraced RSO after the September 11 attacks, there are no indications that it did so to reduce aircrew risk. If anything, the service continued to prefer options that put aircrew in harm's way as a means of promoting the warrior mentality. Consequently, Predator pilots were in a difficult position. Within their own ranks, there was a morale-shattering sense that they were disconnected from the battlespace. Other communities in the USAF shared this perception, showing disdain for Predator pilots because their lack of presence in the battlespace diminished their warrior mentality.

Between 2001 and 2008, the USAF's senior leadership recognized that this perception was potentially corrosive to the combat effectiveness of Predator units. In response, they looked for ways to enhance the warrior reputation of the Predator pilot community. However, there were sharp disagreements over what approach to take. Some argued that only manned aircraft pilots should fly the Predator because they were uniquely qualified to infuse the warrior ethos in the Predator community based on their experiences in the cockpit. Others argued that the very concept of the "warrior ethos" needed to expand to include officers who did not receive manned aircraft flight training but employed the Predator remotely to generate significant combat effects.

Perceptions Inside the Predator Pilot Community: A Struggle to Relate to the Warrior Ethos

The introduction of RSO further eroded the warrior mentality of the Predator mission. Predator pilots stationed in the United States complained that it was often difficult to associate a sense of urgency or risk with the job because they were physically disconnected from the fight. Without a sense of the stakes involved in their work, the Predator pilots at home had trouble relating to the forward-deployed launch-and-recovery elements and ground forces in combat. As Rosenwasser explained, RSO created a "two-culture society within Predator squadrons that eroded unit cohesiveness and thus ultimately combat effectiveness."[123]

The Predator pilots' involvement in targeting provides a specific example of the corrosive impact of their physical dislocation from the battlespace. Forces downrange often did not give the Predator pilots any context for the targets they were observing, so they had trouble perceiving the stakes. "Spending three hours staring at a house with no context was a morale dump," one UAV commander said. As the problem became endemic, Predator squadron commanders began to "fight for context." Explained the squadron commander: "Context increases the aircrew's desire to be there; three hours doesn't' seem that boring when you know you're looking for the key IED maker in Baghdad."[124] Predator squadron commanders in the US also began to adopt gestures that reminded the Predator pilots of their warrior role, such as the adoption of routine targeting training to raise the Hellfire hit rate, as well as the introduction of morale patches. [125]

Creating a New Career Field: Can a Separate Class of Predator Pilots Be Warriors?

As Predator pilots themselves struggled with their lack of connection to the warrior mentality, senior USAF officers debated how best to improve the situation. There were differing views inside the USAF about the best way to inculcate a warrior ethos in the Predator pilot community. Some senior USAF leaders warned against proposals to create a separate Predator pilot career field, which potentially involved the establishment of a separate training pipeline that would reduce or eliminate manned aircraft flight experience. These leaders worried that the reduction or elimination of manned aircraft flight training would highlight the Predator community's lack of exposure to physical risk —

[123] Rosenwasser (2004) 380
[124] ACC History Office (2011) 189
[125] *ibid*

the *sine qua non* for warrior credentials in the USAF, in their view. Then-Brig. Gen. Frank Gorenc, an F-15 pilot who has flown the Predator, warned in 2007 that recruiting manned aircraft pilots to fly the Predator was the only way to save the Predator community from being perceived as "a second class of citizens that never take any risks."[126] Colonel Gary Fabricius, a 15th RS commander from 2002 to 2004, agreed that a separate career field would sharpen the division between manned and unmanned pilots and create a culture of the "haves and have-nots."[127] It would be better, Col. Fabricius argued, to continue the ALFA tour system because manned aircraft pilots had instant warrior credibility.[128]

In his position as USAF chief, Gen. Moseley pursued policies that indicated he saw exposure to risk as a prerequisite for warrior status. Himself an F-15C weapons officer, Gen. Moseley proposed opening a UAV Weapons school, which would emphasize the connection between Predator missions and combat action by attempting to "legitimize the UAV world the same as the B-52, F-16, and A-10."[129] His view of the warrior ethos as tightly linked to physical risk also was apparent in several policy changes he made, including the widespread deployment of personnel in support functions ranging from the USAF band to finance, and the decision to issue an M-16 rifle to every airmen on the first day of basic training.[130]

But other USAF leaders argued that that physical exposure to risk was not the key ingredient for raising the warrior status of Predator pilots. Instead, the solution was to make a cultural shift toward a broader conception of the warrior ethos that looked beyond physical risk to take into account Predator pilots' potential to influence the battlespace. Gen. Jumper argued that Predator pilots were still "credentialed warriors" because they made the "same life and death decisions made in manned platforms."[131] "This stuff is real. I'm taking real lives. I'm

126 Quoted in Cantwell, (2007) 102
127 Cantwell (2007)102
128 *ibid*
129 Moseley (Feb. 28, 2008)
130 Riley (Jan. 2014) 46-51; Moseley interview (Oct. 26, 2015)
131 Cantwell (2007) 97

shooting real weapons. And I have to be really responsible for my actions," he told then-Lt. Col. Cantwell in 2007.[132]

As the demand for Predator pilots continued to grow in the wake of the September 11 attacks, the USAF was forced to reconsider its continued reliance on its limited pool of highly trained manned aircraft pilots. The debate over Predator pilot qualifications fueled a larger internal discussion about their warrior status, which was even more sharply called into question when the USAF adopted RSO. As the USAF struggled with the fundamental question of what makes a warrior, it also began to worry that external challengers might seize on this moment of identity crisis to attack the USAF's special claim to the Predator program, as discussed in Question 4.

Views of Aircrew Risk Outside the USAF

Outside the USAF, there is some evidence to suggest that ground forces were unimpressed with the Predator's potential to reduce aircrew risk. Some troops doubted that Predator pilots, flying thousands of miles away, could act decisively and effectively in combat when they had no "skin in the game." USMC Sergeant Matthew Mardan, who witnessed Predator strikes in Iraq in 2004, explained: "Everything happened so fast on the battlefield that I think we would have not trusted the idiot, especially if he is Air Force, sitting somewhere in an office running this. So much easier for us to just call in exactly what we need from a pilot or a gunship or an Apache or Cobra. That's what we were used to doing."[133]

Yet while Mardan described manned aircraft as a safer alternative to the Predator, US government officials have argued that the opposite is true: Predator missions are potentially more reliable and effective than manned aircraft precisely because of the pilot's physical separation from the battlespace. Facing no immediate threats to their safety, Predator pilots are free to focus on the mission, loitering in close proximity to a target for long periods of time to exercise

[132] Cantwell (2007) 105
[133] Wood (2015) 85

discrimination and maximize combat effectiveness.[134] Consequently, negative perceptions of the Predator among ground forces may have had less to do with their lack of appreciation for the risks of a combat mission than with the distrust created by their geographical separation from ground forces. Ground units have the potential for regular interaction with Cobra or Apache pilots because they forward deploy to the battlespace. But they have far fewer opportunities for such trust-building face-to-face encounters with Predator pilots who are mostly stationed in the continental United States, with the exception of a few launch and recovery elements.

Turning to the US government, there is little evidence to suggest that, beyond the potential to target more discriminately, reduced aircrew risk was seen as a particularly important benefit of Predator operations at least until the mid-2000s. Physical protection of aircrews was less meaningful during a time when the great majority of UAV missions were conducted over nations with brittle air defenses that were swiftly destroyed. The opportunity to reduce political risks was also a less important benefit of UAVS during this time because the US was mostly employing UAVs over nations with it was already at war. It was only in the early stages of conducting UAV strikes outside war zones, where the risk of a manned aircraft being killed or captured could have major diplomatic implications (as was the case with the Gary Powers and Scott O'Grady incidents).

However, in the fall of 2008, the opportunity to reduce political risks started to become more attractive as the US bolstered its anti-terrorism efforts in countries with which it was not at war. The Bush administration was increasingly concerned about Pakistan's Federally Administered Tribal Area (FATA), a lawless region and al Qaeda haven. After US SOF unexpectedly took fire from the Pakistan military while conducting a raid in the FATA, President Bush said he started to rely on CIA UAV strikes to avoid incurring the political fallout that occurred when the firefight "made international news."[135] The political risk calculus would continue to shift in favor UAVs in the coming years, as the Obama administration dramatically

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134 Brennan (Apr. 30, 2012)
135 Wood (2015) 116; Bush (2010) 217

expanded the hunt for al Qaeda and other terrorist organizations beyond Afghanistan and Iraq.

4. **To what extent were judgments about the Predator based on a concern about maintaining the USAF's primary control over those air assets in response to competition from government agencies or other military institutions?**

Once the wars in Afghanistan and Iraq began, Gen. Jumper's instincts to protect the central role of the USAF in Predator combat operations gradually spread to other commanders. The USAF's increased interest in maintaining primary control of Predator assets manifested itself on a variety of fronts. While no one in the USAF was content to let the Predator program fall into the hands of another service, there were debates about how best to shore up the USAF's unique claim to managing the Predator program most effectively. As had been the case in the past, there also continued to be competing rationales for maintaining dominance over Predator operations. While some genuinely sought to integrate the Predator to enhance the USAF's warfighting potential, others sought to control the Predators' rate of growth in an effort to limit its strategic relevance.

Command and Control During the Omar Strike

The first and biggest example of the USAF's increasingly territorial stance toward the Predator was its reaction to being excluded from mission planning and execution of the failed strike against Mullah Omar. Then-Lt. Gen. Wald, the JFACC responsible for air campaign over Afghanistan, saw his involvement limited to watching the FMV screen as Gen. Franks ordered the ACC EAIS to launch the Predator's Hellfire missiles at a convoy vehicle outside a building where Omar was thought to be. The idea was to draw Omar outside, but instead it created an opportunity for him to escape.[136]

The failed Omar strike reinforced air commanders' views that, from a doctrinal perspective, the JFACC was in the strongest position to command and control air assets, including the Predator, during military operations.[137] "As retired Gen. Wald explained, it would have been better for the USAF to take the lead on the Omar strike because the CAOC was established specifically to manage dynamic and complex air taskings in a wartime environment. In contrast, CENTCOM only knew how to handle highly controlled bombing events based on its 1990's experience with no-fly zones over Iraq.[138] The command and control relationships were completely dysfunctional here," said retired Lt. Gen. Deptula, who was Gen. Wald's CAOC director at the time of the incident.[139]

The ROVER and ROVER II

The USAF's territorial approach to the management of Predator combat operations also colored its relationship with the Army. The ROVER II allowed for the "democratization" of the battlefield, giving ground forces access to Predator video feeds so valuable that the military's most high-ranking generals — including Gen. Franks and then-Lt. Gen. Wald — had argued over who should use them to make command and control decisions. As a result, ROVER II raised concerns in the USAF on two levels.

First, on a rational level, Big Safari had given the first ROVER systems to Army SOF units free of charge, and the USAF was reluctant to continue that practice.[140] In the late 1990s, the service had refused to fund TCS on the basis that it would directly benefit other services that were not paying for its use. But now Big Safari was giving away Predator FMV access for free via the ROVER. Grimes,

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[136] Franks (2004) 293: Deptula interview (June 2, 2014)
[137] Campbell interview (June 5, 2014)
[138] Wald interview (Feb. 13, 2015)
[139] Deptula interview (June 2, 2014)
[140] Manuel interview (Oct. 11, 2013)

the Big Safari director "was taking a lot of heat for spending Air Force money to give something to the Army," recalled retired CW02 Manuel.[141]

Second, the USAF fundamentally believed that commanding USAF officers were best positioned to control the flow of information available through Predator FMV feeds; the average ground unit did have the training to accurately digest the information for immediate use on the battlefield. After returning from an Afghanistan deployment with the ROVER II, CW02 Manuel began briefing officers on new ROVER innovations, including the idea of allowing ground forces to take control of Predator sensors. But he ultimately stopped briefing the concept, he said, because USAF officers were so opposed to it. "Air Force guys would literally get up and walk out of my briefing when I would talk about the guy on the ground taking control of the sensor," said the retired green beret. "Air Force guys felt that if you wanted to do that, you needed to go to Air Force school. You have to be trained…I was looked at as: 'You are naïve, this is not how this works.'"[142]

Protecting the USAF's War-Winning Edge: Debates about Predator Pilot Training and Skills

Just as the ROVER raised concerns about the USAF's control of the Predator program, so did proposals to change Predator pilot training. As discussed in Question 3, calls for new UAV career fields raised an internal debate within the USAF about warrior credentials. But it also raised a second internal debate about the types of skills required to fly a UAV. Both Gen. Fogleman and Gen. Jumper believed that good UAV airmanship did not necessarily require the same level of training undertaken by manned aircraft pilots. In their view, training needed to focus on the ability to maintain situational awareness in three dimensions while making decisions to effectively complete a mission — not stick and rudder skills.[143] In contrast, Gen. Moseley wanted to preserve the special role of manned aircraft

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141 *ibid*
142 *ibid*
143 Cantwell (2007) 98 and 105

pilot skills in Predator operations, continuing to insist on the ALFA tour because only manned aircraft pilots "have the third dimensional sense" and "a notion that this business is dangerous and you'll bust your ass if you're not careful."[144]

The USAF's internal debate about a new Predator career field fueled a larger external debate about whether the USAF contributed anything unique to Predator operations. In his 2008 speech at Maxwell AFB, Secretary Gates suggested enlisted airmen could fly Predator because enlisted troops were already flying the Army's ER/MP. He asked the USAF to question "long-standing service assumptions and priorities about which missions require certified pilots and which do not."[145] USAF leaders roundly rejected the proposal, insisting the USAF's manned aircraft pilot skills were required to operate the Predator effectively. Gen. Moseley said using enlisted airmen would require training them up to manned aircraft pilots' standards, which would just take too long.[146]

Innovations in UAV technology also fueled the external debate about whether the USAF's manned aircraft pilots were needed to fly the Predator. For example, RSO created an opportunity to save money and time by limiting launch and recovery training to Predator pilots scheduled to deploy.[147] But some manned aircraft pilots worried that limiting launch and recovery training would detract from the rationale for the pilot-dominated USAF to run the Predator program. Many thought that launch and recovery training was critical because it demanded stick-and-rudder skills that only manned aircraft pilots possess.[148]

Similar concerns were raised when GA-ASI introduced a new automated takeoff and landing (ATLS) system for the Army's ER/MP. From the beginning, the USAF expressed little interest in adopting ATLS, even though launch and recovery represented the most challenging part of the flight envelope.[149] Several sources claim that the USAF's manned aircraft pilot community worried that ATLS would

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[144] Moseley interview (April 1, 2014)
[145] Gates (April 21, 2008)
[146] Moseley interview (Oct. 26, 2015)
[147] Cantwell (2007) 108
[148] *ibid*
[149] Pace interview (Sept. 1, 2014)

detract from their special claim to employing the Predator effectively. "As soon as you start breaking out unmanned components with automation, making it simpler and easier so that the 'sub-human' enlisted race, as they view it, can operate it, you have basically culturally ripped apart the center of what they are trying to do," said Tim Owings, the top civilian in charge of Army UAV programs from November 2004 to October 2011.[150] Pace, the president of GA-ASI since 2010, said he agreed that the sole reason the USAF to this day has not yet adopted ATLS is "100 percent cultural." He added: "It just dramatically, dramatically reduces accidents. It's only the culture that keeps the Air Force from wanting to do automatic takeoff and landing."[151]

There was more at stake in the external debate than simply the question of how much training a Predator pilot needed. If Predator pilots did not need traditional manned aircraft piloting skills, was there any reason for manned aircraft pilots, or, indeed, for the USAF itself, to continue its monopoly on Predator operations? As then-Brig. Gen. Lyon told then-Lt. Col. Cantwell in 2007, if anyone can fly the Predator, than anyone can fly UAVs — any rank, any service — and if that is the case, then the USAF "cedes our authority over managing, commanding and controlling the effects that take place from the air to anybody that wants to do it."[152] The internal debate about the lack of warrior mentality among Predator pilots, discussed in Question 3, combined with the disagreements over Predator pilot skills, created a cultural upheaval in the USAF that left it vulnerable to external attacks on its claim to ownership of the Predator program.

