Rebel Airpower

A Monograph

by

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This paper reviews previous theories on rebel airpower. It analyzes current doctrine and historical examples of the rebel use of airpower in order to create an updated theory about rebel airpower, and a discussion of subsequent implications for military planners. This paper argues that, in the future, rebels will use airpower in four key ways. First, the increase of low-cost, low-risk technology allows rebels to use and contest the air domain. Second, rebels that conceal high cost operations avoid direct targeting from a more powerful state air force. Third, rebel groups increase their effectiveness in the air domain if they consider propaganda at all levels of war. Last, rebels increase their effectiveness in the air domain by presenting opposing forces with a multi-dilemma problem that necessitates simultaneous reactions. Ultimately, this research should help enable the US military to handle surprising and unconventional rebel approaches toward airpower.

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Abstract

Rebel Airpower by Maj Michael G. Kissinger, US Air Force, 47.

Converging trends in rebel airpower will significantly challenge state militaries. Increased doctrinal research and professional thought on rebel airpower are vital. This monograph analyzes rebel airpower and the threats it presents. It seeks to answer the questions: do rebel forces want airpower; if so, what would it look like; and what are the implications for conventional military forces if they find themselves facing rebel airpower? The evidence suggests that rebel groups do want airpower and that rebel airpower capabilities could challenge a state's military.

This paper reviews previous theories on rebel airpower. It analyzes current doctrine and historical examples of the rebel use of airpower in order to create an updated theory about rebel airpower, and a discussion of subsequent implications for military planners. This paper argues that, in the future, rebels will use airpower in four key ways. First, the increase of low-cost, low-risk technology allows rebels to use and contest the air domain. Second, rebels that conceal high cost operations avoid direct targeting from a more powerful state air force. Third, rebel groups increase their effectiveness in the air domain if they consider propaganda at all levels of war. Last, rebels increase their effectiveness in the air domain by presenting opposing forces with a multi-dilemma problem that necessitates simultaneous reactions. Ultimately, this research should help enable the US military to handle surprising and unconventional rebel approaches toward airpower.

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Acronyms

BTTR	Brothers to the Rescue
DCA	Defensive Counter Air
DEA	Drug Enforcement Administration
GPS	Global Positioning System
IED	Improvised Explosive Device
ISIL	Islamic State and the Levant
ISR	Intelligence, Surveillance, and Reconnaissance
JP	Joint Publication
LSS	Low, Slow and Small
LTTE	Liberation Tigers of the Tamil Eelam
NATO	North Atlantic Treaty Organization
NSPD	National Security Presidential Directive
OCA	Offensive Counter Air
ROE	Rules of Engagement
RADAR	Radio Detection and Ranging
SAM	Surface to Air Missile
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
USAF	United States Air Force

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Introduction: Rebels and Airpower

Airpower has drastically changed modern warfare. Increased operational reach, tempo, speed, lethality, Intelligence, Surveillance and Reconnaissance (ISR), mobility, and power projection are a few reasons why people desire airpower in combat. However, control of the air comes with a hefty price tag. Most states, let alone rebel groups, cannot afford to own and operate an air force. However, some rebel groups have sought airpower. Therefore, this paper is interested in answering the following questions: do rebel forces want airpower; if so, what would it look like; and what are the implications for conventional military forces if they find themselves facing rebel airpower?

From the 1936 Spanish Civil War to the 2011 war in Libya, airpower has supported rebel causes.[1] At the end of the spectrum, some rebel groups owe their victory to airpower. However, most rebel groups fail to utilize airpower with any lasting consequence. While failure abounds, it is clear from the historical record that rebels desire airpower if given the opportunity.

In the modern world of small wars, the appetite for rebel airpower is growing. The use of Unmanned Aircraft Systems (UAS) allows cheaper access to the air domain. This shift is understandable, but it is not the only growing concern. Many terrorist and insurgent groups generate funding for their activities through the sale of illicit drugs.[2]

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[1] For information on the German air group (Condor Legion) that supported the Nationalist (rebels) in their fight against the Spanish government, see Raymond L. Proctor, *Contributions in Military History,* vol. 35, *Hitler's Luftwaffe in the Spanish Civil War* (Westport, CT: Greenwood Press, 1983), 3-4; NATO led an air campaign which supported Libyan rebels who overthrew Gadaffi. For more information see, Karl P. Mueller, *Research Report*, vol. RR-676-AF, *Precision and Purpose: Airpower in the Libyan Civil War* (Santa Monica, CA: RAND, 2015), 1, accessed August 12, 2017, http://ebookcentral.proquest.com/lib/columbia/detail.action?docid=2120780.

[2] Michael Ross, "Oil, drugs, and diamonds: How do natural resources vary in their impact on civil war" (paper produced for the International Peace Academy project on Economic Agendas in Civil Wars, UCLA, Jun 5, 2002), 26, accessed February 5, http://www.libertyparkusafd.org/Hale/Special%20Reports%5CNatural%20Resource%20Wars%5COil%20Drugsand%20Diamonds%20--%20Resource%20Wars.pdf.

Drug cartels have long used airpower to transport drugs and to facilitate the exchange of drugs and money.[3] Rebels, insurgents, terrorists, and cartels are often linked together, but their airpower modes of operation do not seem to cross-pollinate. With that said, the potential for these modes to converge could bring a level of airpower sophistication not yet seen during a rebel conflict. This paper argues that rebel forces do want airpower. The paper also argues that the kind of airpower options available to rebel groups can contest a state's control of the air domain, leading to the achievement of a rebel group's aims. Four main points support this argument. First, the increase of low-cost, low-risk technology allows rebels to use and contest the air domain. Second, rebels that conceal high-cost operations avoid direct targeting from a more powerful state air force. Third, rebel groups increase their effectiveness in the air domain if they consider propaganda at all levels of war. Last, rebels increase their effectiveness in the air domain by presenting opposing forces with a multi-dilemma problem that necessitates simultaneous reactions.

Methodology

First, this paper looks at existing frameworks and theories of rebel airpower. They will create the initial foundation for this paper. The literature review section covers these theories in detail. Next, this paper will look at historical examples of rebel airpower. For the scope of this research, rebel airpower is bounded by what rebel groups can procure and operate with limited external help. This limitation will exclude examples of rebel groups receiving airpower from external states. As an example, in 2011 the North Atlantic Treaty Organization (NATO) led the air campaign supporting rebels that overthrew Gaddafi. While rebels gained a marked advantage

[3] Eric L. Olson, David A. Shirk, and Andrew D. Selee, *Shared Responsibility: U.S.-Mexico Policy Options for Confronting Organized Crime* (Washington, DC: Woodrow Wilson International Center for Scholars, Mexico Institute, 2010), 79.

from airpower, they did not acquire it for themselves, and therefore it was never owned or operated by them.[4] Lone terrorists, associated and unassociated with rebel groups, will be considered. Additionally, rebel airpower is not limited to purely military groups. This paper considers drug cartels and groups that oppose the state or operate in defiance of the state's laws. Cartels do not fit the strict definition of a rebel; however, some groups pose a transnational threat. Their employment of airpower is unique and worthy of consideration. The overall diversity of rebel airpower examples will highlight the significance of the threat.

After establishing the existing framework and historical background, this paper shifts to exploring a modern theory of rebel airpower. The theory will look at emerging trends, identify gaps in existing frameworks, and show the potential intersection of different ways in which rebels could use airpower. The intent is to create a modern working model of rebel airpower.

Last, this paper presents an analysis of the strategic, operational, and tactical level implications of rebel airpower. The result will help create an understanding of the potential vulnerabilities and risks to a state dealing with rebel airpower. If military planners are going to combat an air-capable rebel force, it is important that they fully understand how rebel airpower can affect all levels of war.

Criteria

Rebel airpower examples that show a high degree of success with limited disruption from a state will showcase gaps in a state's ability to handle the problem. A 'high degree of success' is defined as any airpower operation that goes unnoticed by the state, cannot be stopped by the state, or whose frequency is ignored by the state. A 'doctrinal gap' exists when existing frameworks do not describe the circumstance or procedure for handling a particular threat. A 'technology gap'

[4] Mueller, 8.

exists when there is an inability to detect, track, and target rebel airpower. Additionally, a 'technology gap' may exist if the current defense solution is cost prohibitive.

Definitions

The following terms are used in this monograph to help define and bound the topic. They will also cultivate a deeper understanding of the nuances of the subject matter. Definitions come from joint doctrine, Service-specific doctrine, and finally, if no definitions exist in doctrine, terms are defined from the dictionary.

Airpower is the "The ability to project military power or influence through the control and exploitation of air, space, and cyberspace to achieve strategic, operational, or tactical objectives."[5] It is important to note that this definition encompasses a wide range of airpower options. A large conventional air force, as well as small recreational UAS devices, all fit under the umbrella of airpower. The size and capability are not the defining qualities of airpower; rather, it is the use of such devices and activities. Airpower also is one method to control the air domain.

Control of the air domain has three levels. *Air parity* means that all belligerents have equal control. *Air superiority* means that one side can conduct air operations without 'prohibitive interference' from air threats.[6] *Air supremacy* means that the weaker side is incapable of conducting 'effective interference.'[7] In conjunction with these three levels, there are three states which describe the risk present in the airspace. *Permissive airspace* is low risk and means that air

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[5] Curtis E. LeMay Center for Doctrine Development and Education, Volume 1, *Basic Doctrine*, 27 February 2016, 9, accessed October 10, 2017, http://www.doctrine.af.mil/Portals/61/documents/Volume_1/Volume-1-Basic-Doctrine.pdf.

