



ALTERNATIVE AIRPOWER FOR AFGHANISTAN: Unmanned Aircraft Systems

Benjamin F. Schumacher, Major, USAF



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Alternative Airpower for Afghanistan:
Unmanned Aircraft Systems

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Wright Flyer Paper No. 86

Air University Press
Muir S. Fairchild Research Information Center
Maxwell Air Force Base, Alabama

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Colleges*
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<https://www.airuniversity.af.edu/AUPress/>

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<https://facebook.com/AirUnivPress>

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Accepted by University Press April 2021 and Published October 2021.

ISSN 2687-7260

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Foreword

It is my great pleasure to present another issue of The Wright Flyer Papers. Through this series, Air Command and Staff College presents a sampling of exemplary research produced by our resident and distance-learning students. This series has long showcased the kind of visionary thinking that drove the aspirations and activities of the earliest aviation pioneers. This year's selection of essays admirably extends that tradition. As the series title indicates, these papers aim to present cutting-edge, actionable knowledge—research that addresses some of the most complex security and defense challenges facing us today.

Recently, The Wright Flyer Papers transitioned to an exclusively electronic publication format. It is our hope that our migration from print editions to an electronic-only format will foster even greater intellectual debate among Airmen and fellow members of the profession of arms as the series reaches a growing global audience. By publishing these papers via the Air University Press website, ACSC hopes not only to reach more readers, but also to support Air Force-wide efforts to conserve resources. In this spirit, we invite you to peruse past and current issues of The Wright Flyer Papers at <https://www.airuniversity.af.edu/AUPress/Wright-Flyers/>.

Thank you for supporting The Wright Flyer Papers and our efforts to disseminate outstanding ACSC student research for the benefit of our Air Force and war fighters everywhere. We trust that what follows will stimulate thinking, invite debate, and further encourage today's air, space, and cyber war fighters in their continuing search for innovative and improved ways to defend our nation and way of life.



EVAN L. PETTUS
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Acknowledgements

A special thanks to those who supported me in the research and writing process. Also, many thanks to my advising team, Dr. William Dean, Lt Col Steven Quillman, and Lt Col Anthony Kim, as well as my Small Wars classmates for their expert instruction, review, and guidance. I also would like to thank Dr. John Geis and Maj Michael LaSorda from the Airpower Research Task Force for providing guidance and direction on Unmanned Aircraft. Additionally, Lt Col Brett Cullen provided the perspective of a Remotely Piloted Aircraft pilot as well as Maj Jason Pettengill, Maj Matthew Hatt, and Maj David Foster who provided real-world Combat Aviation Advisor experiences. Another special thanks for my Airpower II seminar instructor Lt Col Donald Benzing, advisor Dr. Jordan Hayworth, and my “counter-UAS threat swarm” research teammates, Mr. Matthew Hylton, Maj Jeremiah Gilmore, Maj Benjamin Peacock, and Sqd Ldr Anshuman Jaydev for their thoughtful review, additional sources, and experiences.

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Abstract

Over the last two decades, Unmanned Aircraft Systems (UAS) have become an integral part of counterinsurgency and counterterrorism operations. Ground forces rely on the continuous support and protection of military airpower to be effective against an elusive enemy embedded among the population. However, in the case of Afghanistan, international advisors have struggled to fully develop a traditional manned air force and transition from foreign assistance to independent host nation-led air operations. This paper proposes and supports the expanded use of UAS as an alternative to augment the manned Afghan Air Force. As a case study, the Afghan National Army has begun independently using small-UAS for intelligence, surveillance, and reconnaissance missions, setting the precedent for further Afghan UAS capability. Additionally, the paper looks at the ease of UAS implementation in Afghanistan as an affordable alternative located, owned, and operated directly with ground forces like the US Army Aviation construct. The paper concludes by recommending UAS Training Platoons be included within the US Army's Security Force Assistance Brigades to implement UAS training programs in Afghanistan as well as other future counterinsurgency conflicts.

Introduction

Over the last two decades, Unmanned Aircraft Systems (UAS) have become an essential component of military airpower in modern “small wars” such as Counterterrorism (CT) and Counterinsurgency (COIN) operations.¹ Joint Publication 3-30, *Command and Control of Joint Air Operations*, defines UAS as a “system whose components include the necessary equipment, network, and personnel to control an unmanned aircraft.”² The more complex UAS require more integration between functions, services, and organizations to operate effectively.

During the war in Afghanistan, almost all UAS operations were conducted by foreign coalition partners rather than the Afghan Air Force (AAF) or Afghan National Army (ANA). The coalition primarily used complex large frame (Category 4 or 5) UAS such as Predators and Global Hawks. UAS are divided into five categories of size and complexity (Figure 1).³ Although advanced US and allied air forces prefer large UAS, small UAS (sUAS) systems (Categories 1 to 3) have become more prevalent among ground forces and in less-developed countries. Developing countries prefer sUAS for their relative simplicity which makes them easier to train, operate without an airfield, and transport between locations. They are also significantly less expensive than a manned aircraft alternative (usually less than one percent of the unit cost). Recent cases, such as the implementation of the ScanEagle UAS program with the ANA, have demonstrated that effective and independent use of a UAS by Afghan forces is not just a possibility, but already a reality.

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

Figure 1. Unmanned Aircraft Systems Categorization Chart. (Reprinted from Joint Publication 3-30, "Joint Air Operations," July 25, 2019.)

Throughout the US COIN mission in Afghanistan, the integration of UAS into military operations has enabled the detection and elimination of enemy combatants, weapons, and equipment that could harm either coalition forces or their host nation partners.⁴ They have been essential to denying insurgents the sanctuary and freedom of movement they require to propagate their insurgency. American military UAS have been an integral part of "kinetic" strikes such as Attack Interdiction or Close Air Support (CAS) as well as "nonlethal" missions like Intelligence, Surveillance, Reconnaissance (ISR), and force protection overwatch.⁵ However, after the initial successes of defeating the Taliban, the transition from foreign administration to a self-sustaining Afghan government has proven to be difficult. Additionally, transitioning from a foreign-led International Security Assistance Force to independent Afghan National Defense and Security Forces (ANDSF) capable of their own internal defense has been slow, difficult, and consistently lacked a sustainable military airpower capability.