The Army's Decision to Buy its Own Version of the Predator

The USAF's fears of losing control of Predator operations grew deeper after the Army started buying its own version of the Predator. Army leaders complained they lacked Predator support not only because there were too few Predators, but

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[150] Owings interview (Feb. 25, 2014)
[151] Pace interview (Sept. 1, 2014)
[152] Cantwell (2007) 101-102

also because the USAF's doctrinal emphasis on centralized control of Predator operations short-changed ground forces. Rather than focusing on the needs of the Army's troops in contact, Army officials complained, the Predators were focused on strategic intelligence collection on targets across Afghanistan.[153]

The USAF's approach was costing lives, according to Army officials. Lt. Gen. Robert Noonan, the Army's chief intelligence officer, said in April 2002 that better command and control of Predators during Operation Anaconda — the first OEF battle to involve large numbers of conventional forces — might have prevented tactical intelligence failures that led US troops to drop into landing zones under heavy fire. If Army commanders in theater controlled Predator operations, he argued, they could have ensured that Predators supported the operation effectively. "When you have a scarcity of assets, if you only have one or two Predators, somebody has to make the call, where's that thing flying, what it's looking at," said Lt. Gen. Noonan. "So that's why we feel very strongly that all of our brigades have got to have the UAVs."[154] Of course, the Army was developing its own fleet of smaller tactical surveillance UAVs in the early 2000's, including small, hand-launched RQ-11 Ravens.[155] But these were not armed and could not provide close air support when Army lives were at stake.

The USAF faced an uphill battle in challenging the Army's compelling wartime argument for its own version of the Predator, the ER/MP. Nevertheless, it took on the fight during JCIDS meetings in the summer of 2004, arguing that the Army's proposal to build the ER/MP was duplicative with the Predator program.[156] The USAF also argued that the Army's ownership of the ER/MP would be inconsistent with "clearly defined service roles and missions."[157]

As ground forces fought and died in Afghanistan and Iraq, however, the USAF's doctrinal arguments failed to convince Pentagon bureaucrats**.** The first variant of the Army's ER/MP, known as the Warrior Alpha, deployed to Iraq in

153 *Jane's Defence Weekly* (April 12, 2002)
154 *ibid*
155 *Jane's All the World's Aircraft* (Oct. 8, 2015)
156 Deptula (undated)
157 Air Force Association (undated)

October 2006 with the Army's Task Force ODIN, responsible for the detection of one of the war's biggest killers: improvised explosive devices.[158] In keeping with the Army's view that the UAV should be highly responsive to ground forces, the Warrior and its successor, the MQ-1C Gray Eagle, were designed to operate in theater with Army units. The Army One System Ground Control station automated much of the operator's flying tasks, allowing for enlisted operators to fly the system, and it was designed to be forward-deployed with Army ground forces, rather than employing RSO.[159]

The USAF Fights Back: the Bid for Executive Agency

Although the Army had a compelling life-or-death argument for buying their own UAVs, Gen. Moseley continued to make the doctrinal case for the USAF to manage the Predator, Reaper, and Gray Eagle. His 2007 bid for executive agency was rooted in the notion that the JFACC, a USAF officer, was in the strongest position to prioritize the use of these air assets in a way that fully recognized their strategic potential. In his 2007 executive agency memo, he argued that "A joint theater ISR strategy, with the [JFACC] controlling all medium and high-altitude theater ISR assets, will better meet the ISR needs of the joint force commander."[160]

But Secretary Gates opposed executive agency. In his view, the service's claim to masterfully managing the Predator program was hollow and insincere. As discussed in Question 3, he felt that the USAF was culturally biased against UAV technology and he also believed the service was failing to adequately support the Army with UAV orbits. The decision of CIA and JSOC to buy their own Predator assets because ACC was not responsive enough further enforced the impression that the USAF was not genuinely committed to employing the Predator to achieve maximum effects in the battlespace.

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158 *Jane's Electronic Mission Aircraft (*Sept. 26, 2011)
159 *Jane's Unmanned Air Vehicles and Targets* (Updated July 31, 2013)
160 Moseley (March 5, 2007)

In his 2014 book, Secretary Gates explained “The Army resisted [executive agency], and I was on its side; the Air Force was grasping for absolute control over a capability for which it had little enthusiasm in the first place.”[161] Owings agreed that the USAF’s sudden interest in Predator-class UAVs had less to do with doctrine than with trying to keep UAVs from achieving too much success outside the USAF’s control. “I think they felt that by doing [controlling the Predator] they would control the key part of the discussion and funding,” he said.[162]

In closing, it is clear that USAF officers almost universally believed that the service was in the strongest position to manage the UAV. However, there were disagreements over how this was best achieved. USAF officers did not agree on how best to infuse the warrior mentality in its Predator pilots, as discussed in Question 3, nor did they agree on what skills were most important for Predator operations. These questions about USAF pilot identity made the USAF vulnerable to attacks on the service’s claim to the Predator program. The problem was only exacerbated by the reality that while many in the USAF genuinely believed unmanned technology had a future in the USAF, there was still a cultural strain — made worse by wartime pressures and Predator pilot personnel policies — that saw UAVs as a short-term niche capability that ultimately needed to be crushed.

Conclusion

The wars in Afghanistan and Iraq forced the USAF to temporarily overcome pervasive cultural biases against UAVs to deliver a high-demand wartime capability. But the simmering tension between two major imperatives — systematic integration of the Predator into the USAF’s force structure versus meeting rapid innovation to meet wartime demand — was approaching a boiling point. The USAF was already in a state of cultural upheaval following the introduction of the Predator program, and wartime pressures made it worse.

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[161] Gates (2014) 129
[162] Owings interview (Feb. 25, 2014)

USAF leaders adopted two different approaches in response to these competing demands. As described in Chapter 5, Gen. Jumper sometimes acted as a "norm exploiter" in his positions as ACC chief and USAF chief. He tried to identify elements of the UAV that complemented USAF culture, winning over the strike aircraft community through weaponization, and proposing a CSO career field designed for navigators, who tended to want to fly the Predator anyway. In contrast to this approach, however, Gen. Moseley continued the practice of forcing the Predator into existing USAF ways of doing business, thereby provoking a direct confrontation between the manned aircraft community and the Predator program.

Gen. Moseley said he believed unmanned technology had long-term strategic potential, but he also saw the Predator and Reaper as very limited platforms only suitable for fighting counterinsurgencies. His approach to UAV manning further reinforced the idea that he saw Predator integration as a short-term problem. This approach served to worsen cultural tensions and the long-term prospects for UAV integration in the USAF. ALFA tours, which eventually required draconian personnel changes, shocked and angered the manned aircraft pilot community. ACC, the heart of the manned aircraft community, was forced to manage the training and acquisition pipeline for a UAV that it saw as nothing but a niche capability.

Ultimately, the USAF was able to dramatically increase the number of UAV orbits in Afghanistan and Iraq by 2008. But while the short-term problem was solved, the long-term prospects for integrating unmanned technologies in the USAF looked worse than ever. Senior leaders claimed to understand the need to dominate the strategic employment of UAVs in the future, but the short-term approach to Predator integration was upending USAF pilot identity and raising questions about how much the USAF sincerely believed UAVs would be needed to fight the next war. The ongoing cultural upheaval created an opportunity for Secretary Gates and the Army to attack the USAF's claim to being in the strongest position to employ Predator-class UAVs effectively

Chapter Seven, Shifting Battlespaces: Long-Term Predator Innovation

The United States ended combat operations in Iraq in August 2010, and all remaining forces were withdrawn by December 2011.[1] By the time major combat operations in Afghanistan ended in December 2014, the Obama administration's strategic focus had shifted to a broader international counterterrorism campaign. The Predator and its successor, the Reaper, had played a central role in operations against al Qaeda and Taliban targets in the waning days of the Afghanistan war, and their centrality to counterterrorism operations only increased as the Obama administration shifted its attention to countering violent extremism outside "hot" combat zones.

Inside the USAF, the long-running debate about the role of UAVs in the emerging strategic context intensified. Although the wars in Afghanistan and Iraq were "gray" conflicts" that fell short of a high-intensity, full-scale clash, they nevertheless offered some reprieve from the overwhelming sense of strategic ambiguity that had been building since the early 1990s. USAF officials more or less agreed that these counterinsurgencies demanded short-term investment in UAV innovation. As those wars ended and the Obama administration shifted its focus to UAV strikes against terrorist suspects in nations with which the US was not at war, however, strategic ambiguity returned.

With the lines between war and peace so blurred, the strategic relevance of UAVs was a matter of perception. Some in the USAF saw UAVs as a niche capability unworthy of a sustained innovation focus given their far greater concern regarding the potential for a high-intensity war that would demand employment of the USAF's most survivable manned aircraft. Others inside and outside the USAF, however, advocated continued Predator and Reaper innovation based on their prediction of a protracted era of "gray" wars that would call for time-sensitive,

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[1] Khan and Dwyer (Aug. 31, 2010) Vanden Brook (December 15, 2011)

discriminate targeting of non-state actors in a relatively benign air environment. A third possibility was to develop a new generation of UAVs for contested airspace, but with the budget declining, that option was unlikely given that even Predator and Reaper innovation was a source of controversy.

The tension within the USAF over whether to focus on UAV innovation as a short-term or long-term pursuit played out in UAV policy decisions made during the tenures of Gen. Norton Schwartz, the USAF chief from August 2008 to August 2012 and his successor, the current chief, Gen. Mark Welsh. The first half of this chapter describes these policy decisions. The second half explores how USAF culture influenced the USAF's approach to UAV innovation and how the continued operational success of UAVs, in turn, shaped USAF culture.

The Predator, the Reaper, and the Future of UAV Innovation

Secretary Gates quickly nominated a new USAF chief and secretary after Gen. Moseley's dismissal in August 2008. President Bush swiftly approved the nominations of Michael Donley, a career bureaucrat, to be secretary, and Gen. Schwartz, the head of US Transportation Command, to be chief. It was the first time a non-fighter pilot was selected as chief since 1982.[2]

The USAF leadership change came on the eve of the election of President Barack Obama, who supported Secretary Gates' relentless push to increase UAV orbits, even as the Iraq war ended. Between 2008 and 2012, CAPs nearly doubled from 32 to 62.[3] Demand for Predators and Reapers exploded as President Obama launched a troop surge in Afghanistan in late 2009.[4] Coalition UAVs — including USAF Predators and Reapers, and RAF Reapers — flew 3,240 UAV sorties in Afghanistan in 2008, compared to 7,612 sorties before 2012 ended.[5] Most of the

[2] Air Force Fact Sheet (Apr. 15, 2015)
[3] Stein (March 10, 2015)
[4] Spiegel, Weisman and Dreazen (Dec. 2, 2009)
[5] Woods and Ross (Dec. 4, 2012)

sorties were ISR missions, but by 2010 the US and coalition forces used UAVs to conduct one out of every 10 air strikes.[6]

Outside Afghanistan, the growth in UAV reconnaissance and strike missions was equally remarkable. President Obama entered office focused on eradicating Taliban and al Qaeda safe havens along the Afghanistan-Pakistan border.[7] He authorized 370 CIA-managed UAV strikes in Pakistan through January 2015, compared to just 51 authorized by President Bush between 2004 and 2009.[8] The Obama administration also expanded UAV strikes to Yemen and Somalia under a partnership between the CIA and JSOC.[9] In total, President Obama authorized 491 UAV strikes in Pakistan, Somalia and Yemen as of October 2015.[10] This increased activity beyond official combat zones meant more work for the USAF's Predator pilots, as the 17th RS flew UAV reconnaissance and strike missions on behalf of the CIA, while AFSOC's UAV squadrons — including the 3rd SOS, which was joined by the 33rd SOS and 2nd SOS in 2009 — did the same on behalf of JSOC.[11]

The Schwartz Years: The USAF's Approach to Personnel Policy and Force Planning, 2009-2012

The USAF's preference for "normalization," in terms of the gradual integration of the Predator program, proved impracticable with the arrival of Secretary Gates who wanted rapid CAP increases to support wartime demand. His nominee for USAF chief, Gen. Schwartz, oversaw an explosion in Predator flight hours that began shortly before he took office in August 2008. By September 2009, the USAF had been able to accrue 250,000 flight hours in less than two years; in comparison, it took 12 years from 1995 to 2007, to fly the first 250,000.[12]

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[6] Woods (2015) 218
[7] Obama (July 27, 2008)
[8] The Bureau of Investigative Journalism (Dec. 2015)
[9] Woods (2015) 170
[10] Serle and Fielding Smith (Oct. 5, 2015)
[11] Woods (2015) 16-17; Woods (2015) 11-12; Air Force Public Affairs (July 3, 2014)
[12] Schwartz (Sept. 29, 2009)

Shortly after taking office, Gen. Schwartz announced his intention to chart "a path toward full institutional integration of RPAs," the USAF's newest preferred nomenclature for UAVs.[13] In part because of the tremendous pressure to boost UAV orbits quickly, however, the USAF often adopted infrastructure and personnel policies that were effective in wartime but fell short of permanent solutions.

Wartime Expediency: Schwartz's Short-term Fixes

The USAF engaged in organizational reshuffling to accommodate the rapid growth in UAV units. A long-term solution might have been to establish additional UAV wings beyond the 432nd at Creech AFB, but instead the USAF took three steps to increase its short-term capacity to support the growing demand for UAV CAPs.