[6] Curtis E. LeMay Center for Doctrine Development and Education, Annex 3-01, *Counterair Operations*, 1 February 2016, 4, accessed December 30, 2017, http://www.doctrine.af.mil/Portals/61/documents/Annex_3-01/3-01-ANNEX-COUNTERAIR.pdf.

[7] Ibid.

superiority or supremacy is secured. *Contested airspace* represents a medium risk with only localized air superiority. *Denied-access airspace* is high risk and contains pervasive enemy threats.[8]

There are two types of aircraft control, procedural and positive. *Procedural control* is the rules, regulations, flight plans and activities designed to control aircraft without having to have constant surveillance or tracking of each aircraft. *Positive control* is a combination of radio detection and ranging (RADAR), tracking devices, and identification methods that positively identify aircraft. These categories of control can be applied both independently and simultaneously to all types of aircraft.[9]

There are two broad types of aircraft, manned and unmanned. *Manned aircraft* have at least one pilot in the aircraft controlling its flight profile. Conversely, *unmanned aircraft* do not have a pilot in the aircraft controlling the flight profile. These are commonly referred to as UAS and 'drone'. Non-technical discussions use these terms interchangeably; however, they are different. UAS stands for, "Unmanned aircraft system," which is a system, "…whose components include the necessary equipment, network, and personnel to control an unmanned aircraft."[10] UAS refers to large military-grade systems as well as smaller commercial built systems known as commercial-off-the-shelf (COTS) UAS.[11] The third term, 'drone,' is not an official military term for referencing UAS. It is not precise, and it comes with a popular negative connotation of a

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[8] Curtis E. LeMay Center for Doctrine Development and Education, Annex 3-52*, Airspace Control,* 23 August 2017, 3, accessed January 10, 2018, http://www.doctrine.af.mil/Portals/61/documents/Annex_3-52/3-52-Annex-AIRSPACE-CONTROL.pdf.

[9] Ibid., 6-7.

[10] US Department of Defense, Joint Staff, Joint Publication (JP) 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, DC: Government Printing Office, 2017), 242.

[11] Ibid., 279.

mindless automaton seeking targets of its authority.[12] This paper will use UAS when referring to a large military grade system and COTS UAS when referring to small commercial systems.

Within the United States military, UAS have five categories (Table 1). The acronym LSS stands for low, slow and small, and refers to UAS categories 1 and 2. Overall, adversarial UAS protection is a joint force problem.[13] However, the LSS concern is primarily a ground force responsibility. The LSS category is important for this paper because most of the UAS utilized by rebel groups fall into this category. LSS UAS is a significant problem because their size makes them difficult to detect.[14] Most rebel groups use LSS COTS UAS.

[12] Merriam-Webster Dictionary, "drone," accessed October 6, 2017, https://www.merriam-webster.com/dictionary/drone.

[13] US Department of Defense, Joint Staff, Joint Publication (JP) 3-01, *Countering Air and Missile Threats* (Washington, DC: Government Printing Office, 2017), GL-4.

[14] Ibid., I-2, V-5.

Table 1. Unmanned Aircraft Systems Categorization Chart

Unmanned Aircraft Systems Categorization Chart

UA Category	Maximum Gross Takeoff Weight (lbs)	Normal Operating Altitude (ft)	Speed (KIAS)	Representative UAS
Group 1	0-20	< 1200 AGL	100 kts	WASP III, TACMAV RQ-14A/B, Buster, Nighthawk, RQ-11B, FPASS, RQ16A, Pointer, Aqua/Terra Puma
Group 2	21-55	< 3500 AGL	< 250	ScanEagle, Silver Fox, Aerosonde
Group 3	< 1320	< 18,000 MSL	< 250	RQ-7B Shadow, RQ-15 Neptune, XPV-1 Tern, XPV-2 Mako
Group 4	> 1320		Any Airspeed	MQ-5B Hunter, MQ-8B Fire Scout, MQ-1C Gray Eagle, MQ-1A/B/C Predator
Group 5	> 1320	> 18,000 MSL	Any Airspeed	MQ-9 Reaper, RQ-4 Global Hawk, RQ-4N Triton

Legend

AGL	above ground level	lbs	pounds
FPASS	force protection aerial surveillance system	MSL	mean sea level
ft	feet	TACMAV	tactical micro air vehicle
KIAS	knots indicated airspeed	UA	unmanned aircraft
kts	knots	UAS	unmanned aircraft system

Source. US Department of Defense, Joint Staff, Joint Publication (JP) 3-30, *Command and Control of Joint Air Operations* (Washington DC: Government Printing Office, 2017), III-30.

Adversary airpower is countered using two primary methods, offensive and defensive counterair. Offensive Counterair (OCA) is an operation designed to, "…destroy, disrupt or degrade enemy air capabilities by engaging them as close to their source as possible, ideally before they are launched against friendly forces." Defensive Counterair (DCA) is an operation

designed to, "…protect friendly forces and vital interests from enemy airborne attacks and is synonymous with air defense." Service, branch or domain do not limit these operations.[15]

Up to this point, the definitions put forward were technical as defined by doctrine. Next, this paper will look at different groups of people and the nuanced differences between them. It is important to cast the term 'rebel' in the broadest possible light so that military planners can anticipate a wide range of possibilities.

This paper's focus is on the rebel use of airpower and thus must define what the term rebel encompasses. A rebel is one who is "Opposing or taking arms against a government or ruler."[16] Note that this definition makes no judgment on the moral status of the group or individual that opposes a government. Additionally, 'rebel' does not inherently describe the size of the rebel force. This paper argues that revolutionaries, insurgents, or a guerrilla force could all fit under the umbrella of 'rebel groups.' Therefore, the 'rebel use of airpower' simply implies that an actor opposing the government is operating in the air domain.

In addition to rebel groups, cartels are another non-state actor that utilizes airpower. A 'cartel' is a "…combination of independent commercial or industrial enterprises designed to limit competition or fix prices…"[17] The paper's use of 'cartel' applies exclusively to drug cartels. Though not traditionally viewed as a rebel group, drug cartels operate outside the law to pursue their interests and therefore oppose the state's authority and laws. Cartels also take up arms (often through proxies) against the state and other rivals to ensure their survival. As an example, the

[15] LeMay, Annex 3-01, *Counterair Operations* 2016, 6.

[16] Merriam-Webster Dictionary, "rebel," accessed October 6, 2017, https://www.merriam-webster.com/dictionary/rebel.

[17] Merriam-Webster Dictionary, "cartel," accessed October 6, 2017, https://www.merriam-webster.com/dictionary/cartel.

'Los Zetas' is a particularly violent group hired by cartels to combat the Mexican government.[18] Typically, people do not think of cartels as a guerrilla force, but, similar to rebels, they can use guerrilla warfare tactics.

A guerrilla force is, "A group of irregular, predominantly indigenous personnel organized along military lines to conduct military and paramilitary operations in enemy-held, hostile, or denied territory."[19] This term is a bit misleading, as it defines more of a tactic than it does a group. For example, an insurgency could use guerrilla tactics, but not be considered a guerrilla force since they are not indigenous. Guerrilla warfare straddles the idea of a group and that of a method; however, the next definitions focus more on a method of warfare.

Unconventional warfare refers to, "activities conducted to enable a resistance movement or insurgency to coerce, disrupt, or overthrow a government or occupying power by operating through or with an underground, auxiliary, and guerrilla force in a denied area."[20] Unconventional warfare is waged separately or in conjunction with regular warfare. It is not limited to one side or the other.

Unconventional warfare is not the sole method of insurgencies, but it often goes hand in hand with an insurgency. Insurgency is the, "organized use of subversion and violence to seize, nullify, or challenge political control of a region. Insurgency can also refer to the group itself."[21]

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[18] John P. Sullivan, and Adam Elkus, "State of siege: Mexico's criminal insurgency," *Small Wars Journal* 12 (August 2008): 4, accessed March 31, 2018 https://s3.amazonaws.com/academia.edu.documents/5645449/84sullivan.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1522524154&Signature=hsuGekNlbv7qL%2FuCk8TMAornN2Y%3D&response-contentdisposition=inline%3B%20filename%3DState_of_Siege_Mexicos_Criminal_Insurgen.pdf.

[19] US Joint Staff, JP 1-02, *Department of Defense Dictionary of Military and Associated Terms* 2017, 100.

[20] Ibid., 239.

[21] Ibid., 113.

In this sense, an insurgency is a group not indigenous to the region. This term, more than others, is often pejorative.

Literature Review

Rebel airpower is a concept virtually ignored by researchers and military theorists alike. Most irregular warfare research focuses on airpower used against rebel forces, insurgencies, and guerrilla forces. Few authors have considered how rebel groups may use airpower to achieve their objectives. In fairness to this lack of research, there are not many early examples of rebel groups using airpower. With that said, there is some United States doctrine that addresses aspects of rebel airpower. There are also three researchers who have addressed this topic in depth.

Doctrine

There is no single body of doctrine that addresses the threat of 'rebel airpower.' Instead, airpower doctrine covers a wide range of threats and possibilities that planners must incorporate. Conventional airpower used in conventional ways poses the same threat, whether used by a state or a rebel group and is therefore not covered in this doctrine review. However, rebels that use civilian aircraft (manned and unmanned) or use conventional aircraft in unconventional ways are pertinent to this review. A basic understanding of United States military airpower doctrine is a prerequisite to understanding how unconventional airpower threats challenge a conventional force. Below is a detailed description of the applicable airpower doctrine.