The AAF, with associated manned platforms such as A-29 light attack aircraft and UH-60 helicopters, has been slow to develop because of the challenges of training, desertions, corruption, slow procurement, sustainment capacity, and lack of overall proficiency.⁶ An alternative method of providing military airpower support and associated Foreign Internal Defense (FID) training is needed that can be rapidly fielded and aligned with the Army ground forces who require the most air support in COIN warfare. FID is defined as foreign military assistance in programs and activities undertaken by a host nation government to free and protect its society from insurgency or other threats to its security.⁷ Advisors work through FID to develop the host nation's capacity. UAS offer the potential to quickly augment the capacity of the manned AAF by freeing up limited resources, and performing certain mission areas such as ISR, communication links, CAS, and even transportation of cargo in lieu of manned AAF aircraft.⁸ UAS, especially small hand or rail-launched sUAS, provide a system that is easy to operate, can be embedded with ground forces, reduces risks to human operators, has lower costs and training complexity, and is easier to sustain for increased availability.⁹ Additionally, the Security Force Assistance Brigades (SFABs) now deployed to Afghanistan offer an opportunity to implement comprehensive UAS FID combining their existing sUAS expertise, advising capabilities, and familiarity with the Army-controlled airspace and Joint Air-Ground Integration Center (JAGIC) concept which includes the Army-based sUAS operations the Afghan forces require most. UAS have the potential to be very useful in stability and COIN operations when low-supply and high demand aircraft are unavailable or there is a lack of host nation infrastructure or capacity to employ them.

Because of the shortfalls of training pilots in Afghanistan as well as delivering and maintaining aircraft for the AAF, UAS offer the best solution to provide ground forces an aviation support capability to fight any counterinsurgents when manned AAF aircraft are unavailable or in insufficient supply for the mission.

The primary goal of this research is to evaluate whether UAS can be a viable alternative for military airpower in support of the ANDSF's COIN mission. A secondary goal is to identify a potential organization that will run and implement UAS FID training. UAS can assist the ANDSF in conducting their own internal defense and provide relief for international security assistance partners. After 19 years, NATO and US-led coalition air forces are still conducting most military aviation sorties in support of the ANDSF (see Figure 2). Countries like Afghanistan are often economically or politically weak states who rely on foreign partner forces to conduct internal security operations when faced with insurgencies.

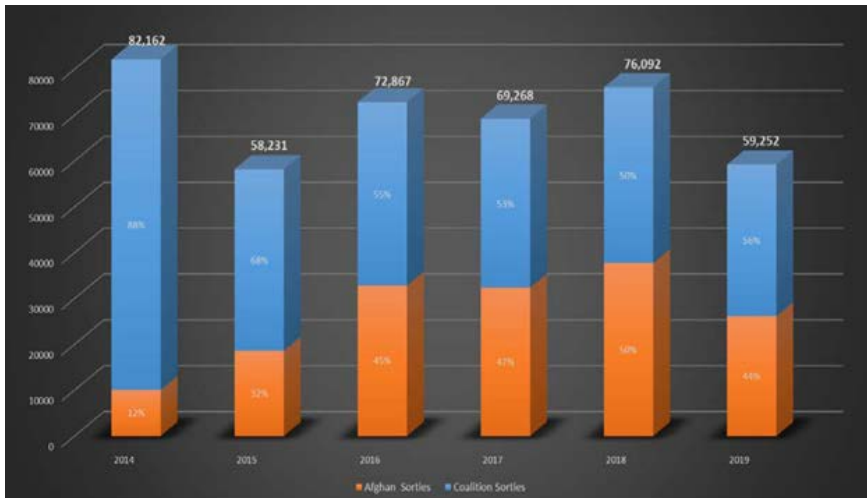


Figure 2. Afghan Sortie Generation Compared to Coalition. (Reprinted from DOD, “Enhancing Security and Stability in Afghanistan, 1225 Report to Congress,” December 2019.)

Since 2001, ongoing insurgency threats such as the Taliban, al-Qaeda, and the Islamic State of Iraq and Al-Sham-Khorasan (ISIS-K), have disrupted the progress in Afghanistan. To counter these threats, the NATO Resolute Support Mission (RSM) helps the ANDSF and other military institutions. Through RSM, US forces are conducting security force assistance and FID training to build the host nation’s independent military capacity.¹⁰ Since the mission statement of NATO RSM is to help the ANDSF and military institutions, Afghanistan needs to develop the capacity to defend itself and protect its citizens in a sustainable way.¹¹ Insurgencies are not only disruptive, but also long-term conflicts which require national governments to use cost effective, sustainable solutions to limit casualties and financial costs.¹² One way to reduce costs is through UAS as they remove the physical threat to personnel and provide protection for forces on the battlefield. Additionally, the UAS have the advantage of being persistent, flexible, low cost, easy-to-sustain weapon systems which further reduce the overhead operating costs. In Afghanistan, coalition forces and the AAF have used traditional aircraft like fighters and helicopters to conduct airstrikes, CAS, gather ISR, establish communication links, or provide mobility.¹³ However, these manned aircraft are expensive to procure and sustain, and complex to train and operate. UAS perform many of the same mission areas at a fraction of the cost. Therefore, it is imperative that Afghan forces be capable of effective COIN operations using

sustainable solutions like UAS to ensure that Afghanistan remains a friendly partner country and does not become a haven for terrorism or broader instability in the region.