First, the USAF created a second operations group, the 732nd, at Creech AFB. That unit took responsibility for the 17th RS, the squadron tasked to support CIA-led missions, from Creech's original 432nd operations group. Meanwhile, the 17th RS had grown so big that it had to be split into additional squadrons, giving the 732nd control over a total of four squadrons.[14] This change, however, did not reduce the overall size of Creech. In 2013, the base had over 570 company grade officers — almost three times the number at Holloman AFB in New Mexico — creating stiff competition for leadership spots, high rankings on performance reports, and awards.[15]

Second, the USAF stood up new UAV squadrons across the country, but they were tucked under existing USAF wings dominated by other aircraft types. In 2009, the service established an MQ-1 and an MQ-9 Formal Training Unit under the 49th Wing, an F-22-dominated unit, at Holloman AFB. (The F-22s would later leave the base in 2013, but two F-16 training squadrons would replace them). In 2010, the USAF stationed a Reaper squadron at the 28th Bomb Wing at Ellsworth

[13] Schwartz (Sept. 15, 2009)
[14] Woods (Apr. 14, 2014);
[15] Byrnes (Sept-Oct. 2015) 37

AFB in South Dakota and another in the 509th Bomb Wing at Whiteman AFB, Missouri.[16]

Third, the USAF shifted its focus to bolstering UAV capability in the ANG. By 2012, there were six UAV units already established in the ANG and an additional five scheduled to stand up in fiscal year 2013.[17]

Gen. Schwartz also made interim personnel changes to accommodate the explosion in UAV orbits. In 2011, the USAF briefly closed the UAV weapons school at Creech AFB to free up more instructors for Predator and Reaper CAPs.[18] But the change with the biggest impact on Predator pilot careers was a decision to start a "UPT-direct" program to quickly increase the number of UAV pilots, which stood at about 450 in 2009.[19] Under this effort, which lasted from 2009 to 2011, the USAF assigned 100 pilots per year to go directly from UPT to fly the Predator and Reaper rather than a manned aircraft.[20] After UPT, the selected pilots went to a "UAS Fundamentals" course at Randolph AFB in San Antonio, Texas, followed by 14 weeks initial qualification training (IQT) at Creech AFB.[21]

Because the UPT-direct program drew from a pool of newly-minted pilots fully expecting to fly manned aircraft, it was essentially a continuation of Gen. Moseley's practice of forcing manned aircraft pilots into UAVs for the sake of expediency. However, there was one important difference. The total of 244 UPT-direct pilots assigned to UAVs between 2009 and 2011 were promised that they would fly only one tour in the UAV before receiving the option to transition to a manned aircraft assignment between 2013 and 2015.[22]

While Gen. Schwartz focused on the ongoing wars, next-generation UAV innovation efforts suffered. This was in part because the USAF, along with the other military services, was facing an increasingly austere budget environment

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16 Spinetta (July- Aug 2013) 106
17 Harrington Lee (July 26, 2012)
18 *Strategypage.com* (Dec. 7, 2011)
19 Mulrine (Jan. 2009) 34
20 Schultz (Oct. 2009) 11; Mulrine (Jan. 2009)
21 Schultz (Oct. 2009) 11-12
22 Air Force Headquarters CAF & ISR Branch, A3O-AC (May 23, 2014)

after years of heavy wartime spending.[23] The financial pressure partly explains why the USAF cancelled MQ-X, an attempt to build a more capable follow-on to the Reaper.[24] The USAF also rejected a GA-ASI design meant to serve as an interim solution until the MQ-X was ready, known as the Predator C Avenger.[25] Finally, the USAF attempted to end procurement of Block 30 Global Hawk, a UAV designed for strategic reconnaissance, on the contested basis that the Cold War-era U-2 Dragon Lady outperformed the UAV for less money. The program was only resuscitated due to congressional pressure.[26]

Long-term Innovation: Schwartz's UAV Institutionalization Efforts

Although next-generation UAV concepts received scant attention, Gen. Schwartz did take a crucial step to integrate the Predator and Reaper programs overt he long term. He successfully launched a new UAV career field to to reduce the USAF's reliance on the manned aircraft community.

In January 2009, Gen. Schwartz launched what was known as the "Beta Test" as a trial program to allow non-rated officers to participate in unique UAV training in preparation to join a distinct UAV career field.[27] In the first class, 10 officers from non-rated backgrounds completed 33 weeks of training. Candidates went to Pueblo, Colorado to complete IFS, consisting of 15 hours of flight time in a Diamond DA-20 trainer aircraft, culminating in a solo flight and a check ride to demonstrate proficiency in basic flight maneuvers and procedures. They then completed a short instrument qualification course using a T-6 Texan II simulator at Randolph, AFB in Texas, before joining UPT-Direct pilots for the "UAS

[23] Fryer-Biggs and Wasserbly (Jan. 30, 2015)
[24] Harrington Lee (July 26, 2012)
[25] Majumdar (Feb. 15, 2012); Axe (Nov. 13, 2014);
[26] Spinetta and Cummings (Nov. 2012)
[27] Schultz (Oct. 2009) 11

fundamentals" Course and IQT.[28] When the first class of Beta test pilots finished training, they pinned on newly designed UAV pilot wings.[29]

After the first class completed training, a consensus emerged in the USAF leadership community that the Beta test went too far in the direction of minimizing manned aircraft pilot skills.[30] After five classes of 50 students completed the Beta test between January 2009 and the fall of 2010,[31] the USAF revised the training syllabus and announced the creation of a new "UAV pilot career field, designated "18X," for Predator, Reaper, and Global Hawk pilots in June 2010.[32] The 18X training, known as Undergraduate RPA Training (URT), increased IFS from 15 hours to 39 hours, the equivalent of flight requirements for a private pilot's license. Flight time included 27 hours with a pilot instructor and another seven to 10 hours of solo time, including a five-hour cross-country solo flight.[33] The URT training culminated with an RPA Fundamentals Course at Randolph AFB instructing 18X pilots on radio communications and mIRC chat.[34]

On top of these efforts to cultivate a new career field, Gen. Schwartz also developed a mentorship program. In March 2011, the USAF "recategorized" about 477 UAV pilots in the ranks of major and lieutenant colonel to serve indefinitely as UAV pilots. Most of them (412 of the 477) made the switch voluntarily, according to USAF headquarters.[35] This program provided a core of more senior pilots for the new UAV pilot career field. As of 2014, a total of 545 UAV pilots had been recategorized.[36]

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[28] Schultz (Oct. 2009) 11-12; Black (Oct. 29, 2009)
[29] Janes (Oct. 1, 2009)
[30] Gersten interview (March 4, 2013); Schultz (Oct. 2009) 53
[31] Air Force Headquarters CAF & ISR Branch, A3O-AC (May 23, 2014)
[32] ACC History Office (2011) 190
[33] *ibid*
[34] ACC History Office (2011) 192
[35] Air Force Headquarters CAF & ISR Branch, A3O-AC (May 23, 2014)
[36] GAO (Apr. 2014) 11

The Welsh Years: Relentless Pressure to Increase UAV Orbits

Gen. Schwartz's efforts had the cumulative effect of dramatically increasing the USAF's capacity to support the ongoing wars with UAV orbits. Shortly before he retired in June 2011, Secretary Gates praised the USAF for boosting UAV orbits from 18 in 2007 to 48.[37] When Gen. Mark Welsh replaced Gen. Schwartz in August 2012, the trend in CAP increases continued, as UAV strikes continued to expand outside "hot" battlespaces.

The USAF reached 65 combat air patrols (CAPs) in May 2014, a goal set by Secretary Gates in December 2009.[38] The number of UAV pilots had grown from around 460 in fiscal year 2008 to 1365 in fiscal year 2014. That total included about 400 18X and Beta-test trained pilots, but the majority of pilots were still former manned aircraft pilots doing an ALFA tour, TAMI-21 pilots, and a handful of UPT-direct pilots who opted to stay with UAVs rather than transition to a manned aircraft. [39]

The continuing high demand for UAV orbits was matched by unrelenting budget pressure. The USAF had sought relief in the form of a request to reduce CAPs, which the Pentagon granted in the 2014 Quadrennial Defense Review, proposing a reduction to 55 CAPs.[40] The relief was only temporary, however, as the plan was scrapped later that year in favor of maintaining a 65 CAP goal after the US launched an air campaign against the Islamic State in Syria and Iraq.[41]

By late 2014, it clear that the demand for USAF UAV orbits was unlikely to abate. UAV strikes were confirmed in Pakistan, Yemen, Somalia, Libya, and Syria, as well as a suspected US UAV strike in the Philippines.[42] The US was also using UAVs to provide targeting data to the Turkish military's anti-Kurdish operations

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[37] Gates (March 4, 2011)
[38] Kelsey (June 9, 2014)
[39] Air Force Headquarters CAF & ISR Branch, A3O-AC (May 23, 2014)
[40] DoD (March 4, 2014) 28
[41] Schogol (Feb. 6, 2015)
[42] Woods (2015) 280

and to French armed forces in Mali.[43] The USAF conducted these UAV missions outside of "hot" battlespaces on behalf of the CIA. USAF UAV aircrews were covering as many as 22 CAPs on a daily basis for the agency.[44]

Strain on the UAV pilot community continued to mount, culminating with a December 2014 memo from the ACC commander to Gen. Welsh warning that the UAV pilot community was at a "breaking point." Gen. Herbert Carlisle said ACC would "continue to non-concur to increased tasking beyond our FY15 force offering" of 62 CAPs. "This is simply not an option for ACC to source indeterminately," he wrote.[45] In May 2015, the USAF announced that the Pentagon had approved a reduction in the service's number of CAPs per day from 65 to 60 because the UAV community had been operating "at a pace that cannot be sustained without accepting risk."[46]

Short Term Fixes in the Welsh Era

The USAF was struggling to meet the demand for Predator and Reaper CAPs because it was losing pilots faster than it could recruit and train new ones. Experienced UAV pilots — mostly former manned aircraft pilots — were leaving the USAF at the rate of about 230 per year because of stress and overwork.[47] But the USAF was producing only about 180 pilots a year to replace them.[48] The main reason for low 18X attrition was the limited capacity of the USAF's 18X training pipeline. Many qualified trainers had been diverted to combat roles.[49]

To ameliorate the UAV pilot shortage, Gen. Welsh developed a series of short-term fixes in 2015, known as the "RPA Get Well Plan," to free up more instructor pilots and improve retention among current UAV pilots.[50] A centerpiece

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[43] Woods (2015) 289
[44] Lubold (Aug. 16, 2015)
[45] Majumdar (Jan. 4, 2015)
[46] Losey (Dec. 2, 2015)
[47] Drew and Philipps (June 16, 2015); Lubold (July 14, 2015)
[48] Lubold (July 14, 2015)
[49] Drew and Philipps (June 16, 2015)
[50] Air Force Headquarters (June 15, 2015)

of the effort was increased reliance on the ANG. In July 2015, the USAF asked the ANG to pick up three additional CAPs, freeing up more active duty UAV instructor pilots for UAV training units.[51] To accommodate the ANG's growing role, its UAV infrastructure was expanded. The USAF planned to stand up almost as many ANG UAV squadrons as active duty ones. By early 2015, there were seven operational ANG squadrons, and plans to stand up a total of 12. There was also one MQ-9 reserve unit, as well as reservists supporting MQ-9 units at Creech AFB. In comparison, there were 14 active duty MQ-1 and MQ-9 units.[52]

Another short-term step, focused on improving retention rates, involved a January 2015 announcement that monthly bonuses for the small pool of existing 18X pilots would be increased from $600 to $1500. Then, in July 2015, the USAF announced it would offer continuation pay to UAV pilots, proposing a retention bonus worth up to $135,000 for pilots who reach the end of their six-year commitment and agree to sign on for another five to nine years. The continuation pay may have made an 18x assignment more attractive, but it was still far less than the $225,000 Aviator Retention Pay bonus offered to some manned aircraft pilots in 2015.[53]

The USAF also announced a re-start of the UPT-direct program, even as the first batch of UPT-direct pilots were getting the option to transition back into their manned aircraft after a three-year UAV tour. In July 2015, the service announced that 80 UPT graduates over the next twelve months would be assigned one UAV tour before transitioning to a manned aircraft.[54]

Taken together, the USAF estimated that the steps to establish the 18X career field and retain existing UAV pilots would allow the service to man its UAV training units at 100 percent by the end of fiscal year 2016. In late 2015, there were already enough UAV instructor pilots to reopen the UAV Weapons School. In terms of retention, the USAF expected its short-term policies to make enough UAV

[51] Air Force Public Affairs (July 15, 2015)
[52] Stein (March 11, 2015)
[53] Losey (July 15, 2015)
[54] Air Force Public Affairs (July 15, 2015)

pilots available to increase the UAV aircrew-to-CAP ratio from 9.4:1 at the end of 2015 to 10:1 — which was considered minimally acceptable — by the end of fiscal year 2016. [55]

Gen. Welsh's Long-Term UAV Innovation Efforts

By early 2016, the demand for the USAF's UAV force was at an "all time high."[56] The Pentagon wanted to boost Predator and Reaper CAPs to 90 by 2019.[57] The increase was needed to broaden surveillance and intelligence collection in Ukraine, Iraq, Syria, the South China Sea and North Africa.[58] In recognition of the growing relevance of UAVs in the emerging strategic context, the USAF began to commit to some long-term UAV innovations. These steps involved shifting capacity away from the overworked, low-morale manned aircraft pilot community and building up a UAV community with other personnel.

In terms of technology development, USAF Secretary Deborah James announced in July 2015 that the USAF would retrofit the GA-ASI ATLS on the MQ-9 Reaper, allowing for automatic launch and recovery of the UAV without the need for stick and rudder skills. Initial fielding of the system, which would make it easier for personnel without traditional manned aircraft pilot training to fly UAVs, was scheduled for fiscal year 2017.[59]

The USAF also announced in December 2015 that enlisted airmen would fly the Global Hawk, and suggested they might eventually fly weaponized Predators and Reapers.[60] This announcement was part of a raft of policy changes proposed as a result of Gen. Welsh's "Culture and Process Improvement Program" (CPIP), established in 2015 to address the morale problems resulting from forcing manned aircraft pilots to fly UAVs. In response to CPIP findings, Gen. Welsh

[55] Air Force Headquarters RPA Capabilities Division (Dec. 5, 2015)
[56] Stevenson (Jan. 15, 2016)
[57] Lubold (Aug. 16, 2015)
[58] *ibid*
[59] Butler (July 23, 2015) 39
[60] Schogol (Dec. 17, 2015)

announced the USAF would pursue a $3 billion plan, subject to congressional approval, to relieve overworked UAV crews. The plan proposed adding 75 Reapers to the USAF's current fleet of 175 Reapers and 150 Predators, but to spread out the workload by adding up to 3,500 new UAV pilots, sensor operators and other enlisted personnel. The USAF also proposed increasing the number of UAV flying squadrons to as many as 17 across the country, and possibly standing up a new UAV wing.[61]

In recognition that the USAF's measures to relieve stress on manned aircraft pilots were insufficient to meet the demand, the Pentagon also announced in 2015 that contractors would fly UAVs as part of a long-term strategy to boost USAF capacity.[62] In December 2015, the USAF confirmed that civilian contractors were already controlling two Reaper CAPs a day, with plans to expand that to 10 a day by 2019.[63]

Another long-term innovation effort that took place during Gen. Welsh's tenure concerned recognition for UAV pilots' service. In 2013, Leon Panetta, the Secretary of Defense from 2011 to 2013, had proposed a new Distinguished Warfare Medal to recognize UAV pilots and others who performed "extraordinary actions" in combat from a remote location.[64] But Secretary Panetta's replacement, Chuck Hagel, who served as Secretary of Defense from 2013 to 2015, immediately cancelled the medal upon taking office.[65] In early 2016, the Pentagon announced that UAV pilots would receive an "R" device to be attached to existing medals.