Control of the air domain is not limited to a specific Service. Therefore, every Service has some doctrine that touches the air domain.[22] Historically, in the joint environment, the Joint Force Air Component Commander is an Air Force officer. The Air Force often fills this role because the Air Force typically has the preponderance of air assets and the ability to command

[22] US Department of Defense, Joint Staff, Joint Publication (JP) 3-0, *Joint Operations* (Washington, DC: Government Printing Office, 2017), IV-10.

and control them.[23] When the Air Force conducts operations to gain and maintain air superiority or supremacy, the purpose of the operation and airspace state (permissive, contested or denied) will determine the level of effort required to achieve the desired level of control.[24]

Counterair operations, whether offensive or defensive, start with accurate intelligence.[25] Many different assets and all Services participate in intelligence collection. Intelligence, surveillance, and reconnaissance are needed to identify threats. Additionally, 'procedural' and 'positive' control measures are used to control aircraft and provide a distinction between friendly and hostile air assets.[26] The United States military has counterair doctrinal publications, but these publications focus on conventional threats and do not have good guidance for countering unconventional air threats.[27] US Joint Staff, Joint Publication (JP) 3-01*, Countering Air and Missile Threats* 2017, acknowledges the increased difficulty of identifying low, slow, and small unmanned aircraft systems. It also emphasizes the importance of detecting and distinguishing civilian aircraft used in unconventional warfare.[28] This question of distinction is especially important during the later discussion about how drug cartels use civilian aircraft to blend in with regular air traffic.

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[23] Curtis E. LeMay Center for Doctrine Development and Education, Volume III, *Command*, 22 November 2016, 67, accessed October 10, 2017, http://www.doctrine.af.mil/Portals/61/documents/Volume_3/Volume-3-Command.pdf.

[24] LeMay, Annex 3-01, *Counterair Operations* 2016, 26.

[25] Ibid., 9.

[26] LeMay, Annex 3-52, *Airspace Control* 2017, 6-7.

[27] US Joint Staff, JP 3-01, *Countering Air and Missile Threats* 2017; Lemay, Annex 3-01, *Conterair Operations* 2016.

[28] US Joint Staff, JP 3-01, *Countering Air and Missile Threats* 2017, I 2-3.

US Joint Staff, JP 3-30, *Command and Control of Joint Air Operations* 2017, identifies the authorities needed to execute airpower operations. [29] Generally speaking, air power operations should have centralized control and decentralized execution. This means that the command and control elements plan, coordinate, and monitor mission progression from an operations center, but mission execution and accomplishment rest with the individual airmen. Issues of authority directly impact aircrews and how they operate. Rules of engagement change based on mission requirements, phases of combat operations, host nation considerations, multi-national force considerations, strategy, and tactics. They are also closely linked with specific combat identification requirements.[30] If rebels use unconventional airpower that is both hard to detect and distinguish, it will slow down friendly force response time and complicate the rules of engagement.

Finally, the ability to attack air threats is a multi-domain, multi-service fight. The United States Air Force has primary responsibility for air superiority/supremacy, but all Services play a role in that fight. Offensive counterair operations involve: "attack operations, suppression of enemy air defenses, fighter escort, and fighter sweep."[31] Current counterair is very effective against conventional threats, including large UAS; Air Force doctrine notes that "…most UAS do not maneuver well against threats, nor do they carry countermeasures, so they will normally operate effectively only in low-threat environments."[32] The same is true for enemy aircraft; slow, non-maneuverable aircraft are ill-equipped to fight against modern fighters. Rebels that possess less capable combat aircraft will not survive in a high-end fight against the United States'

[29] US Department of Defense, Joint Staff, Joint Publication (JP) 3-30, *Command and Control of Joint Air Operations* (Washington, DC: Government Printing Office, 2017), I-3.

[30] US Joint Staff, JP 3-01, *Countering Air and Missile Threats* 2017, III-2.

[31] Ibid., I-5.

[32] LeMay, Annex 3-01, *Counterair Operations* 2016, 34.

conventional airpower assets. However, they may present a threat to a nation with a less robust air force. With that said, rebel airpower may pose an unconventional threat to the United States by utilizing hard to detect assets (LSS UAS or civilian aircraft used for rebel objectives). The United States usually fights wars in other countries, but the need for air superiority in the homeland is also critical, as rebel groups can pose a threat domestically.

One of the sections in Joint Staff, JP 3-27, *Homeland Defense* 2017*,* outlines broad homeland air defense measures.[33] Operation Noble Eagle, as outlined in JP 3-27, was a direct response to the 11 September 2001 terrorist attacks on the World Trade Center. Operation Noble Eagle increases the authorities and assets available to respond to a terrorist who uses aircraft as a means of attack.[34] Additionally, National Security Presidential Directive 47 (NSPD-47) and Homeland Security Presidential Directive 16 (HSPD-16) outline broad defensive measures and authorities to protect the homeland against terrorists using civilian aircraft as weapons. The result is an overall Aviation Operational Threat Response that protects the United States from aviation attacks.[35] However, JP 3-27 goes on to highlight that, "…the rules of engagement (ROE) for operations in United States airspace often produce a constrained engagement environment," and "A terrorist attack using an aircraft as the weapon, as done in September 2011 continues to be the most likely air threat to the homeland."[36]

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[33] US Department of Defense, Joint Staff (JP) 3-27, *Homeland Defense* (Washington, DC: Government Printing Office, 2017), III-4.

[34] Ibid., III-4.

[35] Ibid., II-20.

[36] Ibid., III-12, III-18.

The last piece of doctrine that needs consideration is Air Force, Annex 3-2, *Irregular Warfare*.[37] The doctrine does a good job of defining what irregular warfare is and what the Air Force brings to the fight. However, the doctrine focuses on support to the ground component and host nation; it never once mentions threats in the air domain from rebel forces.[38] The focus is on what the United States brings to the fight, not what capabilities the enemy may have, or what they might do to contest the air domain.

When looking at current US doctrine, there are several big takeaways. First, no single doctrine publication focuses specifically on the threat posed by rebel airpower. Second, doctrine extensively covers conventional airpower threats and assumes that low-end threats posed by rebel groups do not call for vastly different technology or tactics. New doctrine exists to handle the emergence of small unmanned aircraft as well as civilian aircraft used in unconventional warfare. While this doctrine does address unmanned systems and civilian aircraft threats, addressing these threats is admittedly challenging.

Rebel Airpower Researchers

Three US Air Force researchers provide useful frameworks and examples of rebel airpower. The 1997 monograph, *Toward a Theory of Insurgent Airpower,* by Major Judy Graffis, breaks ground on the conceptual framework of insurgent airpower. The second work, *Seeking Shadows in the Sky: The Strategy of Air Guerrilla Warfare,* written by Major Patricia Hoffman in 2000, offers a conceptual framework for nation-state guerrilla warfare. The most recent work, *From the Underground to the High Ground: The Insurgent Use of Airpower,* written by

[37] Curtis E. LeMay Center for Doctrine Development and Education, Annex 3-2, *Irregular Warfare*, 12 July 2016, 1-38, accessed October 15, 2017, http://www.doctrine.af.mil/Portals/61/documents/Annex_3-2/3-2-Annex-IRREGULAR-WARFARE.pdf.

[38] LeMay, Annex 3-2, *Irregular Warfare* 2016, 2-38.

Lieutenant Colonel John Bunnell in 2011, focuses on specific cases studies that highlight rebel airpower.

Toward a Theory of Insurgent Airpower

Major Graffis describes doctrine and theory that encompass both airpower and insurgency.[39] She then uses four case studies to show examples of insurgent and separatist groups using airpower. Those studies allow her to build her theory of insurgent airpower.

First, Graffis looks at the Nicaraguan Contras and their fight against the Sandinista government from 1983-1989. The Contras utilized airpower mainly in support roles in their fight against the Sandinista government. However, Graffis notes that outside sources, including the United States, funded Contra operations.[40] Perhaps the most important aspect of this case is the fact that the Contras operated their aircraft from bases in Honduras and Costa Rica. The Nicaraguan government could not attack those bases outside of their territory. Graffis uses that point to emphasize the importance of sanctuary.[41]

The next case study is on the Sri Lankan Liberation Tigers of the Tamil Eelam (LTTE). Interestingly, Graffis notes that the LTTE wanted to use airpower, but does not find evidence that they did. The LTTE conflict was still ongoing at the time Graffis was writing.[42] History later revealed that the LTTE did in fact use aircraft offensively in their fight. In 2007, the Air Tigers bombed an airbase killing three people, a military complex killing six, and a fuel depot in the

[39] Judy M. Graffis, "Toward a Theory of Insurgent Airpower" (monograph, Army Command and General Staff College, Fort Leavenworth, KS: School of Advanced Military Studies, 1997), 23.

[40] Graffis, 23.

[41] Ibid., 22-24.

[42] Ibid., 24.

capital of Sri Lanka.[43] These attacks were carried out using modified Czech Zlin Z143 light aircraft.[44] In 2009, the LTTE Air Tigers attempted suicide attacks using the same aircraft, but this time they were loaded with over 200kg of explosives. The Air Tigers were targeting the Sri Lanka Air Force headquarters but were shot down by anti-aircraft fire before the pilots could find their targets. Even though the pilots did not hit their intended targets, they killed two people and injured fifty-eight others.[45] The LTTE case is perhaps the purest example of a rebel group that built a manned airpower capability on its own.