The effort to develop the ANDSF into an independent force has recently become even more urgent. The US and NATO are working toward a peace agreement with the Taliban and have announced their intention to withdraw almost all military forces from Afghanistan in 2021. It is unknown how many foreign forces will eventually remain in a security cooperation “noncombat” role. Although the US has stated and reinforced its intent to continue to support and defend the Afghan government, foreign forces will be fewer in number and more limited in their ability to conduct armed or lethal action. Therefore, the US needs a sustainable FID strategy to build ANDSF capacity to be self-reliant. Additionally, Afghan ground forces are taking unsustainable casualties due to factors including lack of tactical air cover as well as battlefield situational awareness while conducting operations.¹⁴ Afghan Special Security Forces (ASSF) are better equipped and trained but the Afghan government has over-tasked them as a quick reaction force for any contingency, thereby degrading their personnel and equipment readiness. While the conventional Afghan forces can generally secure population centers and major transportation routes, they require consistent coalition assistance for fire support, lift, and ISR.¹⁵ If Afghanistan is to have the capability of air support for its forces, an alternative to the traditional manned AAF must be developed and one that is easier to field, sustain, and train. For this, expanding the ANDSF’s UAS capability and the development of a UAS FID solution is critical to meeting the urgent need to develop the ANDSF before the coalition’s withdrawal from Afghanistan.

Background—Traditional Airpower in Small Wars

Government forces in Afghanistan have been fighting almost continuous “small war” insurgencies since 1978 just before the Soviet invasion. When conducting COIN, the government relies on air forces to support ground forces rather than on air force defense from external military aviation threats. In an insurgency, the government is at a disadvantage against an opponent who has the initiative, flexibility, mobility, and the ability to blend in with the local population.¹⁶ Also, the government must exercise restrictive rules of engagement to avoid collateral damage and civilian casualties which undermine the government’s legitimacy and support of the population.¹⁷

The Soviets realized during their war in Afghanistan that the population quickly turned against the government in regions where they resorted to large-scale communal punishment strikes or used indiscriminate fire at hard-

to-target insurgent positions embedded among population centers.¹⁸ The advantage of airpower is that it enables the ground forces to maneuver and strike with greater precision and efficiency around the battlespace which, in turn, denies insurgents sanctuary and access to their objectives. Airpower provides commanders an accurate picture of the battlefield through ISR. Using ISR, ground maneuver forces can track and secure friendly forces as well as generate accurate targeting data. Also, ISR gathers critical information on insurgent infiltration routes and therefore prevents insurgents from escaping back to sanctuaries.

In past conflicts like Vietnam, helicopter-supported small unit operations partnered with a light attack CAS capability were the best counter to guerilla-insurgent tactics by wearing the militants down through relentless movement and strike operations.¹⁹ In other words, airpower is most useful in COIN by providing direct support to land forces as they maneuver and mirror the irregular tactics of the insurgents.

Small wars operations also require flexible, cheap, and rugged solutions which can operate without improved airfields. The US Marines fighting COIN in Nicaragua during the 1920s and 30s used biplanes that could land on dirt roads or grass fields and could remain aloft over the jungle for extended periods.²⁰ In Vietnam, the US was most effective at accurately combating difficult-to-target insurgents when they used highly mobile helicopters in coordination with light attack aircraft for rapid response, insertion of troops, and CAS—similar to the French in Algeria, and the British in Malaya.²¹ Helicopters like the UH-1 Iroquois, the A-1 Skyraider light attack aircraft, and the O-1 Bird Dog were more economical than using conventional jet fighter or bomber aircraft to provide the same long-duration coverage, remain low, and track small dispersed ground targets.

Since the objective here is to eventually transition operations to the host nation, the ease of training indigenous forces was an equally important consideration when selecting an air platform for COIN.²² Light, small-frame aircraft that were easy to maintain, like the A-1 Skyraider, were a more practical option for FID and eventual transfer to partner nation air forces. The asymmetric COIN struggle requires the government to have the means to wear down the insurgent force's capacity by imposing military, economic, and political costs before the enemy can in turn wear down the government.²³ By employing these small, light, mobile aircraft to mirror the simplicity of the insurgent force's operations, governments can sustain COIN operations for a much longer period which is often required to completely defeat an insurgency.

In the recent COIN operations in Iraq and Afghanistan, US and Coalition Forces have relied on high-tech, multi-role jet aircraft such as F-16s, F-15s, and A-10s. However, these aircraft were mostly used to provide air support to

the forces on the ground while remaining in long-duration holding patterns.²⁴ Examples of air support performed by coalition fighter aircraft in Afghanistan today are typical of past COIN missions involving CAS, ground force overwatch, ISR, and protection of convoy supply lines.²⁵ The Air Force fighter, bomber, and ISR aircraft frequently deployed by the coalition are useful but they are not cost effective nor practical for COIN as they are expensive to operate and maintain in austere environments.

As a result of back-to-back deployments over 19 years of Afghan and Iraqi conflicts, many of the US's deployed fighter aircraft have had to undergo costly service-life extensions and maintenance depot overhauls just to keep them operational. When they are being used, fighter aircraft have limited time aloft without needing to continuously refuel. Moreover, any manned aircraft system that operates under the coordinating altitude providing CAS to ground forces is vulnerable to surface-to-air fire.

Alongside these Air Force platforms are also Army helicopters such as UH-60 Blackhawks and AH-64 Apache attack helicopters. These helicopters play an important role in providing security for the movement of personnel and material within the country, but they have a greater vulnerability to ground-based surface-to-air fire that risks losses to personnel and aircraft. A good example of this was during the Soviet Afghan War when Soviet helicopter losses increased from the Mujahedeen's use of the Stinger missile. These missiles were a key contributing factor toward the Soviet Union's failure to freely operate aircraft in support of their ground forces.²⁶ Small war conflicts have shown that the weapon system best suited to confront an insurgency should match the insurgent's style of fighting and be hard to detect, flexible, light, inexpensive, and persistent.²⁷ These attributes could be provided by UAS weapon systems in addition to or even instead of these complex, expensive, and riskier manned aircraft systems currently operated in Afghanistan. The US and most advanced militaries around the world are already embracing UAS as a practical and economical solution to COIN warfare.