Overall, the policy changes enacted by both Gen. Schwartz and Gen. Welsh reflected an acknowledgement that the demand for UAVs was increasing. The two chiefs faced the task of balancing policies designed to quickly meet the growing demand for UAV CAPs against long-term efforts to institutionalize UAV capability as a strategic capability within the active duty USAF. The four questions below will examine how USAF culture shaped the service's approach to Predator and Reaper

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[61] Schogol (Dec. 10, 2015); Bowman (Dec. 10. 2015); Hennigan (Dec. 10, 2015)
[62] Hennigan (Nov. 27, 2015)
[63] *ibid*
[64] Shane (March 1, 2013)
[65] Tilghman (Apr. 15, 2013)

innovation as the USAF began to look beyond the wars in Afghanistan and Iraq, and how the continued operational successes of these UAVs, in turn, shaped the USAF's cultural attitudes about the role of UAVs in future conflicts.

1. **To what extent did individuals or groups within the USAF resist the Predator out of a concern that their jobs or status might be threatened by it?**

Some in the fighter community felt increasingly threatened by the Pentagon's continuing emphasis on asymmetric conflict and the USAF's growing emphasis on enhancing Predator and Reaper capabilities. "Once you're big enough to have a training line, and you're kicking everybody's ass, killing 3000 bad guys a year, it's like – 'whoa, you are coming up on us fast',"' explained Col. William Tart, the 432nd Operations Group commander from 2010 to 2012.[66]

Some also saw the arrival of Gen. Schwartz, a non-fighter pilot chief, as a symbol of the further decline of fighter pilot dominance of the USAF. His arrival came as the fighter pilot community's grip on leadership positions loosened with the Pentagon's continued shift in focus from conventional conflict to counterinsurgency. Fighter pilots held just 33 percent of three and four-star billets in 2010, compared to more than 50 percent in 2001.[67]

In his 2012 autobiography, one retired F-16 pilot, Dan Hampton, attacked Gen. Schwartz for not being one of his own kind. "We went over into the abyss when the Air Force made a noncombatant officer chief of staff," he wrote.[68] But in fact, Gen. Schwartz was very much a combatant, flying airlift missions in the Vietnam War and later flying and commanding special operations aircraft.[69] In any event, the fact that his successor, Gen. Welsh, an F-16 and A-10 pilot, continued to increase UAV capability in the USAF suggests that the service's growing focus on

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[66] Tart interview (Feb. 15, 2013)
[67] Smith (2013) Fig. 11.4
[68] Hampton (2012) 304
[69] Rolfson (June 9, 2008)

UAV innovation had less to do with the chief's platform preferences than a broader concern with focusing on the capabilities required for the emerging strategic context.

Nevertheless, as the USAF's most senior leaders sought to increase UAV capability between 2008 and 2015, they faced resistance from the USAF's fighter community, which sought to reassert its dominance. In January 2014, USAF headquarters issued a memo requiring that fighter pilots populate at least 50 percent of combatant command and staff positions, where policy decisions were made.[70] The move seemed to reflect the fighter community's determination to maintain its grip on power, even as the growing strategic relevance of other air force platforms, particularly UAVs, suggested the need for greater representation of officers from those communities in USAF leadership.

Also during this time period, ACC continued its practice of resisting CAP increases, a move perceived by the UAV community at Creech AFB as an intentional effort to stymie the effectiveness of UAV operations. As late as 2010, the command continued to report to the Pentagon that fewer CAPs were available because the UAV pilot training pipeline needed to remain open, even as Creech commanders showed a willingness to break the training pipeline to deliver more wartime capability. "I really think that the bigger we got, the more successful we were, that, instead of taking credit for it, he [ACC commander, Maj. Gen. Charlie Lyon] felt that it was coming at the expense of other things," said Col. Tart.[71] But perhaps the most damaging effort to undermine the UAV community between 2008 and 2015 was the systematic series of steps the USAF's manned aircraft pilot leaders took to disadvantage UAV pilots in the promotion process.

UAV Pilot Promotion Prospects: 2008-2015

The USAF's manned aircraft pilot leadership made a series of policy decisions that limited the UAV community's opportunities for leadership positions. Most

[70] Air Force Headquarters (Jan. 12, 2014)
[71] Tart interview (Feb. 15, 2013)

damaging was USAF leaders' continued reliance on low-performing, non-volunteer, manned aircraft pilots to fly the Predator and Reaper. Not surprisingly, promotion rates among these airmen were low.[72] A 2014 GAO report found that UAV pilots were promoted below the average rate of active-duty line officers on 20 of 24 officer promotion boards between 2006 and 2014. Rather than seeking to increase the quality of UAV candidates, the USAF justified the practice of recruiting underperformers on the basis that lower-performing manned aircraft pilot candidates needed to go somewhere, implying it was better to stick them in UAVs than manned aircraft. "It doesn't mean they were bad officers, it just meant you got to have some at the top and some at the bottom," USAF spokeswoman Jennifer Cassidy explained in 2014. [73]

The USAF's manned aircraft pilot leadership also engaged in what then-Lt. Col. Lawrence Spinetta referred to as "the organizational equivalent of gerrymandering" to limit UAV pilots' promotion prospects.[74] The main way to short-change UAV pilots through organizational moves was to limit the number of UAV wings, and hence the number of opportunities for wing command. The detrimental impact of this organizational decision becomes clear when one considers that every USAF chief over the last 50 years, as well as every ACC commander since 1992, commanded a wing during his rise to the top of the USAF. Wing commanders typically come from the community that supplies the majority of forces. The USAF's 26 fighter wings provided 26 opportunities for fighter pilots to take command of a wing. Because there was only one UAV wing, the 432nd at Creech, the odds of a UAV pilot taking wing command were much smaller. Without a wing commander position on their record, the likelihood of a UAV pilot rising to the most senior ranks of the USAF was miniscule.[75]

The USAF avoided creating new UAV wings by assigning UAV squadrons to wings dominated by other aircraft. Consequently, UAV pilots frequently found

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72 Spinetta (July-Aug 2013) 102
73 Farran (Apr. 29, 2014)
74 Spinetta (July-Aug 2013) 107
75 Spinetta (July- Aug 2013) 104-105 and 107

themselves under the command of fighter pilots who systematically undermined their promotion prospects. While F-22 pilots controlled Holloman AFB, for example, UAV pilots complained that language in their performance reports included code words that suggested they were "second class" citizens. For example, commanders would give a UAV pilot a high stratification among his peers — one of 28 RPA majors, for example — but that would carry far less weight with the promotion board than a stratification of, say, all majors.[76] A 2015 survey of MQ-1, MQ-9 and RQ-4 pilots and sensor operators indicated that Holloman AFB's reputation as a dead end for UAV pilots had not recovered: 26 percent said they would leave the USAF rather than take an assignment there.[77]

Another organizational decision that limited UAV pilot promotion prospects was the USAF's transfer of UAV capacity to the ANG. As this shift occurred, UAV pilots lost the chance to compete for command of ACC, the largest USAF command and the one responsible for the development and acquisition of UAVs.[78] There was also a sense in the USAF and the ANG that Guard members did not have an equal say in force planning decisions; this sentiment was reinforced in 2012 when the ANG vociferously complained about not having sufficient input into a USAF proposal for major ANG budget cuts.[79]

In addition to these detrimental organizational changes, the USAF's failure to effectively manage major UAV manning shortages also hurt UAV pilots' promotion prospects. In 2014, the GAO found that UAV pilots were overworked to the point that they did not have time for in-residence professional military education and advanced degrees, which were frequently correlated with promotion according to an AFPC analysis. [80]

Finally, the decision to prohibit UAV pilots from receiving certain medals also potentially limited their promotion prospects. Because the USAF considered UAV pilots to be flying "combat support missions," rather than combat missions,

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[76] Byrnes (Sept-Oct. 2015) 39
[77] *ibid*
[78] Spinetta (July- Aug 2013) 105-106
[79] Brannen and Weisgerber (May 12, 2012)
[80] GAO (Apr. 2014) 32

they were not eligible for joint decorations such as the Air Medal or the Distinguished Flying Cross.[81] The decision to attach an "R" device to existing medals in early 2016 suggested a compromise, but in fact the device was awarded for exceptional administrative work, for which all airmen, including Predator and Reaper pilots, were already eligible.[82] As a result, it was unclear that the medal would substantively improve UAV pilots' promotion prospects because it was not on par with medals of a distinguished grade or medals awarded for combat action.[83]

Predator Pilot Morale: 2008-2015

The systematic biases against UAV pilots within the USAF continued to hamper retention of highly qualified UAV candidates through 2015. With the 18X career field still in its infancy, the USAF did not expect the 18X community to constitute even half the USAF's UAV pilot community until 2017.[84] Even with plans to increasingly rely on enlisted personnel and contractors, the USAF would still be relying on a majority of non-volunteer manned aircraft pilots in the short-term to meet the demand for more UAV CAPs.

The bulk of the UAV community was still comprised of the 477 former manned aircraft pilots who were "recategorized" as UAV pilots in March 2011 as permanent members of the UAV community. Pitched as a way to promote mentorship from experienced pilots, the program was actually detrimental to morale. Although 412 out of 477 pilots volunteered to recategorize, many did so fearing their promotion prospects in manned aircraft would be poor after spending time away in the UAV career field. "Yes, I voluntarily recatted to stay with RPA's, but some choices aren't really choices," one UAV pilot told me.[85] One UPT-direct UAV pilot said that he felt he really had no choice but to stay in the UAV

[81] Harrington Lee (July 26, 2012)
[82] Byrnes (Jan. 28, 2016)
[83] *Fox News* (April 15, 2013)
[84] Air Force Headquarters CAF & ISR Branch, A3O-AC (May 23, 2014)
[85] Predator pilot #1 interview (Dec. 2, 2014)

career field, now that he had missed the beginning of his manned aircraft career and would have to start from the bottom if he declined to "recat " into UAVs.[86]

Indeed, the introduction of the UPT-Direct program in 2009 bludgeoned morale. UPT candidates signed up to win an assignment flying a manned aircraft for the USAF. Being relegated to a UAV was largely perceived as a failure. The USAF-wide perception of the UPT-direct pilots was that they were low performers relative to their peers, just like the more experienced manned aircraft pilots forced to fly UAVs. The UPT assignment process fueled that perception. On assignment night, UPT candidates picked their aircraft based on rank in the UPT class, with the top performers choosing their assignment first. "Very few" of those top performers "stood up with every airplane in the Air Force inventory at their disposal and picked RPAs," said Col. Cantwell, the 732nd Operations Group commander at Creech AFB from 2012 to 2014. "The UPT grads were scared to death of the RPA," confirmed then-Brig. Gen. Gersten, the 432nd Wing Commander from June 2009 to June 2011.[87] But UPT candidates in the bottom third of their class had no choice but to pick a UAV assignment, because it was all that was left.[88] Despite the damage to morale, Gen. Welsh restarted the program in 2015 as part of his short-term "RPA Get Well" plan.

As early as 2008, the stigma surrounding the UAV community was widely recognized because of the relatively low performance of the non-volunteers and the resulting low morale. Gen. Schwartz acknowledged the outcast status of manned aircraft pilots forced to fly UAVs in a September 16, 2008 speech. "The Air Force culture must promote a strong and healthy UAS community—not a 'leper colony' or an agency of expedience," he said.[89] But years later, in 2014, the USAF was still relying on a majority of non-volunteered former manned aircraft pilots to fly UAV missions. As a result, the stigma associated with UAVs was worse than ever; many of these pilots signed up to fly in an airplane, and therefore saw their

[86] Predator pilot #2 interview (Nov. 29, 2014)
[87] Gersten interview (March 4, 2013)
[88] Cantwell interview (March 6, 2014)
[89] Schwartz (Sept. 16, 2008)

confinement to a ground control station as a punishment. "Headquarters Air Force officials, RPA pilots in some of our focus groups, and one unit commander stated that some in the Air Force view flying RPAs negatively, resulting in a stigma," wrote the GAO in a 2014 report. "According to these officials, one reason some view flying an RPA negatively is because flying an RPA does not require pilots to operate an aircraft while on board an aircraft in-flight."[90]

In 2015, UAV pilots were still unsure that the USAF was committed to removing the stigma. Gen. Welsh established the CPIP that year to explore ways to alleviate morale problems, but there was skepticism in the USAF about whether the effort was genuine, given that the USAF was still relying on short-term fixes that led to overwork, low promotion rates, and poor morale. One Predator pilot described the CPIP a "dog and pony show" that would give UAV pilots a chance to vent but would provide little actual improvement in the grating pressures of flying combat missions six days a week.[91] Tony Carr, a retired USAF colonel who manages a web site devoted to USAF culture issues, argued that the USAF's continued reliance on stopgap measures, such as recruiting UPT-direct pilots to RPAs, confirmed "there is no master plan. There is no strategy for contending with a chronic issue that has plagued the service for years."[92]

The USAF's $3 billion proposal to dramatically grow the size of the UAV community and open new UAV units was a sign of hope, particularly because it came from ACC, historically a bastion of resistance to UAV innovation. But the USAF still had a long way to go at the end of 2015 before the stigma surrounding the UAV mission could be resolved. To date, the demand for CAPs has led the USAF's pilot leadership community to take steps to systematically disadvantage the UAV pilot community. Rather than taking seriously the notion of building up a new career field by improving promotion prospects, the USAF's leaders continued to prop up a system of short-term fixes that institutionalized the stigma surrounding the UAV pilots.

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[90] GAO (2014) 18
[91] Predator pilot #1 interview (Dec. 2, 2014)
[92] Carr (June 12, 2015)

2. **To what extent were judgments about the potential and cost effectiveness of the Predator based on the USAF's enthusiasm for employing new technology and to what extent was the enthusiasm outside the service?**

The USAF's senior leaders, including Gen. Schwartz and Gen. Welsh, continued to show support for boosting Predator and Reaper CAPS as the US military shifted its focus to Afghanistan, and, eventually, other nations with which the US was not at war. There were still strong undercurrents of pessimism regarding the Predator and Reaper's cost and potential, however. According to 2010 survey data, the USAF's manned aircraft pilot community increasingly acknowledged asymmetric warfare as a long-term challenge, but it nevertheless saw survivable manned aircraft as the main solution to confronting challenges across the conflict spectrum.[93] In other words, while UAVs might be appropriate for asymmetric warfare, they were seen as useless in a high-end conflict because of their vulnerability to SAMs and fighters. This short-sighted view of the relevance of the Predator and the Reaper, combined with wartime pressure from Secretary Gates to build up UAV capacity quickly, meant that the USAF often adopted short-term fixes to build up its UAV inventory rather than a long-term approach to Predator and Reaper innovation.