The next study looked at the Chechen secession from Russia in 1991. In this case, Chechnya gained three air bases and 250 aircraft during the breakup of the USSR.[46] However, once Chechnya made threats against strategic targets in Russia, Moscow reacted and destroyed the airbases and all the aircraft.[47] This case is the largest example to date of an offensive air force under rebel control. However, it ultimately only succeeded in eliciting a swift attack from Russia.

The last case study involves the rise of the Taliban. In 1994, the Taliban captured Kandahar Air Base with its six MiG-21 jets and six Mi-17 Hip helicopters.[48] Graffis points out that the Taliban did not understand how to use these aircraft, other than in random tactical engagements, and that their opposition had similar aircraft that could effectively oppose them.[49]

[43] "Sri Lanka rebels in new air raid," *BBC News*, April 29, 2007, accessed October 6, 2017. http://news.bbc.co.uk/2/hi/south_asia/6604645.stm.

[44] Ibid.

[45] Asif Fuard, "Tigers go kamikaze but attacks fail," *Sunday Times*, February 22, 2009, accessed April 5, 2018, http://www.sundaytimes.lk/090222/News/sundaytimesnews_02.html.

[46] Graffis, 28.

[47] Graffis, 28.

[48] Ibid., 31.

[49] Ibid., 32.

This case offers yet another example of how a rebel group may acquire airpower assets but again does not show a rebel group leveraging airpower to its fullest potential.

Following an analysis of these case studies, Graffis proposes six key aspects for insurgent airpower. First, Graffis argues "insurgents must have a strategic perspective."[50] While this is intuitive to any military professional, the case studies of rebel airpower show a general lack of this basic understanding. Second, phasing is important. Insurgents must adapt their operations based on the level and scale of their capabilities and efforts.[51] Third, insurgents must have a viable sanctuary where they can build and protect their airpower.[52] Graffis uses the example of the Contras to illustrate this point. The idea of sanctuary is perhaps the most important aspect of a rebel force, especially if they want to grow a conventional airpower capability. Fourth, insurgents must have an understanding of both airpower and insurgency theory.[53] Fifth, "aircraft must be available and supportable."[54] This idea may be the single biggest factor why rebel groups do not have airpower. They could not afford it, acquire it, or support it—at least in 1997. Fast forward to 2017, and COTS UAS easily fit Graffis' criteria of available and supportable. For her final point, Graffis argues that any insurgent airpower should be flexible and versatile, citing strengths of both modern airpower and insurgencies.[55] This last recommendation is in line with current Air Force doctrine; both flexibility and versatility are tenets of airpower.[56] Overall, Graffis presents a compelling initial framework of insurgent airpower.

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[50] Graffis, 39.

[51] Ibid., 40.

[52] Ibid.

[53] Ibid.

[54] Ibid.

[55] Ibid., 41.

[56] LeMay, Volume I, *Basic Doctrine* 2016, 65.

Seeking Shadows in the Sky: The Strategy of Air Guerrilla Warfare

Major Patricia Hoffman presents a framework for air guerrilla warfare. In contrast to Graffis, she focuses on why a state may adopt this strategy against rebel groups within a state. Her work is useful in that it provides criteria for waging air guerrilla warfare, which would be a very likely tactic for a rebel air force to use. Hoffman thoroughly analyzes guerrilla warfare in the land domain and shows how those aspects apply to the air domain. Hoffman argues there are two primary methods of guerilla airpower: using unconventional weapons or using conventional weapons unconventionally.[57] Hoffman also describes the 'combat medium,' which is more contemporaneously known as a 'domain.'[58] Hoffman describes the land domain as complex and highly variable, whereas the air domain is rather uniform and comparatively simple.[59] She argues that in simple domains the superpower has the inherent technological advantage, and therefore air guerrilla warfare is more difficult than guerrilla warfare in the land domain.[60] Hoffman's ideas about unconventional weapons and uses, combined with the difficulties of the air domain, are key points that build the foundation of her argument.

Hoffman's research identifies traditional advantages correlated with a guerrilla force, comprised of superior intelligence, security, mobility, surprise, and sustainment.[61] Hoffman goes through each element to show how air guerrilla warfare may achieve and keep those advantages

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[57] Patricia D. Hoffman, "Seeking Shadows in the Sky: The Strategy of Air Guerrilla Warfare" (monograph, Maxwell AFB, AL: Air University Press, 2001), 3.

[58] "Domains are useful constructs for visualizing and characterizing the physical environment in which operations are conducted…" (air, land, sea, space, cyber). US Joint Staff, JP 3-0, *Joint Operations* 2017, IV-10.

[59] Hoffman, 22-23.

[60] Ibid., 23.

[61] Ibid., 21.

within the air domain. During her discussion, a theme emerges. Hoffman seems to argue that these things are possible with increased technology access and proliferation, hit and run tactics, and evasiveness.[62] When Hoffman published her paper in 2000, she wrote about conventional airpower assets. However, her assertions are even truer when we look at the present proliferation of COTS UAS, Global Positioning System (GPS) jammers and surface-to-air missiles (SAMs). Indeed, the proliferation of cheap technology gives adversaries avenues to fight in the air domain that are not instantly destroyed by a conventional air force. Finally, Hoffman discusses evasiveness, in terms of concealment, dispersed forces, and sanctuary cities.[63] This last idea of sanctuary is the same as Graffis' idea. However, unlike Graffis, Hoffman acknowledges that sanctuary in a neighboring country is not possible without accounting for the strategic and political considerations of the host nation.[64]

In conclusion, Hoffman argues that any state must make a deliberate choice between conventional warfare and unconventional warfare, and that choice comes down to what best will accomplish the state's security needs.[65] Additionally, the decision must also consider affordability and strategic context. She puts forth the idea that a state will likely build an air force based on a perceived best-value within a given strategic context.[66] Ultimately, Hoffman describes what may influence a state to choose an air guerrilla strategy, and argues that such strategies are feasible in certain contexts.[67]

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[62] Hoffman, 27-31.

[63] Ibid., 31.

[64] Ibid.

[65] Ibid., 46.

[66] Ibid., 46-48.

[67] Ibid., 48.

Hoffman's ideas on air guerilla strategy also apply to rebels. Rebel forces may try and fight conventionally against a near-peer within their country. However, there is a good chance that necessity will entice them to fight unconventionally either in parallel with conventional efforts or as a main form of warfare. In either case, Hoffman's ideas highlight possibilities and problems for air guerrilla warfare.

From the Underground to the High Ground: The Insurgent use of Airpower

In 2011, Colonel John Bunnell conducted a case study on four insurgent groups who leveraged airpower.[68] His work skips the background theoretical underpinnings of unconventional, insurgent, and guerrilla warfare. Instead, Bunnell allows the case studies to illuminate emergent themes and practices. Like Graffis (whom Bunnell cites), Bunnell looks at the Tamil Tigers and the Taliban. However, his research took place fourteen years after Graffis wrote her paper. Therefore, Bunnell has the benefit of more available data on those two groups. Bunnell also adds two new groups to the discussion, Brothers to the Rescue (BTTR) and Hezbollah.

By 2009, the Sri Lanka-Liberation Tigers of the Tamil Eelam (LTTE) had in fact carried out a series of air raids. The LTTE conducted eleven raids between 2006 and 2009, with both tactical and strategic target sets.[69] Suicide tactics were also used in a last desperate attempt to utilize airpower. Graffis wrote about the LTTE's desire for airpower in 1997, yet it took nearly a decade for their desires to become a reality. Ultimately, Bunnell concluded that the air operations of the Tamil Tigers had impacts disproportionately larger than their losses.[70] Regarding raw material damage and economic cost, this conclusion appears true. However, the LTTE was

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[68] John G. Bunnell, "From the Underground to the High Ground: The Insurgent Use of Airpower" (monograph, Air University, Maxwell AFB, AL: Air War College, 2011), 1-25.

[69] Bunnell, 2-6.

[70] Ibid., 6.

ultimately defeated, which begs the question: was the LTTE's use of airpower effective if it did not help them win the war? Arguably, yes. At the strategic level, the LTTE's use of airpower forced the Sri Lankan government to change its approach and spend more money on the war. The LTTE's use of airpower changed the strategic tempo by creating time for the rebel group. The attacks also created fear and a source of propaganda for the LTTE.

Bunnell's discussion of the Taliban is similar to Graffis' with regards to the origin and use of airpower. However, Bunnell also describes how the Taliban forced the Afghanistan airline (Ariana) to fly operatives not only throughout Afghanistan but beyond its borders to countries globally.[71] Bunnell concludes that the importance of these actions is hard to assess but that they surely helped the Taliban take control of the Afghanistan government.[72] What is interesting about this case is the use of civilian aircraft for combatant transport. This use affords the Taliban a sort of mobility camouflage.

Bunnell's next case study is about the 'Brothers to the Rescue' or BTTR. In 1991, a group of Cubans in the United States wanted to help refugees fleeing from Cuba to the United States. They also advocated for the collapse of the Castro regime.[73] The BTTR would take small civilian aircraft (Cessna 337), fly them in the Gulf of Mexico, look for refugees, and then report them to the United States Coast Guard.[74] From 1991 to 1996, the Coast Guard brought reported refugees to the United States. However, when the Clinton Administration changed the policy and instead returned refugees to Cuba, the BTTR took bolder steps. The BTTR began dropping

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[71] Bunnell, 8.

[72] Ibid.

[73] Ibid., 9.