Emergence of UAS in Small Wars

UAS have heavily influenced the character of how modern small wars are fought. UAS such as the Predator and Reaper have become a central component of the COIN missions in Iraq and Afghanistan. Although UAS is often considered a new phenomenon, it does have a long historical development. The earliest known use of a UAS was when the Austrian Empire used unmanned balloons with time-fused bombs to attack Venice in 1849.²⁸ However, the Austrians discovered that these unmanned systems were hard to control since they were susceptible to wind shifts and could not be repositioned once released. In the

1849 example, it was noted that most of the balloons failed to reach their target, but at least one allegedly exploded over the famous Saint Mark's square in the center of Venice.²⁹ Despite the benefits of reducing the risk to a human operator in combat, the major limiting factor for UAS throughout most of their history has been their guidance and control.

Ease of use and control took almost a century to evolve even in the "electronic" era. The first major step began when the inventor Nikola Tesla developed an electric radio-controlled rudder for a model boat in 1899.³⁰ Radio controls helped greatly, and by WWI the first use of what Brig Gen Billy Mitchell would call unmanned "aerial torpedoes" were employed to ram Zeppelin bombers.³¹ In WWII, under Gen Hap Arnold's direction for technological innovation, the Army Air Force designed remote-controlled B-17 bombers (Operation Aphrodite), but the system was not reliable enough for large scale formation precision bombing or to recover the aircraft for reuse.³² These early UAS lacked the fine control inputs required to land because of signal delays in the early radio equipment. The resulting losses of these "one time use" aircraft were not economically viable. In the WWI and WWII eras, radio controls had to be direct and close. Even in the line of sight, control would suffer from a lack of signal power.³³ Because of the lack of controllability, most countries including the US focused on manned aircraft. Fire-and-forget "cruise missile" variants, like the German V-1 and V-2 would become the first actual long-range unmanned guided aircraft which used autonomous control through preset gyroscopic compasses.³⁴ In the early part of the Cold War, unmanned technology was primarily focused on rockets and long-range nuclear missiles. However, by the 1950s, UAS were capable of being used for testing or target practice. The war in Vietnam saw the first employment of UAS for Suppression of Enemy Air Defense missions against Surface-to-Air Missile (SAM) sites using the Firebee target drone to draw fire or force the SAM sites to turn on revealing their location.³⁵ This technique would be used again by the US Air Force in both Desert Storm and Operation Allied Force against enemy air defenses. Global Positioning Satellites in the 1990s greatly expanded the use, range, and control of UAS and enabled them to be the viable military asset for modern air warfare that they are today.

The wars in Afghanistan and Iraq as part of the broader US-led Global War on Terrorism expanded the role of military UAS for both ISR and attack capabilities. In the late 1990s, the Defense Advanced Research Projects Agency (DARPA) developed and fielded the original Predator, which would become the US military's first fully weaponized UAS.³⁶ By October 2001, during the opening days of Operation Enduring Freedom, UAS were conducting regular precision strikes on al-Qaeda and Taliban forces as they fled Afghanistan for sanctuary abroad.³⁷ Demonstration of this new UAS capability further encour-

aged the intelligence community, Department of Defense (DOD), and defense industry to develop UAS options with more weapons, better sensors, and longer range. Additionally, UAS operations led to increased partnering between the CIA's Special Operations Group, the Joint Special Operations Command, and traditional services like the US Air Force.³⁸ This partnering of UAS missions facilitated the fusing of intelligence and strike capability as well as provided the global reach required to combat the international nature of nonstate terrorist and insurgent groups. From these limited and covert beginnings, the use of UAS by the US military has expanded greatly. There are currently approximately 11,000 UAS in use among all the DOD services, up from just a few dozen in 2001.³⁹ UAS operations increased exponentially after the surges in both Iraq in 2007 and Afghanistan in 2009 and operations have persisted at a near continuous pace under both the Obama and Trump Administrations.⁴⁰ UAS strikes have been effective at targeting mid-level and core terrorist and insurgent leadership throughout both Iraq and Afghanistan.⁴¹ The persistent threat of UAS has reduced insurgent and terrorist groups' ability to operate freely by limiting their communications and movements. As a result, UAS have become an essential component of all US small wars operations since 2001. The utility of UAS has also been noted by armed groups around the world including technologically advanced countries, developing or weak states, and even nonstate paramilitaries. Now UAS have entered a new age of rapid proliferation across the whole military spectrum.

Proliferation of UAS

Historically, the cost of developing or employing a UAS capability could only be done with a complex state-sponsored program like the DARPA-designed Predator. For the US and a few other advanced countries, UAS technology was considered an "off-setting" innovation that was tightly controlled to protect the loss of the capability to adversaries or development of countermeasures to existing systems. However, over time the technology has been independently developed by other countries as well as propagated through corporate and government espionage. Therefore, UAS technology today is no longer as exclusive. Now, almost any country or militant group can access and procure battle-enhancing UAS technology either from government-sponsored Foreign Military Sales (FMS) programs or commercially direct from UAS manufacturers. Some sUAS can even be purchased over the internet and be delivered to any address worldwide.⁴² Moreover, UAS are now being used by competing sides in conflicts and by both governments and insurgents.⁴³ For example, the Islamic State militants have demonstrated the ability to attack coalition forces with UAS

using quadcopters and small remote-controlled aircraft outfitted with grenades or other explosives. Inexpensive and commercially available sUAS are now capable of many of the same COIN mission areas that traditionally only aircraft or large UAS could perform. For example, the Army ISR based sUAS Raven costs less than one percent that of a typical manned military COIN aircraft like an AT-6 or A-29. UAS are now available on the open market and can be increasingly transferred to developing partner nations for use in COIN.