The Schwartz Years: Growing Appreciation for the Strategic Relevance of UAVs in Asymmetric Conflict

Among some in the USAF's manned aircraft community, pessimism regarding the potential of UAVs remained, despite their increasingly apparent relevance in the current strategic context. In the fighter community, the pessimism sometimes bordered on disdain. In his autobiography, retired Lt. Col. Hampton complained

[93] See Smith (2014) Ch. 12 for survey of fighter pilots' views

that while Predators might have value in asymmetric conflicts, they would be useless in the event of a high intensity conflict, what he would consider a "real" war. "These little things, called Predators (which was also funny) were singularly useless in any kind of environment with SAMs, MIGs and anti-aircraft artillery. In other words — a war."[94] Col. Eric Mathewson, the head of the USAF's Unmanned Systems Task Force said that "inflexible attitudes" regarding the strategic potential of UAV technology were a major "roadblock" to implementing long-term UAV innovation plans. "You see a cultural resistance," he said. "It's the same thing with the horse cavalry during the introduction of the tank."[95]

Under the leadership of Gen. Schwartz, however, views of the Predator and Reaper's strategic potential started to change. He argued that the emerging strategic context would require the USAF to operate across the spectrum of conflict, and he predicted that a mix of manned and unmanned systems would maximize the USAF's capability to meet the challenges, ranging from non-state actors to near-peer adversaries, or some combination of these threats in a "hybrid" war.[96] In his interview with me, he explained that the current generation of UAVs would remain relevant in low-intensity conflicts and might also have relevance in a high-intensity war after the airspace is cleared. "The high threat scenario isn't a permanent condition," he explained. "As you attrit the threat, the range of assets increases, and its clear that persistent surveillance of the battlefield is of great value to the operators."[97]

In line with this view, Gen. Schwartz created the 18X career field to institutionalize UAV innovation in the USAF over the long term. Because 18X pilots were volunteers, they had a positive attitude about the future of UAVs in the USAF, suggesting they would be good advocates for UAVs moving forward. Then-Brig. Gen. Gersten told me in 2013 that when he was the 432nd Wing commander from June 2009 to June 2011, he observed that the first 18X pilots were "starving" to fly

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[94] Hampton (2012) 304
[95] Pappalardo (Feb. 25, 2010)
[96] Schwartz (Jan .20, 2010)
[97] Schwartz (Oct. 18, 2012)

UAVs in combat. “They would give anything” to earn their position on the UAV flight line, he said.[98]

The pilots in the UAV community saw great strategic potential for the Predator and Reaper in what they saw as an emerging era dominated by asymmetric conflict. Starting in 2011, the ballooning number of UAV missions beyond Afghanistan fueled the enthusiasm of the 18X pilots. “New opportunities have opened up with the hot pockets in the Middle East and ISIS,” said one UAV pilot who returned to flying manned aircraft in 2015. “When I left, the morale was the highest I’d seen and people were excited to come to work since we were operating in a more dynamic/kinetic environment,” he said.[99] Echoed another 18x pilot: “One of the cornerstones of morale continues to be the mission. Options have opened up to continue operations and morale in this area continues to be high.” [100]

USAF UAV commanders agreed that the Predator and Reaper were likely to remain highly relevant in an era of seemingly endless asymmetric conflict. “We are going to keep flying these things and we are going to be the only game in town for a number of regions,” said Col. Spinetta, who commanded the 69th Reconnaissance Group, a Global Hawk unit, from August 2013 to July 2015,[101]
Col. Tart took the argument a step further, arguing that, contrary to the predictions of the USAF’s manned aircraft pilot leadership, the Predator and Reaper also had strategic potential in a high-intensity conflict. “The fact is that ACC has not paid for any testing of the MQ-1 or MQ-9 in contested airspace,” said Col. Tart. “When people say it’s not good in contested airspace, I say: show me. At the end of the day, in a contested environment, if this little thing goes out there and gets shot down, that’s four million dollars,” compared to the fiscal and political costs of a manned aircraft shoot-down.[102]“

Outside the USAF, Secretary Gates shared the view that UAVs had strategic potential in the future, which he saw as being characterized primarily by

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98 Gersten (March 4, 2013)
99 Predator pilot #2 interview (Nov. 29, 2014)
100 Predator pilot #3 interview (Dec. 8, 2014)
101 Spinetta interview (Mar. 19, 2013)
102 Tart interview (Feb. 15, 2013)

asymmetric conflicts similar to the wars in Afghanistan and Iraq. As a result, he called for a long-term shift toward low-tech innovations optimized for counterinsurgencies, including UAVs for ISR and strike missions.[103] To be fair, Secretary Gates' predictions about the future threat environment did not include much discussion of the highest end of the threat spectrum, to include nuclear threats. In those instances, even Gen. Schwartz was dubious about the potential of UAVs. "I would ask you candidly, would you be comfortable with a nuclear-laden remotely piloted aircraft? I wouldn't be," he told an audience at the Center for Strategic and International Studies in February 2012.[104]

In fact, Secretary Gates' focus on delivering UAV capability for the ongoing low-intensity conflicts often came at the expense of long-term innovation for both manned and unmanned platforms designed to operate in high-end conflicts. While he was secretary, the USAF cancelled production of its F-22 Raptor, but it also dropped the MQ-X and the Predator C Avenger, both UAVs designed to operate in contested airspace. More importantly, the USAF faced enormous pressure to deliver UAV capability quickly, lacking the time and resources to focus on the long-term integration of the Predator and Reaper into its force structure. In this way, Secretary Gates ironically contributed to the USAF's tendency, with the exception of the 18X program, to focus on short-term plans to meet the demand for CAPs.

The Welsh Years: Initial Pessimism Runs into the Ongoing Strategic Reality

The creation of the 18X career field came shortly before the end of combat operations in Afghanistan in 2011, providing an opening for the new USAF chief, Gen. Welsh, to reflect on force structure priorities. Despite budget pressure, Gen. Welsh prioritized force modernization, emphasizing the importance of innovation as a means to improve military effectiveness without overspending. [105]

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[103] DoD (June 2008); Gates (Jan/Feb. 2009)
[104] Schwartz (Feb. 9. 2012)
[105] Lee (Aug. 30, 2012); Welsh (2013)

Initially, his tenure seemed to mark a return to a pessimistic view of UAVs' cost and potential. In September 2012, he was so unsure of the future relevance of Predators and Reapers beyond Afghanistan that his central concern was where to put them when they returned. "I don't know what we're going to do with them when they come back from Afghanistan," he said. "Buying more right now might not make any sense."[106] The next year, in November 2013, Gen. Welsh proposed reducing Predator and Reaper CAPs over Afghanistan in favor of investments in ISR alternatives, such as manned aircraft and satellites. "We need to trade some of that [RPA force structure] for investment in other platforms," he said, noting that combatant commanders in other theaters, such as US Pacific Air Forces, were not well-served by 65 CAPs. "You need something that looks at a broader area and cues those platforms to provide direct support to small units on the ground," he said. [107]

Although he had previously expressed interest in developing a new generation of UAVs for high-intensity clashes, he said in November 2013 that it would probably be too expensive to do so. "I'm a big fan of RPAs where they make sense," he said, "but we should not rush into a bunch of RPAs just because we can…there is nothing cheap about them. There is a lot of manpower behind them that isn't cheap either."[108]

Gen. Welsh's cautious view of the relevance of UAVs beyond Afghanistan was reinforced with much deeper skepticism at ACC. The commander, Gen. Michael Hostage, declared the Predator and Reaper to be "useless" in conflicts outside Afghanistan because of their small chance of surviving against even basic enemy air defenses. "We're not talking deep over mainland China; we're talking contested airspace," said Gen. Hostage. "Pick the smallest, weakest country with the most minimal air force — [it] can deal with Predator." Given his reservations about the Predator and Reaper's future relevance, he lobbied for a reduction in CAPs. "We're trying to convince [the Office of the Secretary of Defense] that the 65

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[106] Lee (Sept. 19, 2012)
[107] Lee (Nov. 14, 2013)
[108] *ibid*

[CAPs] challenge — while it made sense to the people who gave it to us when it was given, and we dutifully went after it — is not the force structure the nation needs or can afford in the anti-access, area-denial environment," he said. [109]

There seemed to be an agreement within the USAF, even among potential UAV advocates that "the place to take risk is in the permissive environment," as Lt. Gen. Robert Otto, the USAF's intelligence chief, explained in September 2013. Gen. Otto advocated a new generation of survivable UAVs to replace the Predator and Reaper, but in an era of tight spending the prospects of next-generation UAV innovation was mixed at best. The USAF had covertly developed the unmanned, stealthy RQ-170 Sentinel for ISR operations in denied air environments, but little was known about the UAV's capabilities or inventory, and Gen. Welsh had already declared his skepticism about the costs of a next-generation UAV fleet.[110]

These pessimistic views of the strategic potential of UAVS began to shift somewhat, however, as the demand for the UAVs in conflicts short of war continued to grow despite the drawdown in Afghanistan. Previously a source of strong skepticism, ACC, under the leadership of Gen. Carlisle, who arrived in October 2014, began to support Predator and Reaper innovation. With the support of Gen. Welsh, he unveiled a $3 billion plan in 2015 to build up the USAF's UAV community based on an evolution of views in the USAF that now saw the Predator and Reaper as sufficiently relevant in the emerging threat environment to warrant continued investment. Signaling a shift from the notion that the Predator and Reaper were a niche capability, Gen. Carlisle said the Predator and Reaper were "in demand across the range of military operations," adding that the UAVs have "really changed the way of warfare in many ways — or certainly the way we conduct in-theater airpower."[111]

Gen. Carlisle's proposal came as enthusiasm for USAF UAV operations outside the service continued to grow. The Obama administration and the CIA saw the current generation of UAVs as effective strategic assets for high value targeting

[109] Reed (Sept. 19, 2013)
[110] *ibid*
[111] Bowman (Dec. 10, 2015).

of terrorist suspects over the long term.[112] As early as 2012, President Obama defended the growing use of UAVs outside hot battlespaces."Our actions are effective…Dozens of highly skilled al Qaeda commanders, trainers, bomb makers, and operatives have been taken off the battlefield. Plots have been disrupted that would have targeted international aviation, US transit systems, European cities, and our troops in Afghanistan," he said. "Simply put, these strikes have saved lives."[113] Secretary Panetta, who served as CIA director from 2009 to 2011 before replacing Secretary Gates in the Pentagon, confirmed before his retirement in 2013 that Predator and Reaper strikes outside war zones would be a "continuing tool of national defense in the future."[114]

In addition to their effectiveness, UAV strikes became attractive as a means to reduce the political risks of downed aircrew during high value targeting operations outside war zones, as discussed in Question 3. The use of UAV strikes in nations with which the US was not at war also had the added advantage of minimizing collateral damage during a time when the international community expressed mounting outrage over suspected civilian deaths. "Conventional airpower or missiles are far less precise than drones, and likely to cause more civilian casualties and local outrage," President Obama said in a 2013 speech clarifying his administration's policy on UAV use.[115] John Brennan, the CIA director, confirmed the view that UAV strikes continued to provide a means to reduce collateral damage and minimize the US military's footprint abroad.[116]

Interestingly, one of the reasons for Gen. Welsh's appointment as chief was his first-hand experience with the important role that covert UAV missions had come to play in the White House's counterterrorism strategy. From 2008 to 2010, he served as a senior USAF representative at the CIA. "He understood the intelligence community better than most" as a result of that tour, recalled Gen.

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[112] CIA Directorate of Intelligence (July 7, 2009)
[113] Obama (May 23, 2013)
[114] Gerstein (Jan. 21, 2013)
[115] Obama (May 23, 2013)
[116] Brennan (April 30, 2012)

Schwartz, his predecessor.[117] During the first part of his tenure, however, Gen. Welsh shared Gen. Hostage's pessimistic view of the relevance of the current generation of UAVs in the future threat environment. As the continuing value of the UAVs became more apparent with time, however, his views seemed to shift in favor of a long-term approach to integrating the Predator and Reaper, which was reflected in the 2015 announcement to dramatically expand the USAF's Predator and Reaper operations.

3. To what extent were USAF judgments about the employment of the Predator driven by a desire to reduce the risk to friendly personnel, and to what extent was that push from outside the service?

Even as the operational success of the Predator and Reaper expanded beyond Afghanistan and Iraq, there was still a view inside and outside the USAF that UAV pilots' reduced exposure to risk was a liability rather than an asset. UAV pilots continued to be seen as filling a "combat support" role and therefore lacking the warrior credentials of manned aircraft pilots. That said, there was also a growing recognition inside and outside the USAF that the UAV pilots' reduced exposure to risk had some benefit, allowing them to achieve strategic impacts that would be difficult or impossible in a manned aircraft.

Views Inside the Predator Pilot Community: An Expanded Perception of the Warrior Ethos

Gen. Schwartz achieved an important victory for those who saw reduced exposure to risk as an asset when he created the 18X career field. That decision helped to quiet critics who said that only manned aircraft pilots had the warrior credentials to bring credibility to the Predator and Reaper programs. Gen. Schwartz, was, in effect, declaring that a new class of USAF officers were credentialed warriors

117 Schwartz interview (Oct. 20, 2015)

specifically because they could achieve combat effects remotely. “No Airmen measures his or her worth by their proximity to the fight,” he said during a March 2009 speech. “Everyone counts, everyone contributes. No job or specialty is more worthy than another because it takes all of us playing our respective positions to be successful.”[118]

The UAV community’s confidence in its warrior status continued to grow as its physical dislocation from the battlespace became an increasingly obvious asset. When I asked 13 UAV pilots at Creech AFB from a variety of backgrounds whether they considered themselves warfighters in 2014, all of them said yes. “Warfighter is a state of mind and a contribution to the war effort,” said one UAV pilot.[119] Echoed another: “I provide support every day to the war effort…i.e. fight the war. To me that is the definition of a warfighter.”[120] Embracing an expanded definition of the warrior ethos, UAV pilots increasingly stood up to detractors who judged warrior credentials strictly on the basis of proximity to combat. “You would have guys at the officer’s club giving your lieutenants and your captains shit because they are RPA drivers at Creech. They were looking down their noses at them,” recalled Col. Tart. “This was hysterical because they would reply: ‘who did you go kill in the war this week?’”[121]

Outside the UAV community, however, there continued to be a sense among some in the manned aircraft community that reduced exposure to risk was a strike against UAV pilots, regardless of their combat effects. In his autobiography, Hampton, the retired F-16 pilot, scoffed at one UAV pilot applying for an air medal, awarded for “single acts of heroism or meritorious achievements while participating in aerial flight” in non-peacetime operations. “Not too long ago, a Predator ‘pilot’ tried to write himself up for an air medal – it didn’t happen, but a lot of fine fighter pilots threw up at the thought,” he wrote. “What next? A Purple

[118] Schwartz (March 3, 2009)
[119] Predator pilot # 4 interview (June 12, 2013)
[120] Predator pilot #5 interview (Dec. 23, 2014)
[121] Tart interview (Feb. 15, 2013)

Heart for carpal tunnel syndrome?"[122] When Capt. Dave Blair, a UAV pilot, wrote an article in the *Air & Space Power Journal* questioning why UAV missions were considered "combat support," and therefore ineligible for air medals, he received some angry responses, many from retired USAF personnel but also from some active duty officers who said UAV pilots were combat support personnel because they have no "skin in the game."[123]

Obviously there was still a debate within the USAF about proximity to combat as a prerequisite for warrior credentials. The UAV community was becoming more comfortable with its role, advocating for an expanded definition of the warrior ethos that took into account effects on the battlefield. But there also remained a cultural tendency in the USAF to see UAV missions as secondary combat support operations that did not meet a traditional definition of the warrior ethos.