[74] Ibid.

leaflets on Cuba and penetrating Cuban airspace.[75] In 1996 the Cuban government responded to an airspace incursion by sending fighter aircraft to intercept three Cessna aircraft. Two aircraft were shot down, claiming the lives of four individuals.[76] This case study highlights the idea of sanctuary and exposes some of the limitations that sanctuary offers. The United States provided a base of operation well inside its protection, but it also allowed the Cuban government to enforce its sovereignty. Bunnell concludes that the BTTR had tactical level success in rescuing 4,200 refugees, and strategic impacts on both United States policy and anti-Cuban sentiment in America.[77]

Bunnell's last case study is about Hezbollah. From 2004 to 2006, Hezbollah used Unmanned Aerial Vehicles (UAVs) primarily for reconnaissance during its fight with Israel.[78] Hezbollah also used the UAVs for artillery spotting and tried to arm them with explosives. However, both of those uses had negligible impacts.[79] Ultimately the Israeli Air Force shot down four of Hezbollah's six UAVs.[80] Bunnell concludes that the UAVs had limited tactical success, but the propaganda value created a strategic success.[81] This case is important because it is an early example of rebel forces using UAVs as a cheaper alternative to manned aviation.

Bunnell draws four overall conclusions from his case studies. He argues that insurgent airpower needs (in rank order), "external support, a sanctuary area, a somewhat permissive air

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[75] Bunnell, 11.

[76] Ibid.

[77] Ibid., 11-12.

[78] Unmanned Aerial Vehicle (UAV) is an older term for UAS. US Joint Staff, JP 1-02, *Department of Defense Dictionary of Military and Associated Terms* 2017, 279. Bunnell, 12.

[79] Bunnell, 13.

[80] Ibid.

[81] Ibid., 14.

environment, and a reasonably sophisticated command and control system."[82] While his case studies support his conclusions, the current environment provides small, cheap, commercially available UAS for the battle space, which may diminish the need for external support. As with Graffis and Hoffman, sanctuary remains a strong requirement for rebel airpower.

Conclusions from Doctrine and Research

In both doctrine and research, consistent themes emerge that underpin rebel airpower theory. These themes include the idea that rebel groups have limited success using conventional airpower against a conventional state air force. Sanctuary emerges as a concept that continues to play a role in successful rebel airpower attempts. Also, rebel groups tend to use what they have access to, not necessarily what they need. Here, external support is hugely important to rebel air power. Finally, rebels must understand what doctrine and theory apply to their specific set of circumstances; airpower applied without doctrine or strategy is a waste of effort and resources.

First, a rebel force that tries to conventionally contest a state air force that possesses air superiority or air supremacy will likely not succeed. The Chechen, BTTR, and Hezbollah case studies demonstrate the consequences of pitting a weak rebel air force against a strong state airpower force. Similar to the Russian response to the Chechen airbase threat, the United States Air Force offensive counterair doctrine prescribes hitting both adversarial aircraft on the ground and the air bases themselves before they ever become a threat.[83] Intuitively, the inadvisability of rebels using conventional tactics makes sense, as a large force is unlikely to lose to a smaller force that is trying to play by the same rules.

Second, the LTTE, BTTR, and Contras all benefitted from sanctuary bases. However, sanctuary only protects a belligerent so long as the political atmosphere aligns with their efforts.

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[82] Bunnell, 14.

[83] LeMay, Annex 3-01, *Counterair Operations* 2016, 22.

Only the Contras were able to maintain their sanctuary bases through maintaining their external political support. Sanctuary is difficult to maintain because, if achieved in a neighboring country, it increases the political ante for both the state fighting the rebels and the state supporting them. While sanctuary may be difficult to come by, it is also valuable, as it allows rebel groups to operate with a decreased risk to their force.

In all of these cases, the rebel groups used what they could access. Graffis asserts that a belligerent must have access to aircraft and be able to support them.[84] The evidence supports Graffis' idea. In all cases, rebels did not build an airpower capability based on requirements, but instead used what they had available, and tried to fit it into their overall operational approach. The LTTE built a capability, but it was limited based on their budget and their ability to smuggle, maintain, and conceal aircraft. The LTTE tried to create an air force but ultimately failed. The evidence supports Bunnell's assertion that effective insurgent airpower needs external support.[85] In the six case studies, only the Contras had a large degree of external support and were subsequently successful.

However, even if a rebel group had external support, failure is likely if the incorrect doctrine and strategy are applied. The Taliban achieved air parity with the Afghanistan state, but lack of doctrine and strategic vision kept strategic airpower gains beyond the reach of the Taliban. In this case, the rebels could challenge the state, but lack of doctrine and overall strategy ensured that the Taliban were doomed to waste the air assets they acquired and controlled. In the end, any small tactical gains did not help the Taliban achieve strategic objectives. Graffis claims that a rebel group must understand both airpower and insurgent theory.[86] Hoffman further argues that it

[84] Graffis, 40.

[85] Bunnell, 14.

[86] Graffis, 40.

must be a conscious choice to engage in air guerrilla warfare, though that choice is likely born out of necessity.[87] Finally, Bunnell argues that a permissive environment is necessary for successful insurgent airpower operations.[88] The interplay of these ideas is important to grasp for rebels seeking airpower. If the airspace is permissive, then rebel groups could use conventional or unconventional airpower dependent on available resources. However, in denied airspace, rebel groups should use unconventional means and tactics to contest the air domain.

Other Rebel Airpower Cases

Graffis, Hoffman, and Bunnell examined a small number of rebel airpower case studies. However, a wider range of examples will better underscore how rebels use airpower. In an attempt to fully ingest a wide array of airpower uses, this section contains three main parts. The first looks at fixed-wing aircraft, analyzing both suicide attacks and smuggling operations. Except for the LTTE, none of the previous cases used suicide attacks as a form of air warfare. The second part looks at a case of a rotary-wing aircraft used in a rebel attack. The third part deals with unmanned aircraft systems. It examines how the Islamic State of Iraq and the Levant (ISIL), Hezbollah and drug cartels each use UAS in their operations.

Fixed Wing Aircraft

The Kamikaze

During World War II, Japanese Kamikaze pilots turned their aircraft into deadly weapons. There were over 400 kamikaze attacks carried out by the Japanese Air Force.[89] Though categorically not a rebel group, Japan embraced the use of pilots and aircraft in unconventional

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[87] Hoffman, 46-48.

[88] Bunnell, 14.

[89] Robin L. Rielly, *Kamikaze Attacks of World War II: A Complete History of Japanese Suicide Strikes On American Ships, by Aircraft and Other Means* (Jefferson, NC: McFarland & Co., 2010), 1.

ways to attack American warships. This deadly mode of combat changed the world at the beginning of the twenty-first century.

The most striking modern kamikaze attack occurred on 11 September 2001. Al-Qaeda terrorists hijacked four aircraft and flew them into the World Trade Center buildings and the Pentagon. Nearly 3,000 people died. The leader of the Al-Qaeda terrorist network, Osama bin Laden, devised a plan that turned civilian airliners into devastating weapons.[90] This attack is perhaps the most extreme occurrence of aircraft used as weapons by a terrorist organization. Importantly, the airliners used in this attack were on proper flight plans, meaning that there was limited time to recognize and react to the threat once the hijackers veered the aircraft off of their flight profiles. This case differs from Japanese attacks in World War II, in that the terrorists first hijacked civilian airliners and then used them as weapons. Historical examples of this type of activity are common; from 1931 through 2016, individuals and groups hijacked 1,074 aircraft. From 1950 to 2015 there were 20 suicide crashes.[91] The majority of these are not due to rebel actions. However, they provide an important understanding of the vulnerability that exists.

On 7 January 2002, a fifteen-year-old boy flew a Cessna 172 into a high-rise in Tampa, Florida. Evidence showed that the pilot, Charles Bishop, took inspiration from bin Laden's 9/11 terrorist attack. Luckily, the pilot was the only person who died in the incident. By 2002, the United States had already instituted homeland defense measures to deal with aircraft terrorist attacks, and yet these measures did not prevent this incident. Unlike the 9/11 attacks, Bishop departed the airport without permission, and the controllers immediately notified authorities. Bishop departed St. Petersburg-Clearwater International airport and flew the small plane over the

[90] 9/11 Commission, The 9/11 commission report. US Government Printing Office, 2011, 155.

[91] Harro Ranter, "ASN Aviation Safety Database: (Contributory) cause index." Aviation Safety Network, last modified November 1, 2017, accessed November 1, 2017, https://aviation-safety.net/.

MacDill Air Force Base runway at 100 feet. His total flight time was about fifteen minutes. The Coast Guard initially intercepted Bishop with an unarmed helicopter, but the helicopter had no way to force Bishop to the ground. A pair of F-15 Fighter aircraft launched from Homestead Air Force Base in Miami, Florida. The fighters arrived just after the crash occurred.[92] This case highlights the difficulty of stopping aircraft that are already near the intended target, even if authorities immediately know something is wrong.

The incident above is rare, but still a concern. So, a question remains, how great is the threat of suicide aircraft attacks? Large aircraft attacks can cause immense damage, but the required training, planning, and scale of the operation make them less feasible. However, in 2012 the Department of Homeland Security and the Federal Bureau of Investigation released a bulletin stating that Al-Qaeda was encouraging terrorist acts using small aircraft.[93] Such small aircraft attacks, however, may not be that useful to rebel groups. Kenneth Solosky, who retired from the New York Police Department as chief pilot and director of aviation, argues that a larger threat exists from ground vehicles than small aircraft.[94] Small aircraft do not have a large payload, and they are more difficult to operate versus a truck or van.[95] Solosky's perspective brings a rational realization to these case studies. Although aircraft suicide attacks are certainly possible, they do not pose the greatest or most likely threat. With that said suicide aircraft attacks remain within reach of terrorist and rebels alike.