There are now hundreds of UAS choices available on military markets. Common suppliers include governments and companies from the US, China, France, Turkey, Iran, and Russia.⁴⁴ Small UAS (Category 1–3) are now commercially available, have greater range and payload options, and are less complex to maintain and operate than manned aircraft. This makes them a logical choice for countries with limited air force capabilities, human resource constraints, and small defense budgets. Military forces of both state and nonstate groups have begun to use UAS for almost all types of COIN operations, and the sUAS models have proven to be exceptionally versatile for ground force support. They are also easy to train for host nation operators, often requiring nothing more than a handheld smart phone or videogame-sized controller. Even the insurgents themselves have begun to use the sUAS effectively.⁴⁵ ISIS has used them in Syria and Iraq to attack Iraqi forces from above with small grenades and also for battlefield situational awareness.⁴⁶ Houthi militias in Yemen were also capable of using UAS to strike Saudi oilfields, seriously disabling half the Saudi oil infrastructure and disrupting 5 percent of the world's oil supply in one attack.⁴⁷ Small wars of the future will increasingly see the use of UAS.

Many countries are in the market for military UAS. Rather than wait for other countries such as China to meet their needs, the US should expand the integration of US-managed UAS into FMS and FID programs.⁴⁸ The US benefits by providing US-sourced UAS to partners instead of using foreign-supplied technology or equipment. Providing the host country with US compatible systems ensures interoperability and establishment of a long-term relationship between the two countries. In 2017, the US issued a State Department policy change to expand UAS sales abroad by relaxing export controls and caps on the quantities of UAS that can be sold to approved partner nations.⁴⁹ As a result, the US has begun to sell UAS as complex as the MQ-1 Predator and MQ-9 Reaper to partner nations like the UK and Korea. Developing nations, like Iraq and Afghanistan, have also received US provided UAS through the FMS process, specifically small reconnaissance UAS like the Raven and ScanEagle. The UAS market is expanding, and the US should continue to explore ways to compete through FMS programs.

Air Force FID in Afghanistan—Traditional Air Advising

The historical contexts of Air Force FID (AF FID) and previous air advising missions in Afghanistan are important to understand as a basis for developing future UAS FID. Afghanistan represents a model case for AF FID because in the last 100 years, military airpower has been repeatedly built and rebuilt from scratch. Additionally, both NATO's and the Soviet Union's conflicts in Afghanistan have provided a wealth of experience about the challenges and limitations of building a host nation military amid ongoing COIN operations. Specifically, for military aircraft systems, AF FID provides aviation capability to developing and improving host nation partners through Air Advisor operations in coordination with security assistance programs.⁵⁰ Airpower developed through FID operations allows a country to have the means to eventually assume full responsibility for their own defense. However, as the US DOD Inspector General observed recently, rebuilding a fully manned and equipped air force from scratch has proven challenging in Afghanistan. With ongoing combat operations and little organic capability, the AAF is not yet able to sufficiently support the ground force's ability to control the country despite over 10 years of focused air advising.⁵¹

Afghanistan has had a series of air forces since the 1920s when then-King Amanullah purchased a small mix of biplane aircraft from the Soviets, Italians, and British and then had pilots trained in the Soviet Union and Italy.⁵² Throughout most of the twentieth century under the monarchy, Afghanistan maintained a small contingent of Soviet-sponsored jets and transport aircraft. Most of the pilots received training in the Soviet Union. When the Soviet invasion began in December 1979, the AAF quickly increased from a few squadrons of largely ceremonial jet aircraft to over 500 aircraft and began conducting combat missions with a diverse mix of MiG-17, MiG-21, and Su-7 jets as well as Mi-8/17 and Mi-24 helicopters.⁵³ The Soviet aircrews frequently piloted most combat missions, but Afghan pilots were trained and capable of conducting their own operations. Afghan pilots were also increasingly trained locally in Afghanistan in addition to in the Soviet Union. After the Soviet withdrawal, many of the aircraft and equipment were left behind to try to support the Afghan communist government to continue their COIN operations. However, when the communist regime collapsed soon after the Soviet withdrawal and throughout the 1990s much of the AAF was dispersed, fell into disrepair, or was destroyed during the civil war between the various Mujahedeen groups.

It was not until 2005 that the development of an Afghan presidential air-lift capability became the initial requirement for the future AAF.⁵⁴ By 2006, only a few US Army helicopter pilots in Kabul were available to conduct some limited Mi-17 training flights with Afghan pilots. However, these basic programs soon became the start of the US-led Combined Air Power Transition Force-Afghanistan (CAPTF-A), which was activated by the spring of 2007. It would not be until 2009 that Afghanistan started to have its own military airpower capability as Mi-17 helicopters were delivered and the first pilots began to graduate from training.⁵⁵ Since then, the training, advising, and assisting of the AAF has been the responsibility of the NATO Air Command-Afghanistan and its subordinate Train Advise Assist Command-Air (TAAC-Air). Additionally, NATO Special Operations Component Command-Special Operations Joint Task Force-Afghanistan (NSOCC SOJTF-A) Special Operations Advisory Groups, advise the Afghan Special Mission Wing (SMW). The SMW directly supports the Afghan Special Forces and Commandos. These advising organizations include both Special Operations Combat Aviation Advisors (CAAs) as well as deployed conventional force Air Advisors. Because of the drawdown of US and coalition forces since 2014, Air Advisors are increasingly more limited to where they are based, where they can operate and train, and how much risk they can assume on partnered missions. While not diminishing the resolve of the Air Advisors, green-on-blue insider attacks have reduced the ability to train and produce Afghan pilots on schedule. Much of the 100 years of AAF history is filled with internal conflict and Air Advisors are still struggling to establish an AAF capable of sustaining itself and operating independently.

Current State of the Afghan Air Force

In the 10 years since the CAPTF-A initiated the air advising mission in Afghanistan, the AAF and ANDSF ground forces are still relying extensively on foreign forces to provide them assistance for their COIN mission. Advisors are still piloting Afghan aircraft alongside Afghan pilots. Nationwide, over half the missions in support of the ANDSF are conducted by Coalition air forces (see Figure 2.) In addition, the AAF relies largely on Contractor Logistics Support to ensure the sustainability of its fleet (see Table 1). Maintainers, as well as aircrew, regularly depend heavily on advisors for help, not only to solve operational problems, but also for reading and understanding the English language technical manuals.⁵⁶

Table 1. Percentage of AAF organic maintenance and Contractor Logistics Support (CLS) Maintenance. (DOD, “Enhancing Security and Stability in Afghanistan, 1225 Report to Congress,” December 2019).