Views of Aircrew Risk Outside the USAF

Outside the USAF, ground forces continued to dismiss the potential of Predators and Reapers to reduce aircrew risk. A 2015 survey of 460 military personnel authorized to call in air strikes — including JTACs from all the services as well as Army Joint Fires Observers — found that respondents preferred manned aircraft when there was a high risk to ground forces because they distrusted the remote nature of UAV operations. Survey respondents said they got the impression that UAV pilots treated their calls for close air support in "danger close" situations with less of a sense of urgency than their manned counterparts. In contrast, they perceived that manned aircraft pilots would be quicker to respond due to their "intuition and experience," increased situational awareness, and sense of urgency due to the fact that they had "skin in the game" as a physical presence in the

[122] Hampton (2012) 304
[123] Blair (May-June 2012)

battlespace.[124] "On-site judgment from a live person makes me feel safer than someone controlling a computer screen," remarked one survey respondent.[125]

At the national level, however, the importance of the Predator and the Reaper as a means to reduce aircrew risk increased considerably. President Obama aggressively expanded the use of UAVs for air strikes in countries where the US was striving to minimize its military footprint for both political and security reasons. In a speech to announce that weaponized UAVs would be returning to Iraq in the summer of 2014 to counter ISIS, the president alluded to UAV strikes in Yemen as evidence of what could be achieved "without putting large numbers of US troops on the ground." He said that the US would look to expand that concept to Syria and Iraq.[126] The American public also increasingly supported the use of UAVs as a means to reduce aircrew risk in air strikes against ISIS, with 20 percent of respondents in a 2014 Quinnipiac University poll saying they preferred to use drones or cruise missiles "where American pilots are not at risk," and only two percent saying they would prefer to use manned aircraft.[127]

While President Obama was relatively comfortable with using UAV strikes outside war zones, there were also vocal critics in the US and the international community. In 2013, he gave a speech at the National Defense University defending his policy of flying UAVs over nations with which the US was not at war.[128] The speech followed a groundswell of criticism regarding the moral and legal issues of UAV use, particularly outside the "hot" battlespaces of Iraq and Afghanistan. In the US, there was a view among some veterans' groups that UAV strikes were unsporting or dishonorable because of the remoteness of UAV aircrews from combat. "Just the very idea of a pilotless aircraft is dishonorable," complained J.D. Wyneken, the director of the American Fighter Aces Association.[129]

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[124] Schneider and Macdonald (2015) 24
[125] Schneider and Macdonald (2015) 25
[126] Obama (June 19, 2014)
[127] Quinnipiac University (July 3, 2014)
[128] Obama (May 23, 2013)
[129] Michaels (Dec. 1, 2012)

These opinions were expressed even more openly after February 2013, when outgoing Secretary Panetta announced the creation of the Distinguished Warfare Medal. On behalf of US veterans, a bipartisan group of lawmakers criticized the medal's order of merit relative to other medals awarded for combat action, such as the Bronze Star, in a letter to Secretary Hagel, who replaced Secretary Panetta in February 2013.[130] Many UAV pilots themselves felt that while a medal was appropriate, its order of precedence was, in fact, too high.[131] Secretary Hagel cancelled the medal in April 2013 in response to the uproar.[132] The Pentagon announced in early 2016 that UAV pilots would be eligible for an "R" device. This time, however, many UAV pilots felt the device went too far in the other direction of failing to recognize their ability to achieve combat effects. An informal poll of USAF combat wings revealed that officers found the "R" device "detrimental and demotivating."[133]

In the US and abroad, the USAF's own reservations about the warrior credentials of its UAV pilots fueled a larger debate about the morality and legality of US UAV operations. One retired USAF fighter pilot argued that UAVs were unethical because they undermined "the foundations of the laws of war by removing moral equity of combatants." He and some former USAF enlisted personnel argued that UAV strikes violated the principles of just war theory by giving an unfair advantage to remotely based US aircrews over the adversaries they were targeting.[134]

Some US and international scholars argued that this unfair advantage, when applied outside existing war zones, created a moral hazard by lowering the threshold for the US to go to war. Because UAV pilots were kept away from the dangers of the battlespace, civilians were more willing to authorize UAV strikes knowing there was minimal risk to their own forces.[135] Along these same lines,

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130 Lee (Apr. 16, 2013)
131 For example, Jaffe (Feb. 28, 2010)
132 *ibid*
133 Byrnes (Jan. 28, 22016)
134 Riza (2013)168; Heller (Dec. 7, 2015)
135 Kreps and Zenko (March/April 2014); Heyns (Apr. 9, 2013)

three former USAF UAV sensor operators and one UAV technician made public statements in late 2015 claiming that the work of UAV aircrews at Creech AFB was “morally outrageous” because it had become too easy to authorize strikes without hard evidence of a target’s involvement in terrorist activity.[136]

The USAF’s UAV pilot community remained vulnerable to this legal and moral criticism because USAF itself was still struggling to reconceive its own definition of the warrior ethos. UAV pilots still faced scorn from some inside the USAF who felt they were not proper warriors because they were not at risk. Outside the USAF, the warrior credentials of the USAF’s UAV pilot community were further called into question in 2015 when the USAF revealed it was already relying on civilian contractors to fly Reaper CAPs.[137] The blurring of the lines between a USAF UAV pilot and a civilian contractor further detracted from the warrior status of the former.

Ultimately, the USAF’s own reservations about the warrior credentials of its UAV pilots exposed the entire service to external criticism that the USAF was gaining an unfair advantage in war by employing UAVs. A fundamental tenet of US airpower doctrine is that it provides an “asymmetric advantage” over adversaries.[138] To suggest that seeking to enhance this advantage through the use of UAVs was morally negligent was to call into question the very purpose for having an independent Air Force in the first place. Although this was likely not the intention of those in the USAF who questioned UAV pilots’ warrior credentials, the effect was to undermine the legal and moral basis on which the USAF employed airpower.

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[136] Heller (Dec. 7, 2015)
[137] Beauchamp (Jan. 24, 2016)
[138] Air Force Headquarters (March 15, 2013)

4. **To what extent were judgments about the Predator based on a concern about maintaining the USAF's primary control over those air assets in response to competition from civilian and military institutions?**

The USAF's bid for executive agency, initiated by Gen. Moseley before he was fired, had invited criticism of the USAF's UAV policies at a time of cultural upheaval. The USAF was in the midst of a high-stakes debate over the qualifications needed to fly UAVs. The outcome of the debate would have significant repercussions for USAF pilot identity and, by extension, the identity of the USAF itself. The USAF's manned pilot leadership community had built their justification for dominance around the USAF's capacity to independently achieve war-winning effects through the expert employment of manned aircraft. Ongoing UAV operations raised questions not only about the centrality of manned aircraft pilots in USAF operations, but also about whether the USAF needed to act independently to achieve strategic effects, or whether it could play a supporting role.

In terms of the USAF's role relative to other services in wartime, Gen. Schwartz and Gen. Welsh seemed to side with those who believed it was possible for the USAF to make a strategic contribution without acting completely independently. To this end, Gen. Schwartz dropped all discussions of executive agency, and instead focused maximizing the USAF's impact in a supporting role. "The larger imperative was to be 'all in,' and I think there was a lingering perception that the USAF wasn't all in to the fight," Gen. Schwartz told me in October 2015.[139] Similarly, Gen. Welsh emphasized that the USAF's UAVs played a supporting role to ground forces in the fight against ISIS. In his view, the UAV strikes were meant to "inhibit ISIS, to attrit ISIS, to slow ISIS down, to give a ground force time to be trained because the ground force will be required." [140]

Both Gen. Schwartz and Gen. Welsh also seemed willing to adopt a broader conception of pilot identity, taking into account the possibility that airmen other

[139] Schwartz interview (Oct. 20, 2015)
[140] Welsh and James (Jan. 15, 2015)

than fully-trained manned aircraft pilots could operate UAVs. Gen. Schwartz established the 18X career field based on the belief that officers with less training than manned aircraft pilots could fly UAVs effectively. Gen. Welsh pushed the bounds of pilot identity further with his decision in late 2015 to allow enlisted personnel to fly the Global Hawk and to consider allowing enlisted personnel to fly armed UAVs. The latter possibility would become even more realistic if the USAF followed through with its plans to introduce ATLS for the Reaper, which would automate the part of the flight envelope where stick-and-rudder skills were most needed.

All of these efforts contributed to the formulation of a more comprehensive, flexible view of airpower theory. The USAF did not need to operate independently, or rely on the unique contributions of USAF manned aircraft pilots, to make a strategic impact. This broader view of airpower theory buffered the USAF against critics who argued that the service was losing relevance as a warfighting institution because it was clinging to a doctrine built around manned aircraft even as UAVs proliferated. For example, the USAF's decision to allow new categories of personnel to fly UAVs with less training than manned aircraft pilots, including 18X pilots, enlisted personnel, and contractors, provided a counterpoint to Van Creveld's argument that the USAF was losing its institutional relevance as automation was diminished the need for manned aircraft pilots to fly manned or unmanned systems.[141]

While this broader view of airpower theory improved the USAF's capacity to contribute to ongoing UAV operations, however, it also had a downside. Just as the USAF's narrow view of airpower theory had led critics to question the service's relevance in Afghanistan and Iraq, an exceedingly broad view also risked provoking questions about the USAF's institutional relevance in the future. For example, if the USAF completely shifted responsibility for UAV operations from officers to enlisted personnel and contractors, this could raise questions about why the USAF needed to be involved in UAV operations at all. The USAF recognized the

[141] Van Creveld (2011) 437

danger of completely removing its officer corps from UAV operations in a 2009 Air Force Research Institute Paper. Drawing on Rosen's intraservice model of military innovation, the report argued that only officers have the authority and status to lend credibility to notion that the USAF considers UAV operations to be part of their core mission set.[142] Without an officer presence in the USAF's UAV community, the USAF risked the charge that it was not taking the UAV mission seriously.

Conclusion

Wartime expediency forced the USAF to expand its UAV capabilities during Gen. Schwartz and Gen. Welsh's tenure. But the pressure on the USAF's force structure — especially the manned aircraft community — was becoming unbearable. As had been the case during Gen. Moseley's tenure, the USAF's ongoing dependency on manned aircraft pilots, many of whom did not want to fly UAVs, aggravated cultural tensions and the long-term prospects for UAV integration in the USAF.

Gen. Schwartz partially addressed the stress on this community by creating an 18X career field to help man current UAV operations and to build up a long-term USAF UAV enterprise. In this way, he acted as a "norm exploiter," seeking to find ways to accommodate UAVs within USAF culture by attracting candidates who actually wanted to fly UAVs. Gen. Welsh's "RPA Get Well Plan" and Gen. Carlisle's $3 billion proposal to expand UAV operations also provided some hope for relieving the short-term UAV manning problem and aligning the Predator with USAF culture.

But the prospects for UAV innovation over the long term were still uncertain. Gen. Schwartz and Gen. Welsh took actions that reflected their awareness of the growing relevance of UAVs in a protracted era of asymmetric conflict. However, there were still powerful undercurrents of cultural bias in the manned aircraft community that emerged in discriminatory UAV promotion and

[142] Rosen (1991); Schultz (Oct. 2009) 36

basing policies, pessimistic assessments of the strategic context and negative views of UAV pilots' warrior status. These powerful undercurrents were undermining the USAF's capacity to meet the relentless demands for Predator and Reaper capability, calling into question the service's institutional relevance in ongoing conflicts.

Recognizing that continued reliance on the manned aircraft community to fly UAVs was reinforcing these negative trends, USAF leaders sought to adopt broader conceptions of the warrior ethos and to expand UAV pilot qualifications to allow new groups of personnel to fly UAVs. While these efforts enabled the USAF to meet the relentless demand for more Predators and Reapers, however, they also risked raising questions about whether the USAF had anything unique to offer to UAV operations.

As the year 2016 began, the USAF continued to walk a tight rope in regards to UAV innovation. On one hand, USAF leaders ought to overcome longstanding institutional preferences for manned aircraft and manned aircraft pilots over UAVs. On the other hand, USAF leaders had to guard against the potential for enacting cultural changes that improved the USAF's capacity for UAV innovation at the expense of the qualities that made the USAF unique, including its cadre of officers trained to employ airpower for strategic effects.

CONCLUSIONS

My concluding analysis of the relationship between USAF culture and UAV innovation is divided into three parts. The first section draws on the four-sub-questions asked across the history of USAF UAV innovation to identify significant patterns and changes in USAF culture over time. The second section explores an overarching theme that emerges across the analysis of these four sub-questions, which is that innovation in the Predator program was influenced by three factors: the strategic environment; USAF leadership behavior; and, most importantly, USAF identity, perhaps the main determinant of the USAF's capacity for innovation. The third section discusses possibilities for further research.

USAF Culture and UAV Innovation: Significant Cultural Trends

In his doctoral dissertation on UAV innovation, Col. Ehrhard argued that the USAF's historic lack of sustained support for UAV innovation had far less to do with culture than with technological immaturity, cost, and performance problems. In his view, to the extent USAF culture mattered at all, it exerted a positive influence and even contributed to a "general enthusiasm for UAVs that in retrospect was not supported by technology at the time."[143] Contrary to Ehrhard's research, I found that while USAF culture has positively influenced UAV innovation, in some respects, there are also significant undercurrents of cultural bias that have obstructed UAV innovation. The four sub-questions below explore the evidence I have gathered across the history of USAF UAV innovation to reach this conclusion.

[143] Ehrhard (2000) 493

1. **To what extent did individuals or groups within the USAF resist UAV innovation out of a concern that their jobs or status might be threatened by it?**

Some scholars argue that USAF has not reflexively welcomed alternatives to manned aircraft that might increase the service's war-winning potential. The USAF's leadership community, first dominated by bomber pilots and, later, fighter pilots, has tended to focus on narrow conceptions of airpower theory built around manned aircraft as the central tools for winning wars. Therefore, if a new technology threatens to replace their preferred weapon system, they resist it. The most frequently cited example is the USAF bomber leaders' reluctance to embrace the ICBM because they perceived that it as a direct threat to the manned bombers around which they built their justification for an independent USAF and their future prospects for promotion.[144]

Contrary to Ehrhard's finding that there is no pro-pilot bias stunting UAV innovation in the USAF,[145] I found that the relationship between USAF culture and UAV innovation reflects a tendency to see alternatives to manned aircraft as a threat. Historically, the USAF's manned aircraft pilot community has been most likely to indulge this tendency during peacetime, while in wartime it briefly embraced UAVs out of necessity. The prime example is TAC's approach to UAVs during the Vietnam War. After rejecting UAVs before the war because they threatened to diminish the role of manned reconnaissance aircraft, TAC aggressively employed UAVs to meet wartime demand. After the war, TAC abandoned UAVs to the chagrin of lawmakers and Pentagon civilians, even as other military services continued UAV development.

The manned aircraft community's tendency to see UAVs as a threat persisted with the introduction of the Predator program in 1993. But the clear pattern of wartime adoption and peacetime rejection dissolved with the shift in the strategic environment following the 1991 Gulf War. The USAF faced constant

[144] Builder (1989); Werrell (1985); Perry (Oct. 1967)
[145] Ehrhard (2000) 492-493

pressure to field UAVs to the absolute limit in response to the challenges presented by growing US involvement in conflicts that fell short of full-scale war.