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[92] Kathleen Koch, "Police: Tampa pilot voiced support for bin Laden," *CNN*, January 7, 2002, accessed November 2, 2017, http://edition.cnn.com/2002/US/01/06/tampa.crash/.

[93] J.J. Green, "Terrorists eye small airplanes," *Washington's Top News*, May 6, 2012, accessed November 2, 2017, https://wtop.com/j-j-green-national/2012/05/terrorists-eye-small-airplanes/.

[94] Kenneth Solosky, "Kenneth J. Solosky," Officer.com, accessed November 2, 2017, https://www.officer.com/home/contact/10226424/kenneth-j-solosky.

[95] Kenneth Solosky, "General Aviation as a Terror Weapon," Officer.com, March 16, 2010, accessed November 2, 2017, https://www.officer.com/investigations/article/10232804/general-aviation-as-a-terror-weapon.

Drug Cartels

Drug cartels use civilian aircraft to smuggle drugs and money across international borders. Some operations take place from clandestine airstrips, while other flights fly in areas that lack control procedures.[96] Some cartels even fly transatlantic flights taking advantage of the vastness of the ocean and lack of RADAR coverage.[97]

The Sinaloa Mexican drug cartel is one of the best examples of criminal airpower. The Sinaloa cartel is one of Mexico's largest cartels. Between 2006 and 2015, authorities captured 599 aircraft and helicopters owned and operated by the cartel.[98] While most aircraft were small, the captured inventory included Gulf Stream business jets and a 727 airliner. The cartel operated these aircraft from a network of 4,771 clandestine airports spread across the country. The cartel used these aircraft to smuggle drugs and money. To put this in perspective, Mexico's largest airline, Aeromexico, only has 127 aircraft. Mexican authorities also note that 599 airframes represent only the number of seized aircraft and not the cartel's total inventory.[99] This example echoes the same problem discussed above, the difficulty of identifying civilian aircraft used for illicit activities.

In 2014, the California Attorney General released a report detailing its office's fight against organized crime. From 2008 to 2014, there were over 200 incidents recorded in which ultra-light aircraft (gliders with engines) crossed the Mexican border and dropped drugs in the

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[96] Christopher Woody, "'El Chapo' Guzmán had more airplanes than the biggest airline in Mexico," *Business Insider*, May 4, 2016, accessed November 2, 2017, http://www.businessinsider.com/el-chapo-guzman-mexico-drug-trafficking-airplanes-2016-5.

[97] Chris Hawley, "South American gangs flying vast quantities of cocaine to Europe," *Guardian*, November 15, 2015, accessed April 5, 2018, https://www.theguardian.com/world/2010/nov/15/south-american-gangs-flying-cocaine-to-europe.

[98] Woody.

[99] Woody.

San Diego desert. These ultra-light aircraft fly at night and under normal RADAR scanning altitudes to avoid detection. The pilot does not land the aircraft in the United States; they drop their payload of drugs and return to Mexico.[100] Ultra-lights are relatively cheap, require little training to fly, and can easily operate undetected.

Recent kamikaze-style attacks both large and small in scale share a commonality with drug cartels. They both use civilian aircraft to disguise their true intentions. These tactics make it hard for authorities to get a positive identification and intercept rebel air.

Rotary Wing

While all of the above examples have used fixed-wing craft, as of this writing, there is only one instance of rotary-wing aircraft used by a rebel group. In 2017, in Venezuela, a helicopter flew over the Supreme Court, opened fire, and dropped grenades on the building.[101] The attack happened concurrently with a protest at the National Assembly against President Nicolas Maduro. Venezuelan citizens blame President Maduro for the poor Venezuelan economy and the dismantlement of democratic policies. The helicopter pilot claimed to represent a group of police and civilians that want to restore democracy. There were no reports of injuries in this incident.[102] This case certainly fits the bill of rebel attack. Tactically, it did little to hurt President Maduro. There is also no evidence that analyzes the propaganda value of this event. Still, this case represents yet another way in which rebels could utilize airpower.

[100] Kamala Harris, "Gangs Beyond Borders California and the Fight against Transnational Organized Crime" *California: California Attorney General* (2014), 65, accessed 1 November 2017, https://oag.ca.gov/sites/all/files/agweb/pdfs/toc/report_2014.pdf.

[101] Sam Jones and Virginia Lopez, "What do we know about the Venezuela helicopter attack?" *Guardian*, Jun 28, 2017, accessed November 2, 2017, https://www.theguardian.com/world/2017/jun/28/what-do-we-know-about-the-venezuela-helicopter-attack.

[102] Jones and Lopez.

Unmanned Aircraft Systems

Of all the previous threats discussed, the threat of UAS is the most extensively researched. A quick comparison of early reports, compared to more recent reports, reveals rapid growth in technology, capability, and an increased concern. For the purposes of this monograph, this section will simply serve as a primer to the problem of UAS proliferation and highlight a few cases of rebel groups using UASs.

First, regarding context, there are three markets for COTS UAS: personal, commercial, and military. All three markets are growing quickly. The UAS research company, Gartner, found that in 2015 to 2016 personal and commercial UAS sales increased 60%. Furthermore, personal and commercial sales are expected to increase 34% in 2017. The projected total number of UAS produced in 2017 is just shy of 3 million globally.[103] These figures are important because they show a growing demand, highlight issues of proliferation, and show that access to the technology is global.

The Islamic State of Iraq and the Levant

The most recent and menacing rebel group using UAS is the Islamic State and the Levant (ISIL). For starters, ISIL is not just using off-the-shelf toys and harassing coalition forces; they are systematically employing UAS using precise tactics with a definite strategy.[104] The entire use of UAS is managed internally by ISIL, complete with the requisite request, capability matching, and after action reports process.[105] ISIL starts with COTS UAS and then modifies them to fit their

[103] Gartner, "Gartner Says Almost 3 Million Personal and Commercial Drones Will Be Shipped in 2017," Gartner, February 9, 2017, accessed November 3, 2017, https://www.gartner.com/newsroom/id/3602317.

[104] Serkan Balkan, *Daesh's Drone Strategy: Technology and the Rise of Innovative Terrorism* (Ankara, Turkey: SETA Foundation for Political, Economic and Social Research, 2017), 9-12.

[105] Ibid., 14-15.

need. Modifications include upgraded cameras, control servos, and the ability to carry munitions (grenades, Improvised Explosive Devise (IEDs), and 40 mm bombs). Flight time varies between ten and thirty minutes with ranges from half a kilometer to seven kilometers. The average cost for each UAS is between 650 and 1,000 US dollars. Lastly, open source flight control software (Qground Control 2.0) is used in conjunction with Google Maps to pre-program and rehearse flight routes, live stream video, and make real-time in-flight changes.[106]

ISIL has two main strategies for UAS employment: maximize casualties and produce propaganda.[107] ISIL accomplishes these goals with tactics that include ISR, battlefield coordination, and direct attack. To maximize casualties, ISIL uses ISR to pinpoint coalition forces and blockades. They can either target the blockade or coordinate with their ground forces so that those forces can avoid them. This integration of air and ground capabilities has increased the effectiveness of vehicle-based attacks by avoiding coalition forces and concentrating on areas of greatest target density. ISIL also uses UAS for direct attacks, sometimes with the UAS dropping munitions and sometimes with the UAS acting as flying IEDs. In both cases, the footage from these attacks is recorded, screened, and processed for use as propaganda.[108] ISIL only broadcasts successful operations, and often they are edited to look like video games, so they appeal to impressionable youth.[109] The recent fight in Mosul highlights the seriousness of ISIL's UAS operations.

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[106] Balkan, 14-20.

[107] Ibid., 23.

[108] Don Rassler, Muhammad al-Ubaydi, and Vera Mironova, "CTC Perspectives–The Islamic State's Drone Documents: Management, Acquisitions, and DIY Tradecraft" *Combating Terrorism Center*, 2017, 1.

[109] Balkan, 23.

In the 2017 fight for western Mosul in Iraq, ISIL launched 72 UAS attacks in the first day alone. Some attacks saw up to five UAS used at once. UAS attacks persisted throughout the operation, due to the operator's ability to blend in with the city and fight from a stand-off position.[110] ISIL successfully integrated UAS sorties into their combat plans.[111]

ISIL was not trained, equipped, or funded like a traditional state, yet they showed remarkable prowess using COTS UAS in a comprehensive approach to support both tactics and strategy. Nor did their lack of statehood hamper their ability to acquire airpower. ISIL's easy access to, and effective utilization of, UAS technology demonstrates that, in the future, states engaged in fights against rebel groups will likely face the use of adversarial UAS.

Hezbollah

Hezbollah also has a history of using UAS.[112] In comparison to ISIL, Hezbollah uses larger UAS platforms, namely the Mirsad-1 and Ababil, which are Iranian built military-UAS platforms.[113] They can carry up to 50 kilograms of explosives with ranges well more than 100 miles.[114]

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[110] Balkan, 36-38.

[111] Ibid., 36.

[112] In 1997, Hezbollah was classified as a terrorist organization by the United States. It remains on the terrorist list and therefore warrants consideration as a rebel group. "Foreign Terrorist Organizations," US Department of State, accessed January 18, 2017, https://www.state.gov/j/ct/rls/other/des/123085.htm.

[113] The Mirad-1 and Ababil UAS are 'Group 3' UAS systems according to the Unmanned Aircraft Systems Categorization Chart. They have payloads less than 1,320 lbs, fly under 250 knots, and operate below 18,000 feet mean sea level. US Joint Staff, JP 3-30, Command and Control of Joint Air Operations 2017, III-30.