	Aircraft	% Organic	% CLS
Fixed Wing	C-130	0	100
	C-208	40	60
	A-29	30	70
Rotary Wing	Mi-17	85	15
	MD-530	20	80
	UH-60A	0	100

Despite these limitations, there has been significant progress made and air force operations are slowly transitioning to Afghan owned and operated platforms such as the A-29 light attack aircraft and the MD-530 helicopter. The AAF headquarters is in Kabul and provides command and control of 18 detachments and three wings around the country.⁵⁷ The AAF has improved its pilot skills, air-to-ground integration, and ground crew proficiency, and is now capable of independently providing logistics, resupply, medical evacuation, ISR, air interdiction, CAS-attack, and overwatch. For strike missions, the AAF even has the capability to use laser-guided bombs on their A-29 light attack aircraft as well as rocket pods on their MD-530 helicopters. Afghan pilots have also demonstrated improved proficiency in targeting to avoid collateral damage and minimize civilian casualties.⁵⁸ Lack of regard for civilian casualties by government forces during the Soviet Afghan War was a key factor in the loss of public support for the government and increasing support for the Mujahedeen insurgency.⁵⁹ So far, the manned AAF has demonstrated it can provide effective airpower for the ANDSF and ASSF ground forces while avoiding civilian casualties. However, even after 10 years of building, it does not have enough capacity to meet the high demand that ground forces require for their missions.

The inability to produce, fly, and maintain enough AAF airframes and aircrews is the main limiting factor to having a modern AAF capable of self-sustaining COIN operations.⁶⁰ As part of the aviation recapitalization effort from 2015 onward, the Russian-based helicopters, such as Mi-17s and Mi-35s, are being phased out. The procurement, use, and sustainment of Russian aircraft is no longer politically acceptable in the current US National Security environment. To have a US compatible system, the designated helicopter platform for Afghanistan was changed to UH-60 Blackhawks. UH-60s are a more

complex modern platform with advanced avionics, aircraft controls, and weapon systems than the Russian-based helicopters. This creates a challenge for pilots and maintainers, many of whom had prior experience with Russian aircraft and associated Russian language manuals. Retraining current personnel or developing new aircrews and maintainers has yet not met training timeline or quantity goals.⁶¹ The standard pipeline for Afghan aircrew training is 18 months and requires transitions between international and domestic training locations. Pilots need to be commissioned officers and have a college degree, further narrowing the pool of available candidates. Additionally, the intense training has had an average attrition rate of 26 percent per class and frequently been the result of student incompletions as well as desertions or members being absent without leave. Also, the requirement for proficient English speakers has slowed the training pipeline due to lack of qualified candidates. Insufficient language skills for pilot trainees alone results in more than 50 percent of available training slots going unfilled.⁶² Thus, the requirement of understanding the English language in pilot training was reduced to handle only basic aviation communications, which led to higher numbers of trainees, but then resulted in problems reading and following manuals required to meet proficiency standards. TAAC-Air originally intended to train 477 UH-60 pilots, but currently across all aircraft types there are only 222 AAF pilots total (see Table 2).⁶³ TAAC-Air now believes they will not achieve even a revised 320-pilot target as the number of pilots continues to fall behind and class slots routinely go unutilized.⁶⁴ Recruitment of candidates is also a challenge as positions are often subject to internal and informal bargaining processes within the ANDSF. As a result, many positions go unfilled awaiting ANDSF selections, approvals, and vetting of potential candidates.

Table 2. Status of aircrew training in Afghanistan. (Security Assistance Office-Afghanistan IMET report, updated with DOD, “Enhancing Security and Stability in Afghanistan, 1225 Report to Congress,” December 2019).

Aircraft	Qualified Aircrew
A-29	18
C-130	11
AC-208/C-208	5/45
MD-530	66
Mi-17	48 (phasing out)
Mi-35	Unsupported
PC-12	Undisclosed
UH-60	29

The AAF aircraft have generally been delivered on schedule through US managed FMS programs (see Table 3).⁶⁵ However, the overall quantities of aircraft are low, and questions remain whether the size of the AAF is sufficient to meet the needs of the ANDSF units which are spread out across the country. While the addition of COIN-specific light attack A-29 and MD-530 helicopter gunships have been well received by both Afghan forces and US advisors, having only 15 A-29s available out of 26 total is not sufficient to support seven active ANA Corps as well as Special Forces and commando units across the country with persistent CAS (Figure 3). As a result, requests for air support after incidents of enemy contact often go unanswered. Because of the lack of air cover, ANDSF forces have had to remain close to population and main transportation routes which has resulted in most rural and remote areas being left to insurgent control. Therefore, the ANDSF needs to have a better method of providing timely and persistent air support for their ground units.

Table 3. Status of aircraft in Afghanistan. (Security Assistance Office-Afghanistan, Air FMS Report, updated with DOD, “Enhancing Security and Stability in Afghanistan, 1225 Report to Congress,” December 2019).