With no relief from combat operations in sight, manned aircraft pilots no longer had the option to ignore UAVs. To the contrary, an increasing number of manned aircraft pilots were forced to give up flying — and the career satisfaction and status that came with it — to operate UAVs in conflicts ranging from Bosnia to Kosovo and Afghanistan and Iraq. As more manned aircraft pilots were forced to fly UAVs, some came to see the growing relevance of UAVs as a direct, long-term threat to their jobs and status in the USAF.

Acting as a "norm exploiter," Gen. Schwartz, chief from 2008 to 2012, sought to mitigate the growing resentment toward UAVs by starting to shift the burden of flying them to a new 18X community of volunteer UAV pilots. In line with Rosen's model of military innovation, Gen. Schwartz hoped that this new career field would provide a pathway for a generation of UAV officers to rise to senior positions from which they could advocate a new way of warfare that saw UAVs as playing a central role in the emerging strategic context.

Rather than seeing the 18X career field as an attempt to relieve the burden on them, however, manned aircraft pilots tended to see the move to foster UAV advocacy in a competing career field as a threat to their dominance. To protect their lock on leadership, manned aircraft pilots showed a tendency to adopt a narrow conception of airpower theory that emphasized the primacy of manned aircraft operations at the expense of everything else. In practice, this belief provided the justification for the manned aircraft community to monopolize leadership positions and to obstruct UAV innovation in a variety of ways, including systematic attempts to limit UAV pilots' promotion prospects.

The USAF's cultural tendency to obstruct UAV innovation is consistent with Posen's civil-military model, which predicts that military organizations, when left to their own devices, will resist innovation in favor of preserving old ways of doing business, or SOPs, that have become so culturally engrained that they tend to persist even after they have outlived their usefulness.

2. **To what extent were judgments about the potential and cost effectiveness of UAVs based on the USAF's enthusiasm for employment of new technology and to what extent was the enthusiasm outside the service?**

The authors of the USAF's influential strategy document released in 1990, *Global Reach-Global Power,* called on the USAF to embrace technological innovations of all types as a means to advance the USAF's war-winning edge.[146] The document declares: "our aerospace forces and technology are a national treasure and a competitive edge, militarily and commercially."[147] Given technology's central role in airpower, Builder argues that the USAF's very existence depends on its continued enthusiasm for technological progress across a growing array of air and space power assets.[148] In his dissertation, Ehrhard argues that USAF culture supports this institutional imperative. The service's senior manned aircraft pilots have historically "made rickety UAV programs fly efficiently," he claims, because "their love of technology perhaps allowed more flexibility concerning non-standard forms of aerospace power."[149]

In line with Ehrhard's findings, I found that senior USAF leaders often adopted a broad conception of airpower that embraced UAV innovation. These leaders sought to enact a cultural shift in favor of UAV innovation despite pervasive pessimism in the manned aircraft community regarding the potential of UAV technology. Contrary to Ehrhard's findings, however, I found that the USAF's broader manned aircraft pilot community persistently expressed pessimistic views about the cost and potential of UAVs despite the efforts of USAF leaders to promote a culture that favored UAV innovation.

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[146] Rice (1990) 4-6
[147] Rice (1990) 14
[148] Builder (1989)19
[149] Ehrhard (2000) 592-593

Turning to pre-Predator history, I found that the manned aircraft community's negative views of UAV innovation were more prevalent during peacetime than wartime. Following spikes of UAV enthusiasm among airmen during WWII and the Vietnam War, pessimistic assessments of UAVs contributed to the rejection of UAV innovation once the wars ended. Even Gen. Arnold, a highly regarded USAF forefather, failed in his attempt to infuse enthusiasm for future UAV innovation at the end of WWII.

In contrast, during the Predator program the USAF's perceptions of UAVs were more consistently pessimistic because there was no clear wartime impetus to temper those reservations. The manned aircraft community, and particularly ACC, headquarters for combat aviation, shifted to their historic focus on high-intensity conflict for which UAVs would be poorly suited because of their vulnerability to enemy air defenses and fighters. Highly survivable manned aircraft were a top priority because they were considered proven technology that could operate across the spectrum of conflict, while UAVs were viewed as relatively untested and totally useless in the kind of conflict that the USAF was most worried about fighting.

USAF leaders tried to shift these perceptions starting in 1995 with the adoption of the Predator program. Acting as what Farrell calls a "norm entrepreneur," Gen. Fogleman adopted the Predator as a symbol of what he saw as the growing importance of reconnaissance in the emerging asymmetric threat environment. His attempt was only somewhat successful, however, because his decision to force manned aircraft pilots to fly the Predator reinforced the view within that community that UAVs posed a threat to their jobs and status. In 2000, Gen. Jumper, the commander of ACC, enjoyed slightly more success in trying to shift USAF culture by attempting to align Predator innovations with the cultural preferences of the manned aircraft pilot community. Acting as a "norm exploiter," Gen. Jumper weaponized the Predator, an act that molded the UAV to conform to the manned aircraft pilot community's preference for systems that deliver kinetic effects.

These leadership attempts to shift USAF culture, combined with wartime necessity after the September 11 attacks, fueled a surge in support for UAV innovation. But as the wars wore on, views of UAV innovation diverged. Many in the service, including Gen. Moseley, USAF chief from 2005 to 2008, and Gen. Hostage, the ACC commander from 2011 to 2014, urged the USAF to shift its strategic emphasis to the risks of a high-intensity conflict for which the current generation of UAVs was ill-suited. But others in the USAF, including Gen. Schwartz, the USAF chief from 2008 to 2012, and Gen. Welsh, the chief from 2012 to the present, viewed asymmetric war as an ongoing threat severe enough to warrant a continued emphasis on the Predator and its follow-on system, the Reaper.

Outside the USAF, many in the US government shared the view that the Predator and Reaper would continue to play central roles in a seemingly endless era of asymmetric conflict. Therefore, the USAF needed to focus its planning and resources on the current generation of UAVs, and there was less of an immediate need to focus on highly survivable aircraft, manned or unmanned, for high-intensity clashes that were unlikely to occur. Secretary Gates championed this position, which became even more widespread in the government as the Obama administration expanded its counterterrorism campaign beyond Afghanistan and Iraq, which further increased the demand for the Predator and the Reaper.

Despite this outside pressure and the encouragement of some USAF leaders, the manned aircraft community's enduring pessimism about the Predator often obstructed UAV innovation between 1993 and 2015. In an era of strategic ambiguity, the USAF's manned aircraft community saw the Predator as a distraction from manned aircraft, a proven weapon system that they saw as having strategic potential across the spectrum of conflict. But this view was losing credibility as the strategic relevance of the Predator, at least in the current context, was becoming increasingly apparent. The dissonance between the USAF's strategic planning and the realities of the strategic context suggests that, contrary to Ehrhard's findings, the USAF was not willing to embrace a broad conception of airpower by accepting alternatives to manned aircraft to maximize its strategic relevance.

3. **To what extent were USAF judgments about the employment of UAVs driven by a desire to reduce risk to friendly personnel and to what extent was that push from outside the service?**

Over the history of airpower, technological innovation has allowed Western air forces to dramatically reduce air combat casualties, thereby fueling two emerging norms in Western culture: growing casualty sensitivity and an increasing disassociation between air forces and heroism. By even further reducing aircrew risk, the proliferation of UAVs in Western society has reinforced these norms.

Historically, the USAF's willingness to use UAVs to reduce aircrew risk in wartime varied according to the degree of casualty sensitivity among USAF commanders, US civilian leaders and the American public. With the exception of Gen. Arnold, USAF officers were not particularly interested in using UAVs to reduce aircrew risk in WWII. Casualty tolerance was high both because vital interests were perceived to be at stake and because the technology was not yet available to considerably reduce casualties. During the Vietnam War, however, the USAF aggressively employed UAVs in response to growing casualty sensitivity, triggered by the perception that the conflict was not vital to US interests and by rising expectations about the potential for new technologies to reduce combat losses.

During periods of peacetime, in contrast, the USAF found that in the absence of immediate concerns about combat losses, it could afford to greatly reduce its emphasis on UAVs as a means to reduce aircrew risk. This course suited the service because a secondary concern of airmen had been that a growing reliance on UAVs might fuel a disassociation between the USAF and heroism. After Vietnam, for example, the USAF worried about what it considered unacceptable aircraft loss rates. Yet it took steps to enhance the survivability of its fighters in contested airspace, rather than pursuing UAV innovations that would further remove its pilots from the valor of combat.

Over the history of the Predator program, internal USAF perceptions of the value of UAVs as a means to reduce aircrew risk have begun to diverge from the perceptions of civilians and the American public. The rise of seemingly endless asymmetric conflicts following the 1991 Gulf War has created ambiguity about the emerging strategic context. As a result, the value of using UAVs to reduce aircrew risk has become more open to interpretation. To be sure, some historical patterns have persisted. During the air wars over Bosnia and Kosovo in the 1990s, USAF commanders, civilian leaders and the American public continued to prize UAVs as a way to reduce aircrew risk in these conflicts, in which vital interests were not perceived to be at stake. Also in keeping with the historical precedent, the USAF, civilian leaders and the American public were less concerned with the employment of UAVs to reduce aircrew risk immediately after the September 11 attacks, when America's vital interests were perceived to be at stake.

As the wars in Afghanistan and Iraq wore on, however, the USAF's perceptions of UAVs as a means to reduce aircrew risk began to diverge with the perceptions of the White House and the American public. The Obama administration increasingly valued UAVs as a means to reduce risk to aircrew, particularly as it shifted its counterterrorism campaign beyond Afghanistan. Operating outside official combat zones, often in clandestine missions, the White House believed it was now more important than ever to minimize risks to aircrew because of the political risk associated with the capture of a downed pilot over a territory with which the US was not officially at war. The American public also increasingly supported the use of UAVs as a means to reduce aircrew risk.

Inside the USAF, however, there was a growing sense that the US was now locked in a never-ending asymmetric conflict that required the USAF to employ its UAV capability to the maximum. With no end to this demand in sight, the USAF returned to its longstanding peacetime concern with preserving the association between aircrews and heroism. As more manned aircraft pilots were pulled from the cockpit to fly Predators, the manned aircraft community became increasingly concerned about preserving its warrior identity. Some manned aircraft pilots felt that the growth of the UAV career field posed a threat to the pilot community's warrior credentials, built around the demonstration of courage and skill in aerial combat. Others, including Gen. Schwartz, argued for the adoption of a broader conception of the warrior ethos that took into account not only combat risk but also combat effects.

The USAF's conflicted views about the warrior credentials of its UAV pilots left it vulnerable to external scrutiny. As the Obama administration expanded UAV strikes against terrorist suspects operating outside official combat zones, the USAF's internal debate about the warrior status of its UAV pilots fueled a broader international discussion about the morality and legality of UAV strikes conducted by pilots who were not physically at risk. Taken to its logical conclusion, the claim of some manned aircraft pilots that UAV pilots were not proper warriors exposed the entire USAF to external criticism by suggesting that the service was gaining an unfair advantage in warfare by reducing risk to aircrews.

4. To what extent were judgments about UAVs based on a concern about maintaining primacy over air assets in response to competition from other civilian and military institutions?

Halperin's theory of organizational essence predicts that, like any large institution, air forces will jealously guard their autonomy by seeking a monopoly over things they see as essential to their core missions.[150] Edgely argues that the USAF has been particularly protective of assets it perceives as close to its core functions because of a longstanding insecurity about its position as an independent service. Like air forces in other democratic cultures, the USAF was established much later than national navies and armies and therefore engaged in constant inter-service rivalry as the Army and Navy sought to protect their own institutional power by seeking to maintain control of their own air arms.[151]

Given its perennial insecurity over independence, the USAF and like-minded air forces tend to see inter-service competition for greater resources and

[150] Halperin and Clapp, with Kanter (2006) 27
[151] Edgeley (June 2010) 19-35

prestige as a fundamental threat to their existence.[152] With the stakes so high, the USAF can be expected to jealously safeguard aerospace assets and missions that are viewed as essential to its continued independent functioning. In practice, this means that if the USAF takes an expansive view of airpower theory, it will fight for a broad range of aerospace assets, including UAVs, in response to external challengers. However, if it takes a more narrow view of its core functions as being tied only to manned aircraft, then it may either ignore an external challenge to UAV management or seek to control the UAV program only to slow development or kill it.

Historically, the USAF has been most protective of UAVs under the influence of powerful leadership or in response to wartime pressure. The main historical leadership example is Gen. Arnold, who challenged the Army's control of unmanned programs after WWII because he knew airmen needed all the war-winning capability they could muster to establish an independent air force. The historical tendency for the USAF to protect its control of UAV assets in wartime can be seen in the case of the Vietnam War. The success of UAVs for reconnaissance missions created a competition between SAC and TAC to control the technology. But once the war ended, those commands quickly returned to a narrow conception of airpower theory focused on manned aircraft.

In the case of the Predator program, USAF leaders pursued the service's protective instincts, but wartime demand was not an obvious source of pressure. The blurring of the line between war and peace following the first Gulf war led to diverging interpretations of the strategic environment. During the McPeak era, for example, the USAF ignored the Predator program based on the perception that the service's main concerns were to deter and fight a high-intensity conflict in which UAVs would have little relevance. But the USAF's 1995 *volte face* under the leadership of Gen. Fogleman reflected the view that ISR would become a central USAF mission in future conflicts and therefore the Predator could not be ceded to another military service. Similarly, Gen. Jumper fought for the USAF to play a

[152] Edgeley (2010) 64

central role in Predator operations prior to the invasion of Afghanistan because he wanted the USAF to be the service to capitalize on the Predator's strategic potential in the emerging threat environment. The USAF's protective tendencies emerged again when Gen. Moseley made a bid to win executive agency over medium and high-altitude UAVs while he was chief.

These bids to control the Predator program suggest that inter-service rivalry was a powerful source of Predator innovation. In line with the inter-service rivalry model of military innovation, the USAF scrambled to control a new capability to prevent another service from encroaching on an air asset that could contribute to the USAF's strategic relevance. As mentioned earlier, however, another possibility is that the USAF sought control of the Predator program in some instances to slow its growth. Some outsiders suggested that the USAF's bid to control the Predator program in 1995 reflected this tendency. Similarly, Secretary Gates suggested in his 2014 book that the USAF's bid for UAV executive agency was a ploy meant to stifle the Predator-class UAVs because the service had sought to obstruct UAV innovation in the past.

In closing, it is clear that USAF leadership has played a critical role in determining the USAF's reaction to external interest in the Predator program. USAF leaders made judgments about whether to protect the Predator from outside meddling based on their views of airpower theory. Wedded to a narrow view of airpower theory, Gen. McPeak ignored the Predator in favor of focusing on proven manned aircraft for a high intensity conflict. In contrast, Gen. Fogleman pursued the Predator program based on a broad view of airpower theory that acknowledged the possibility that other airpower platforms, such as UAVs, might perform the same mission as well as, or better than, manned aircraft, at least in some strategic environments. In more recent history, the USAF has taken a less possessive stance, but it is too early to say whether this position marks a return to the McPeak era or an effort to embrace UAV innovation through a more flexible approach that does not require total USAF control.