[114] Milton Hoenig, "Hezbollah and the Use of Drones as a Weapon of Terrorism," *Public Interest Report* 67, no. 2 (2014), 1-2.

Hezbollah launched two UAS sorties in 2004 and 2005. Both flights caught Israel off guard. The sorties penetrated Israeli airspace undetected and were subsequently not intercepted by the Israeli Air Force. From the very start, Hezbollah used these sorties for propaganda to embarrass Israel and tout Hezbollah's deep strike capability. In 2006, Hezbollah launched a third UAS, but this time it was shot down by the Israeli Air Force. Even though the UAS was shot down, Hezbollah still used this event for propaganda and to incite fear inside Israel. After that incident, there was a lull in UAS operations that lasted until 2012, when Hezbollah launched a UAS sortie that flew over an Israeli nuclear facility. It too was shot down, but it may have streamed footage of the facility back to Hezbollah.[115]

This short example provides a different look at how rebels can use UAS. Hezbollah seems to focus primarily on the propaganda value of the sorties. They utilize military grade systems, yet do not integrate them into broader tactical and operational plans. Instead, Hezbollah appears content to use UAS as a strategic propaganda tool in stand-alone operations. Additionally, the ability of the Israeli Air Force to shoot down these aircraft is noteworthy. Hezbollah continued to launch UAS sorties, but starting in 2006, Israeli pilots have been able to intercept all sorties. This ability to intercept supports United States Air Force doctrine, which argues that that medium and large UAS are relatively easy to detect, have limited maneuverability, and are subsequently vulnerable to conventional air-to-air interception.[116]

Drug Cartels

Lastly, some actors use UAS platforms for smuggling operations. According to Drug Enforcement Administration (DEA) reporting, transnational criminal organizations use UAS

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[115] Hoenig, 1-3.

[116] LeMay, Annex 3-01, *Counterair Operations* 2016, 34.

platforms to transport narcotics across the United States-Mexico border.[117] In 2015, a COTS UAS carried 28 pounds of heroin to El Centro, California.[118] In 2016, another COTS UAS carried 30.8 pounds of marijuana across the border to San Luis, Arizona.[119] In both of these cases, the captured UAS were relatively small commercial airframes with small payloads. It is hard to estimate how many flights like these occur since most go unnoticed. Currently, the DEA reports that this particular method accounts for a very low volume of smuggling, but notes that it is a growing concern.[120]

Of all the nefarious uses of UAS, this smuggling case seems like a low threat. Nevertheless, it marks a distinct use not echoed by ISIL or Hezbollah. While individual UAS flights are tactical by nature, large-scale smuggling activities are operational level efforts that connect cartels to end users. Additionally, unlike ISIL or Hezbollah, drug cartels want their UAS to remain unseen. The hard to detect nature of small UAS platforms is an advantage cartels are exploiting, and one that rebel groups, as well, may find useful.

These examples of rebel groups and cartels using UAS highlight a willingness to adapt and incorporate new technology at all levels of war. For now, it appears strategic UAS impacts are limited to propaganda operations. Operational uses include large-scale smuggling and deliberate distribution and integration into broad operations. Moreover, at the tactical level, UAS sorties provide ISR and attack capabilities at a low cost and with low risk to the user. The continued evolution of UAS threats poses significant challenges for military and civilian

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[117] *2017 National Drug Threat Assessment* (DEA Strategic Intelligence Section, 2017), accessed January 23, 2018, 7, https://www.dea.gov/docs/DIR-040-17_2017-NDTA.pdf.

[118] *2016 National Drug Threat Assessment* (DEA Strategic Intelligence Section, 2016), accessed January 23, 2018), 8, https://www.dea.gov/resource-center/2016%20NDTA%20Summary.pdf.

[119] DEA, *2017 National Drug Threat Assessment*, 7.

[120] Ibid.

planners. This problem will not go away and must be considered on any new battlefield, whether a military is facing state actors or a rebel threat.

The Future of Rebel Airpower

This paper argues that rebels will continue to seek the ability to fight in the air domain. Additionally, current airpower trends could intersect, creating a challenging convergence of capabilities and tactics that present opponents with multiple dilemmas. In particular, the emergence of COTS UAS offers several potential advantages to rebel groups.

Previous theorists presented ideas and concepts that rebels should consider. The validity of those concepts remains relevant within certain contexts, but there are caveats. Bunnell argues that external support is needed to wage an effective rebel air campaign. However, not all rebel groups rely on external support. Increasingly, COTS UAS offers affordable access to the air domain void of the need for external support. Graffis argues the need for sanctuary. While still helpful if available, it is not necessary. Again, UAS are hard to track and easy to conceal (which is a form sanctuary, but not exactly what Graffis argued). Moreover, civilian aircraft blend in with civilian traffic. Hoffmann argued that guerrillas need to make a conscious choice to fight either conventionally or unconventionally. While it certainly is true that a rebel group must be purposeful in its actions, ISIL uses both conventional and unconventional methods integrated into a coherent strategy. In fairness to these previous theorists, there are now more examples of rebel airpower. Additionally, this paper's liberal categorization of rebels allows for a broader scope of inquiry, and subsequently more examples.

Consider Table 2, below. Recent rebel airpower examples point towards an increased tendency to use airpower unconventionally, with the use of civilian equipment more prevalent than military equipment. Propaganda, ISR, and strike appear consistently as preferred airpower uses. UAS add to the mix of air assets. Moreover, rebel groups continue to use airpower that has impacts at all levels of war. These current trends in rebel airpower are helpful in preparing for the

future, but airpower professionals must also pay attention to the outliers, activities not yet incorporated into rebel air strategies.

Cartels are extremely successful with air smuggling operations that generate enormous amounts of wealth. If rebel groups were to use this tactic to facilitate their financing operations, they would create a dilemma for conventional forces. Additionally, it is hard to forecast if suicide attacks will grow, or will stay on the fringes of combat. However, flying IEDs will likely become more prevalent with increased capability and proliferation of UAS technology. Lastly, in most of the cases of rebel airpower examined above, rebels used airpower in multiple ways. Sometimes these uses are separate, with specific tasks in specific situations, but in other times well thought out operations combine ISR, strike, and propaganda across multiple levels of war. On the macro level, it appears that the tendency for rebels to utilize airpower in complex ways will continue to grow. For example, the potential for airpower to expand and encompass new ideas like swarming UAS has not yet occurred, but is a potential future threat.

Table 2. Rebel Airpower Modes

Rebel Airpower

	Strategic	Operational	Tactical	Conventional	Unconventional	Military Equip	Civilian Equip	Propaganda	ISR	Strike	Mobility	Suicide Attack	Flying IED	Smuggling	Aircraft	RPA
Contras		S		X		X					X				X	
LTTE	S			X		X		X		X		X			X	
Chechens			F	X		X									X	
BTTR	S		S	X			X	X	X						X	
Taliban			F	X		X				X					X	
Drug Cartels		S		X			X							X	X	X
9/11	S		S		X		X					X			X	
Hezbollah	S			X		X		X	X							X
Charles Bishop			S		X		X					X			X	
ISIL	S	S	S	X	X	X	X	X	X	X			X			X
Venezuela	S				X		X	X		X					X	

S = Success
F = Failure

Source: The Author

There are obstacles to rebel airpower growth. Rebels do not appear to share best practices across the community. Most groups stick to one form of airpower or one tactic. Cartels utilize both UAS and aircraft, but they use both platforms to perform the same purpose, smuggling drugs. ISIL uses UAS for propaganda, ISR and strike, but that is the only type of airpower technology they use. Perhaps rebel groups simply make choices based on best value, as Hoffman suggests. Alternatively, perhaps it shows that these groups are not as adaptive and creative as often portrayed.

The United States Air Force conducts simultaneous attacks which overwhelm the enemy because of the enemy's inability to cope with multiple dilemmas.[121] Rebel groups could equally benefit from this way of thinking. The integration of different aircraft, roles, and tactics into rebel operations would create a multi-dilemma problem for the conventional forces fighting the rebels. It is prudent for military planners to consider the possibility that, in the future, rebels will indeed adapt and adopt tactics across multiple rebel organizations.

This paper argues that, in addition to the ideas of the earlier theorists, there are four broad considerations rebels could use to most effectively leverage airpower: use low-cost, low-risk technology, conceal higher cost operations, consider propaganda at all levels of war, and present a multi-dilemma problem in the air domain. The most successful rebel airpower operations examined above support these ideas.

Both the Taliban and Chechen rebels captured conventional fighter aircraft assets. However, neither could use them in any effective way. On the surface, it seems like captured military aircraft is of great value. In reality, it is unlikely that rebel groups can maintain such aircraft, or are trained to fly them effectively. Also, the airpower capability posed by military-grade aircraft would present such a serious threat that it would demand, and receive, an immediate response from a conventional air force. More-conventional rebel airpower is similar to the conventional airpower threat posed by adversarial states; current military doctrine and training is already focused on and prepared to defeat this threat.

In contrast, cheap off-the-shelf UAS or civil aircraft adapted for warfighting create better options, present a perceived lower risk to the enemy, and thus garner less of a response from a conventional force. This idea is similar to Hoffmann's 'best value' idea but differs in simplicity.

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[121] Curtis E. LeMay Center for Doctrine Development and Education, Annex 3-0, *Operations and Planning*, 4 November 2016, 26, accessed, October 15, 2017, http://www.doctrine.af.mil/Portals/61/documents/Annex_3-0/3-0-Annex-OPERATIONS-PLANNING.pdf.