Aircraft	Current Inventory	Available	Total Req'd
A-29	25	15	25
C-130	4	3	4
AC-208/C-208	10/24	10/23	10/23
MD-530	49	44	55
Mi-17	45 AAF (SMW N-D)	23	0
Mi-35	4	0	0
PC-12 (SMW)	Undisclosed	Undisclosed	Undisclosed
UH-60 (SMW shifting to CH-47)	45	45	53

Transition to independent ANDSF combat operations has resulted in unsustainable casualties because of the lack of battlefield situational awareness.⁶⁶ Dedicated ISR remains a major AAF support gap. Ground forces also must rely on whatever light attack or rotary aircraft are available to concurrently perform ISR. Traditional ISR-specific platforms like the PC-12 and C-208 aircraft are in limited supply. For example, the AAF only has 24 C-208s and the SMW only has a handful of PC-12 aircraft which are primarily designated for use by the ASSF only.⁶⁷ The seven regionally aligned ANA Corps therefore lack consistent access to the use and support from these ISR assets and be-

come completely reliant on continued advisor or coalition support or go without ISR coverage altogether. Thus, independent ANDSF units are frequently ambushed or take casualties when insurgents attack their positions by surprise. Additional ISR remains a critical need for the ANDSF if they are to operate effectively as an independent force.

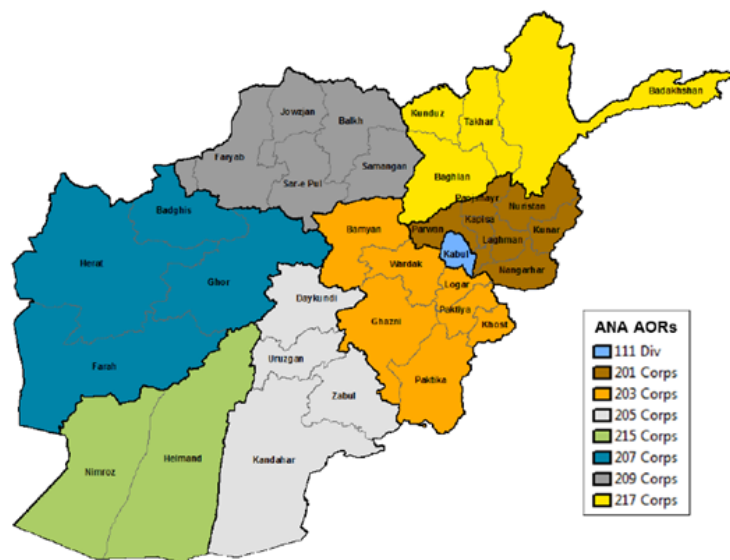


Figure 3. Afghanistan National Army Corps Boundaries. (Reprinted from DOD, “Enhancing Security and Stability in Afghanistan, 1225 Report to Congress,” December 2019.)

Traditional AF FID has been continuously and rigorously conducted since 2009, but the AAF still struggles to meet the demand for ground force support required in COIN operations. Therefore, an alternative FID model is needed to augment the current efforts while still providing ground forces the air support they need. In Afghanistan, helicopters and any manned aviation support are in such limited supply that they become national level strategic assets, centrally managed by the AAF. In comparison, the US Army has helicopters and other light aircraft as a dedicated component of Army Aviation. In 1946, the War Department Equipment Board recognized that the newly separated US Air Force could not conduct their wartime or strategic-level missions and still provide adequate support to Army ground forces for their tactical maneuvers.⁶⁸ Therefore, the Equipment Board established that the Army would receive organic Army Aviation elements to be available and in

direct support to its land forces. This decision resulted in the assignment of light aircraft and helicopters for the US Army. Afghanistan has a similar requirement for aviation support to their ground forces, but rather than adding manned aircraft to the Afghan Army units, UAS could fill the void without drawing resources or personnel away from the manned AAF.

Toward a New Model of UAS FID—Establishing an Owner

Currently, there is no functional mission owner for UAS FID in the US military. It is an emerging area of the FID enterprise because of the recent proliferation of UAS beyond great-power nations. Just as manned aviation FID takes special advisor units to conduct air advising, there is a lack of a dedicated organization or standardized process for UAS advising. Now that UAS are more prevalent and even applicable to developing countries' militaries, the requirement for UAS advising has grown. All the primary military services—Air and Space Forces, Army, Navy, and Marine Corps—have well established UAS programs integrated into their own operations. However, despite their expertise in UAS, most general purpose forces do not have expertise conducting FID.⁶⁹ UAS FID is conducted by many of the Special Operations units, like the Navy Sea, Air, and Land (SEAL) Teams and Small Boat Teams Naval Small Craft Instruction and Technical Training School, Army Special Forces Groups, Army 160th Special Operations Aviation Regiment, and the AFSOC 6th Special Operations Squadron (SOS). All these units have developed programs to integrate UAS systems for support to partnered ground forces. Some United States Special Operations Command UAS training programs are 10-day accelerated courses, however, most of these programs are tailored to support very specific and often temporary mission objectives of the partnered units or countries.⁷⁰ There remains a lack of an overarching, long-term functional owner and advocate for managing and developing UAS FID doctrine.

Currently among US forces, missions requiring UAS FID are only conducted on an as-needed basis. One example was a recent UAS FID mission conducted by the 6th SOS, which used an Adaptive ISR Mobile Training Team (MTT) to integrate UAS into host nation operations. The advisors assisted the host nation air force in the development of standardized processes, products, and procedures for their ISR UAS. They also developed air-to-ground integration between aircrew, Forward Air Controllers, and intelligence analysts.⁷¹ The 6th SOS has various CAA Operational Aviation Detachment training team organization models, but the team that was most practical for UAS advising was the Adaptive ISR MTT. This type of team has manned ISR aircrew,

combat ground controllers, aircraft maintenance, and intel sensor and mission specialists who can train foreign partners on how to use and task aircraft as part of their operations.⁷² However, there are currently no specific Remotely Piloted Aircraft pilots in the 6th SOS nor are there any UAS assets that are owned by the 6th SOS. This example demonstrates that UAS FID capabilities among Air Force CAAs should continue to be developed and integrated into partnered training events, but their capacity is not sufficient to do large-scale whole army or whole air force UAS FID. Especially in a country like Afghanistan, an Army organization such as a UAS platoon embedded with conventional Security Force Assistance and FID advisor units like the SFAB would better support the Army Aviation UAS requirement needed to support the whole ANDSF.