Key Determinants of the USAF's Capacity for Innovation: Strategic Context, Leadership, and USAF Identity

Contrary to Ehrhard's interpretation, the analysis above indicates that the USAF's powerful undercurrents of cultural bias against UAV innovation shaped, and were shaped by, the Predator program. The USAF's manned aircraft pilot community has often seen UAVs as a threat, taken a pessimistic view of UAV technology, downplayed the potential for UAVs to reduce aircrew risk, and either ignored the Predator program or sought to control its rate of growth. To overcome these biases, visionary leaders have sought to manipulate Predator innovation in a way that encouraged a cultural shift in favor of UAV technology. Their powerful moderating influence on USAF biases against UAV innovation helps to explain how the USAF was able to integrate the Predator program as far as it did. Despite periods of muted resistance, however, the USAF has not completely relinquished its undercurrents of bias against UAV innovation. While these biases did not prevent the USAF from ultimately adopting the Predator and the Reaper, they slowed the process and also raised troublesome questions about the USAF's capacity to embrace new innovations to maintain its relevance in future conflicts.

The analysis of the four questions above indicates that the USAF's capacity to pursue innovation in the Predator program changed over time based on perceptions of three factors: the strategic context; USAF leadership behavior; and, USAF identity. By analyzing the influence of these factors on the USAF's relationship with the Predator program, I aim to contribute to a broader understanding of how USAF culture influences the service's capacity for military innovation in general — a critical determinant of its continued institutional relevance.

The Strategic Environment

The impact of the strategic environment on the USAF's relationship with the Predator program changed over time. Historically, airmen embraced UAV innovation during wartime out of necessity, but rejected UAV innovation when peacetime afforded the luxury of regressing into their longstanding cultural preferences for manned aircraft over any alternatives. But this pattern of UAV adoption and rejection became murky after the 1991 Gulf War as non-state actors and violent extremist groups increasingly sought to uproot the existing international order by engaging in violence that fell short of all-out war.[153]

With the lines between war and peace increasingly fading, the strategic relevance of UAVs became far more open to interpretation. Many in the USAF's manned aircraft community chose to interpret the rise of asymmetric conflict as a distracting adjunct to the more worrisome prospect of a high-intensity clash in the future, which would require highly survivable aircraft that could operate across the spectrum of conflict. To manned aircraft pilots, the growing strategic ambiguity of the threat environment offered an opportunity to lapse into their historical peacetime preferences for doctrine built around the primacy of manned aircraft, around which their jobs and status in the USAF were built.

USAF leaders enjoyed some success in mitigating these biases, and after the September 11 attacks, the invasions of Afghanistan and Iraq further diminished manned aircraft pilots' skepticism as the utility of the Predator in those conflicts became increasingly obvious. But as the wars dragged on and the Obama administration expanded its focus to UAV strikes outside "hot" conflict zones, strategic ambiguity returned. With it, a divergence in views regarding the

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[153] United States Special Operations Command (Sept. 9, 2015) 1-6

Predator's utility also resurfaced, with many manned aircraft pilots retreating to their pessimistic views of UAV innovation.

Leadership Behavior

The actions of USAF leaders sometimes provided a powerful, but ultimately insufficient, counterbalance to the strong undercurrents of cultural bias against UAVs in the USAF. Although they were manned aircraft pilots themselves, Gen. Fogleman, Gen. Jumper and Gen. Schwartz nevertheless broke with the cultural norms of their community to promote processes of cultural change (norm entrepreneurship and norm exploitation, respectively) in favor of UAV innovation. Despite their limited ability to shift USAF culture over the long term, without them the USAF may have never adopted the Predator program or improved it to maximize its strategic potential. Therefore, it is worth examining the chief selection process to determine how these individuals arrived at a position from which they could influence the USAF's approach to UAV innovation.

USAF chiefs come from a limited pool of candidates. Historically the USAF's general officers have always been pilots, with fighter pilots dominating since the early 1980s, although their percentage of general officer slots has declined with the shifting emphasis toward asymmetric conflict in recent years.[154] My research indicates that manned aircraft pilots tend to share a preference for their own platforms to achieve strategic effects, even in asymmetric contexts. Within this group, however, there is variation enough to allow for the selection of chiefs who are more or less willing to promote a broader conception of airpower.

The personal preferences of senior leaders inside and outside the USAF determine what kind of chief is selected. The sitting USAF chief and secretary pick their nominees (usually they agree, but not always), which are vetted by the other military services through the JCS before the Secretary of Defense makes a

[154] Smith (2014) Fig. 11.2 and 11.3

recommendation to the White House, which ultimately nominates an individual who must then be approved by the US Congress.[155]

Because the secretary of defense and, ultimately, the president, has considerable influence on chief selection, they have a powerful, if indirect, impact on the USAF's approach to innovation. For example, Secretary Rumsfeld supported Gen. Moseley's nomination as chief based on their similar views that USAF modernization to fight a high-end conflict would be key to winning future wars, while the current generation of UAVs offered only a niche capability. In contrast, Secretary Gates fired Gen. Moseley and supported the nomination of Gen. Schwartz based on their shared view that the current generation of UAVs were essential capabilities for the foreseeable future that demanded the USAF's continued focus.

USAF Identity

While USAF leaders enjoyed some success in shifting perceptions of UAV innovation within the USAF, in their absence the manned aircraft pilot community tended to interpret strategic ambiguity as a reason to retreat to a culturally engrained preference for war planning built around manned aircraft. The USAF's diverging views regarding the strategic relevance of UAVs were emblematic of a larger, existential debate about USAF identity. Oftentimes, the manned aircraft community's focus on platforms created the impression outside the USAF that the service narrowly limited its remit to the strategic employment of manned aircraft. The danger of this perception was that it exposed the service to external criticism regarding the USAF's institutional relevance in regard to other platforms, roles, missions, and mediums including space and cyberspace. On the other hand, the USAF leadership's periodic efforts to establish the USAF as embracing a broad variety of aerospace power missions risked the perception that the USAF had expanded its remit so broadly that it lost its legitimate claim to mission specialist expertise.

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[155] Deptula interview (Aug. 13, 2015)

The USAF's internal debate about the warrior ethos is a prime example of the difficulty of balancing narrow and broad views of airpower theory. Manned aircraft pilots have tended to adopt a narrow view of the warrior ethos that includes only their small community on the basis that they are the only ones exposed to physical risk. But denying warrior credentials to UAV aircrews has inadvertently fueled an ongoing international debate about the ethics of drone warfare, centered on the idea that drone strikes may be immoral precisely because UAV pilots are at far less risk of dying than their adversaries. Providing fodder to this debate is likely not the intention of most airmen, given that every chief between 1993 and 2015, every USAF chief has publicly touted the USAF's employment of airpower as America's own asymmetric edge in battle.[156]

Equally damaging to the USAF's reputation, however, is the risk of espousing an exceedingly broad view of the warrior ethos. To infuse a warrior mentality in the USAF's UAV community, in 2013 the Pentagon created a new medal for UAV pilots to recognize their warfighting contributions. But there was a sense, even among many in the UAV pilot community, that the medal's order of merit above medals awarded for combat action cheapened the warfighting contributions of those in combat. The Pentagon's decision in early 2016 to pin an "R" device on UAV pilots' existing medals provided a compromise solution. But the risk of extending the definition of "warrior" so broadly that it becomes meaningless is still very much a live issue as the USAF considers how far to extend responsibilities for UAV operations to civilian contractors. If contractors are given the authority to fire weapons from a UAV, for example, then this potentially diminishes the USAF's reputation as a warfighting institution because someone who is not even in the service can perform a critical mission that, according to the USAF, requires warrior credentials broadly defined.

This thesis has focused on the relationship between USAF culture and the Predator program because the unmanned system's growing operational relevance

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[156] Rhay (May 29, 2007); Fogleman (March 5, 1997); Johnson (Jan. 12, 2000); Jablonski (Feb. 11, 2005); Air Force Public Affairs (May 17, 2004); Schwartz (March 2011); Eliason (3rd Quarter 2014) 9

has thrown into sharp relief the need to recalibrate airpower theory. But the struggle to strike a balance between doing too little and doing too much extends far beyond UAVs to other platforms, roles, missions, and mediums. The USAF's proposal to retire the A-10 Thunderbolt II has drawn fire from critics who argue the USAF must broaden its strategic portfolio to include close air support rather than diminish its relevance. Conversely, the USAF's struggle to dominate space has drawn criticism from those who say the USAF is overreaching because it is poorly positioned to operate in that realm and lacks a genuine interest in honing mission specialist expertise in that medium.[157]

The stakes could not be higher for the USAF as it seeks to balance its strategic portfolio. The gravest threat at present appears to come from those inside and outside the USAF who believe the institution is inextricably wedded to a narrow conception of airpower built around manned aircraft. If the USAF's tendency to obstruct UAV innovation based on its cultural preference for manned aircraft extends to its capacity to innovate across other roles, missions, and mediums, then the USAF is vulnerable to claims from authors such as Van Creveld and Farley that it is losing relevance as a warfighting institution.

In closing, there does not appear to be any easy way out of the USAF's identity crisis. One potentially helpful endeavor is to return to my research, which found the USAF tends to adopt too narrow a view of airpower, but which also may offer some insight into how to shift USAF culture to expand the service's capacity for innovation.

Clearly, civilian leaders play a powerful role in shaping the USAF's cultural attitudes toward innovation because they nominate USAF chiefs, who proved to be critical actors in shaping Predator innovation. Farrell's model of cultural change, which centers on the role of norm entrepreneur, provides a helpful lens to understand the nature of this influence. Indeed, Gen. Fogleman's act of norm entrepreneurship, calling on the USAF to embrace the Predator as a symbol of a broader commitment to ISR, is the very reason that the USAF controls the Predator

[157] For more on space debates see Lambeth (2003)

program today. Perhaps even more promising is the norm exploiter concept developed in this thesis, which depends on visionary leaders seeking to adopt innovations in a way that complements existing culture. Examples include Gen. Jumper's successful efforts to weaponize the Predator and Gen. Schwartz's decision to create a new 18X career field manned with eager volunteers.

As this research has shown, however, USAF leaders' attempts to shift USAF culture in favor of innovation are often undermined by powerful undercurrents of persistent cultural bias. Still, there is hope for overcoming the bias in the future. One possibility is that norm exploiters will establish new career fields that provide an avenue to promote innovation over the long term, as Rosen's model of intraservice competition predicts. This solution would not only guard against too-narrow views of airpower, but it also would also protect the service from charges of overextending itself by ensuring the service possesses the mission expertise required to credibly adopt new aerospace innovations.

Further Research

One fertile area for further research involves re-visiting the relationship between USAF culture and UAV innovation in another 15 years. Aside from my different approach to methodology, a possible reason that I found pervasive cultural bias against UAVs where Ehrhard did not relates to timing. His research, like my own, was limited by his capacity to induce interviewees to speak truthfully beyond the prevailing politically correct sentiments of the time. During his research period, interviewees may have felt pressure to offer positive portrayals of USAF attitudes toward UAV innovation because of USAF leadership support for UAVs in the 1990s, whereas during my research period, low morale in the UAV community may have created pressure to report negative portrayals. One mitigating factor for my research is that my early chapters benefit from the analytical detachment of hindsight, but my later chapters are vulnerable to this research limitation.

Noting in 2000 that UAV innovation was still in an "early, indeterminate stage," Ehrhard called his dissertation a "companion piece to UAV research yet to be conducted."[158] Although my research was conducted15 years after his work, it would still be inaccurate to say that the process of UAV innovation in the USAF is complete. Without the benefit of hindsight, it is difficult to know whether more recent policies, such as the establishment of the 18X career field, the creation of the CPIP, and the plans to rely more heavily on civilians and enlisted personnel, mark a growing acceptance of UAV innovation in the USAF. Future analysis of the USAF's cultural attitudes toward UAV innovation would help to determine whether the USAF's capacity for innovation has improved.

Another area for further research concerns USAF leadership. Some of the most important leaders in Predator innovation came from the fighter community. Yet these leaders demonstrated a willingness to look beyond fighter operations to consider how USAF approaches to a variety of roles, missions, and mediums might advance the USAF's war-winning edge. It would be helpful to learn more about the inherent traits and training of these officers to develop an understanding of how to recruit and promote officers who embrace a broad conception of airpower rather than a narrow view.

Lastly, the USAF's Reaper program is also ripe for further study. Cullen's 2011 dissertation, and Mindell's 2015 book drawing on that research, focused on the relationship between UAV operators and Reaper technology, but no open-source Reaper history has been written yet. Conducting an analysis of the USAF's cultural attitudes toward the Reaper, which is faster and more heavily armed than the Predator, would be an interesting avenue to pursue as the USAF considers the relevance of UAVs in future conflicts.

[158] Ehrhard (2000)633

GLOSSARY

AB	Air Base
ACTD	Advanced Concept Technology Demonstration
ACC	Air Combat Command
AFB	Air Force Base
AFMC	Air Force Materiel Command
AFOTEC	Air Force Operational Test and Evaluation Center
AFPC	Air Force Personnel Command
AFSC	Air Force Systems Command
AFSOC	Air Force Special Operations Command
ALFA	Air liaison - forward air control - Air Education and Training Command
ANG	Air National Guard
CAIG	Cost Analysis Improvement Group
CAOC	Combined Air Operations Center
CAP	Combat Air Patrol
CAPE	Cost Assessment and Program Evaluation
CPIP	Culture and Process Improvement Program
DARO	Defense Airborne Reconnaissance Office
DARPA	Defense Advanced Research Projects Agency
DSB	Defense Science Board
DoD	Department of Defense
EAIS	Expeditionary Air Intelligence Squadron
EUCOM	European Command
ER/MP	Extended Range/Multipurpose
FMV	Full Motion Video
GA-ASI	General Atomics Aeronautical Systems
IFS	Initial Flight Screening
ISR	Intelligence, surveillance and reconnaissance
JCIDS	Joint Capabilities Integration Development System

JFACC	Joint Forces Air Component Commander
JPO	Joint Program Office
JROC	Joint Requirements Oversight Council
JSOC	Joint Special Operations Command
JTAC	Joint Tactical Air Controller
JWICS	Joint Worldwide Intelligence Communication System
MARS	Mid- Air Recovery System
mIRC	Internet Relay Chat
MRAP	Mine Resistant Ambush Protected
NSC	National Security Council
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OT & E	Office of Test and Evaluation
RMA	Revolution in Military Affairs
RPA	Remotely Piloted Aircraft
RPV	Remotely Piloted Vehicle
RS	Reconnaissance Squadron
RSO	Remote Split Operations
SAM	Surface-to-Air Missile
SIGINT	Signals Intelligence
SOF	Special Operations Forces
SOS	Special Operations Squadron
SOUTHCOM	US Southern Command
TRA	Teledyne-Ryan Aeronautical
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
UPT	Undergraduate Pilot Training
URT	Undergraduate RPA Training
USAFE	US Air Forces Europe

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