Instead of trying to determine what 'best value' means and how that translates into a specific airframe, rebels would be best-served by simply acquiring low-cost assets. This concept prioritizes quantity over quality and allows for learning to occur without steep operating cost.

Next, the concept of concealing high-cost operations is similar to the idea of sanctuary, but differs in that rebels can hide in plain sight both in and out of territory they control. Drug cartels showcase this idea when they utilize civilian aircraft. Cartels operate many different aircraft from both public and private airports. Rebel using airframes that masquerade as civilian aircraft present identification issues, especially when they use small aircraft that are hard to see with RADAR.[122]

Military forces are understandably wary of shooting down civilian aircraft, so the lack of positive control measures in countries with less RADAR coverage offers a distinct advantage regarding concealment. Additionally, rebels may use civilian aircraft operating on approved flight plans to aid in covering the true nature of their aims. While concealment is important in all aspects of war, it is increasingly important when considering aircraft which are expensive to own and operate. In the case of smuggling, larger aircraft equal larger payloads and often faster transit times, making smuggling operations more profitable. Large civilian aircraft also pose a greater danger when hijacked and turned into a kamikaze-style attack due to their sheer size and speed.

The third concept of rebel airpower, propaganda, has many important roles for rebel groups. Target audiences are both internal and external to the group and push messages that have both strategic and tactical consequences. The LTTE, BTTR, and Hezbollah all focused on strategic propaganda. However, ISIL demonstrated a keen ability to create propaganda from tactical and operational actions. The first three groups focused on missions where the goal was specifically to produce propaganda, but ISIL understands that UAS missions (indeed all missions)

[122] "Small Dark Aircraft," Department of Homeland Security, February 27, 2018, accessed April 10, 2018, https://www.dhs.gov/publication/small-dark-aircraft.

have both a primary role (the tactical action) and an inherent secondary potential for producing propaganda. In this way, ISIL maximized the impact of each sortie. If rebel groups are going to maximize their efforts, they will likely adopt ISIL's model and potentially seek a dual purpose for every air sortie.

The last idea of presenting a multi-dilemma problem for opponents is not new, yet attacks from rebel groups often seem one-dimensional. The 9/11 terrorist attacks happened in one domain, but by using four planes in near-simultaneous attacks, it created a moment of paralysis and confusion. It also ensured there was no misinterpretation of the events as anything other than a deliberate attack (important for propaganda). Drug cartels use UAS, aircraft and a host of other means simultaneously to smuggle drugs. This multiplicity of effort means that law enforcement cannot do just one thing to stop drug smuggling. Regarding military operations, ISIL used coordinated UAS strikes and surveillance integrated into ground operations, which presented coalition forces with multiple problems in multiple domains. In contrast, Cuba easily defeated the BTTR. The BTTR only had one mode of operation, which always presented the same problem. The Taliban never used their aircraft in any coordinated fashion and attacked haphazardly. This lack of planning showed in the strategic and tactical inadequacy of Taliban airstrikes. These cases show that multi-dilemma problems incorporated in multiple domains, or at a minimum, simultaneous attack in a single domain, pose a serious threat even to a conventional state air force. Simultaneous attacks mandates increased planning and strategic thought, but the cases studies show that it is worth the effort. The only real value for a single attack is the potential propaganda value depending on the context.

In sum, this paper argues that, by using low-cost, low-risk technology, concealing higher cost operations, developing propaganda, and presenting multiple dilemmas, rebel airpower operations could successfully challenge a state's air superiority. The main argumentative strength of this paper's new theory is that it does not require any change or radical adaptations for rebel

groups. The theory relies on a wide sample of current rebel airpower actions and then forecasts the danger if multiple modes of rebel airpower come together. In essence, the theory of this paper is simply evolutionary.

This paper focused on existing practices and did not consider near-future technologies, such as swarming UAS and artificial intelligence. Additionally, this paper did not consider anti-access technology like surface-to-air missiles, yet rebels are likely interested in creating denied airspace areas. Instead, this paper focused on how rebels might themselves use the air domain.

However, this theory does not offer concrete solutions to solve the problems of rebel airpower. If rebels do adopt the strategy outlined in this paper, it remains to some degree untested. Even with ISIL's resourceful use of COTS UAS, they are losing their fight.[123] While moments of tactical victory are intriguing, this list of rebels is mostly a list of losing groups. It remains to be seen if rebels will successfully use airpower to achieve victory in a conflict.

Implications for the Military Planner

Currently, rebel groups seem to utilize only a few different modes of airpower operations. If the convergence of techniques described above occurred, however, it would significantly increase the complexity and challenge of any state response. Consider a rebel group that uses the air domain to smuggle illicit drugs to fund its operations. It could utilize civilian aircraft for mobility, hijacking, and suicide missions. It could use UAS to conduct ISR, smuggling and strike missions. Moreover, the rebel group could do all of these things simultaneously, integrating its air operations with efforts on the ground. The propaganda generated by these actions could circulate instantly on social media, creating an atmosphere of fear (the air is not safe), mistrust of the

[123] Patrick Cockburn, "Preview 2018: After a String of Defeats in Iraq and Syria What 2018 means for ISIS," *Independent*, January 1, 2018, accessed April 5, 2018, https://www.independent.co.uk/news/world/middle-east/isis-defeat-syria-latest-iraq-2018-survive-a8107891.html.

government (which is incapable of air superiority), and the potential for increased recruitment. Additionally, consider that this may take place in an urban setting outside of a defined war zone. Furthermore, this hypothetical rebel operation could happen as a stand-alone attack, or in conjunction with a state-waged conventional attack, effectually creating a hybrid warfare scenario.

In the 2016 United States Air Force Posture statement, the Chief of Staff calls for Air Force modernization capable of handling 'full-spectrum' operations.[124] Technology, while it is necessary, it is not the only fix. Policy, procedures, and rules of engagement can help combat rebel airpower, but it requires dedicated thought ahead of time to prepare for the future. As an example, what kind of rules of engagement should be in place when known groups use civilian aircraft to smuggle drugs and fund operations? If this occurs outside of a war zone, it is unlikely that a no-fly policy will work given the disruption it would cause to normal civil transportation and commerce. Alternatively, take the problem of UAS technology. The United States can regulate it to a point, but rebel groups will probably not abide by those restrictions. Technological defenses are in the works, but at what cost? Will the cost of countering rebel airpower be prohibitively high? Moreover, how widespread do UAS defenses have to be so that they provide effective protection to populations from rebel groups bent on causing destruction?

Finally, rebel airpower can present a multi-dilemma problem, either on its own or in conjunction with an adversarial state. The combined result creates a hybrid warfare problem for military planners. This paper has highlighted these dangers at the macro-level, but solutions will not become apparent until the military closely examines these possibilities. This research demonstrates that use of the air domain is not the exclusive privilege of the state or conventional

[124] Deborah Lee James and General Mark A. Welsh III, "Fiscal Year 2015 Air Force posture statement" (2016), 4.

forces. Rather, emerging airframe technology and the potential for convergence between rebel and cartel strategies portends a likely change in the threats to military air superiority.

Conclusion: Rebel Airpower is a Factor

This paper asked the following questions: do rebel forces want airpower; if so, what would it look like; and what are the implications for conventional military forces if they find themselves facing rebel airpower? These questions are important because military planners must consider a wide array of challenges and outright dismissal of rebel air capabilities would overlook a threat that could have serious consequences.

Doctrine focuses on conventional airpower threats. Despite attempts to protect United States airspace, there are still potential threats from rebel airpower. Previous theorists agree that rebel groups have limited success using conventional airpower against a conventional state air force; the Chechen, BTTR, and Hezbollah case studies support that claim. Sanctuary consistently emerges as an important role in rebel airpower. Here the LTTE, BTTR, and Contras case studies reinforce this statement. Additionally, airpower doctrine and strategy is needed even for rebel groups, as the Taliban and Chechen case studies demonstrate. Also, if rebel groups can acquire external aid, it increases their odds. The Contras won their fight because of it. Last, rebel groups tend to use what they have access to, not necessarily what they need. All the cases analyzed in this paper corroborate this claim.

This paper argues that rebel forces do want airpower, and that they can contest a state's control of the air domain. Four main points support this argument. First, the increase of low-cost, low-risk technology allows rebels to use and contest the air domain. UAS technology in the hands of ISIL and drug cartels supports this claim. Second, it is beneficial to conceal high-cost operations. Drug cartels use many civilian aircraft, even airliners to smuggle drugs. The aircraft blend in with other civilian aviation, which conceals the smuggler's movement. Third, rebel groups should consider propaganda at all levels of war. ISIL was adept at creating propaganda

from tactical actions that had strategic implications. Lastly, rebels should create multi-dilemma problems for their opponents. ISIL, drug cartels, LTTE, and the terrorist attacks on 9/11 all created multiple-dilemmas, or at least multiple simultaneous attacks, that created havoc for their opponents.

The convergence of rebel airpower techniques and technical capabilities will present an emerging challenge for states. Doctrine is largely silent when it comes to rebel airpower, leaving room for much expansion on the subject. Planners should make the automatic assumption (until invalidated) that rebel groups will incorporate some form of airpower. Additionally, airpower experts should expect that rebels will try and fight in ways that are advantageous for them, not for conventional state forces. The most likely course that rebels will take is one that causes military professionals some degree of surprise and headache. As the United States continues to equip itself for the high-end fight, it must also prepare for the unknown and develop creative options to address unconventional airpower challenges. Air Force officers must think beyond procedure and intended platform purpose. They must recognize rebel airpower as a threat, and consider how to defeat it.

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