Army Aviation Construct

Ground units require rapid response, support, and cover from the air, especially for COIN.⁷³ The US has whole units of Army Aviation available to support ground commanders. For instance, the 101st Airborne Division has a 101st Combat Aviation Brigade. To develop airpower capabilities for ground forces in developing nations like Afghanistan, the US Army Aviation model would streamline support, availability, and control for ground units. Within Army Aviation, the Army organizes UAS into UAS platoons.⁷⁴ These platoons can remain within a Combat Aviation Brigade or be assigned to a Brigade Combat Team such as armor or infantry brigades. Nearly every brigade that fought in Iraq or Afghanistan had a dedicated UAS element for ISR and over-watch purposes.⁷⁵ Using mutual support between rotary aircraft and UAS, Army Aviation has consistently provided comprehensive force protection and aviation support for maneuvering forces on the ground.⁷⁶ The US Army has flown the RQ-7 Shadow UAS for over 1.2 million hours in almost 20 years of use primarily in support of COIN operations.⁷⁷ Army UAS numbers have grown to well over 8,000 aircraft with the bulk of this increase being sUAS, and are planning to increase to over 20,000 aircraft over the next five years.⁷⁸ The Army is now also operating a high-altitude, large frame (Category 4–5) UAS. This Predator variant is called the Gray Eagle and has provided Army units with a method to quickly relay information as well as conduct their own targeting and CAS.⁷⁹ The future COIN battlefield will continue to require extensive UAS and sUAS. For this reason, the Army is well positioned to be an FID leader for sUAS operations.

Combat Aviation Brigades and UAS Platoons are managed as part of the JAGIC model for controlling fire support and movement within the Army's

Airspace Control Area.⁸⁰ The JAGIC integrates an Air Support Operations Center, Tactical Air Control Parties, division-level active weapon operations (referred to doctrinally as “fires”), airspace, force protection, and aviation personnel for simultaneous execution of surface-to-surface fires, aerial-delivered fires, and aviation maneuvers within the designated operating zones (see Figure 4).⁸¹ The traditional system of having a separate Air Force-run Air Operations Center (AOC) that provides control over CAS assets required by ground commanders is inefficient for use in small wars COIN environments where quick response and communication with fielded forces is critical.

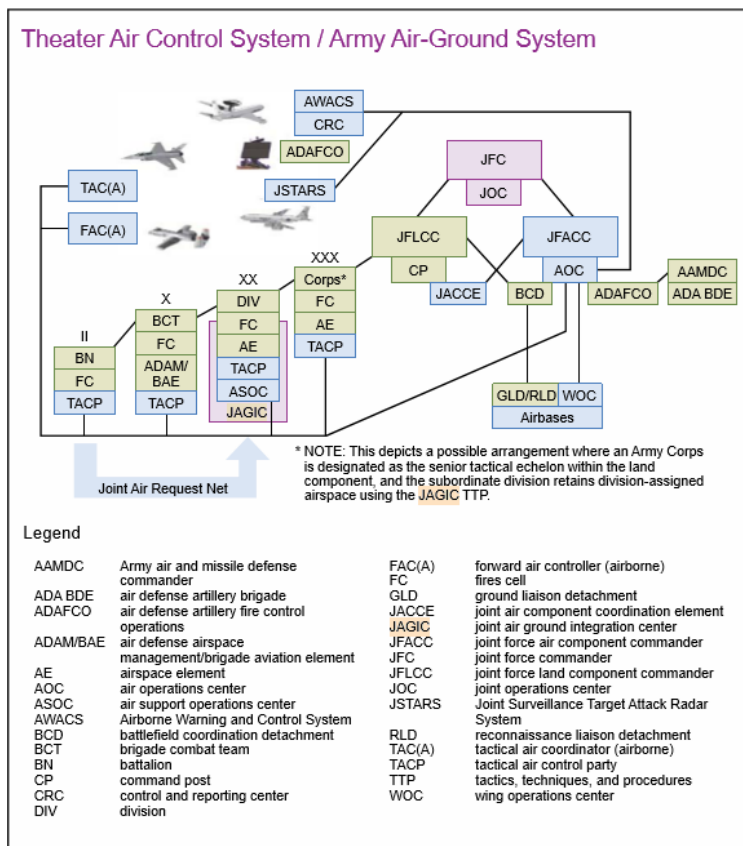


Figure 4. Division of Assigned Airspace. (Reprinted from Joint Publication 3-30, “Joint Air Operations,” July 25, 2019, II-11.)

A ground commander must have dedicated air assets that can be on-call when required.⁸² Manned aircraft and complex fighter or mobility jets require the level of coordination that an AOC provides, but the sUAS which are typically used by Army units operate below the air traffic coordinating altitude and are controlled by the same units they are supporting on the ground. For this reason, operating UAS in environments like Afghanistan is better done using sUAS within the JAGIC framework rather than a separate AOC.

Security Force Assistance Brigade for UAS FID

The SFAB is the US Army's newly formed conventional military organization for conducting general purpose advising around the world. Each of the three currently established SFABs have a regional focus, and can be tailored to any capabilities they are required to perform.⁸³ They also have critical cultural and regional orientation that is essential for foreign partner advising. An SFAB has the force structure and is large enough to cover multiple regional areas and associated training bases simultaneously. They can also provide their own security and conduct combat operations if required. In Afghanistan, this means they can work side-by-side with Afghan forces in areas that are still considered at high risk of enemy activity and where most contractors or noncombat capable trainers are unable to go. In other words, they provide both Security Force Assistance (security based operations) and FID (training based capacity building).⁸⁴ The SFAB first began conducting security and advising operations in Afghanistan in 2018. Since then, two of the SFABs have completed their one-year deployment cycle. The third just deployed to Afghanistan at the beginning of 2020. Although the SFAB is now fully operational, they are still new enough to be adaptive and could implement innovative FID programs like UAS FID quicker than establishing or tasking other outside organizations.

The SFAB already has the understanding, trained personnel, and sUAS equipment to use in UAS FID training missions. The recently deployed SFABs had members of their advisor teams specifically trained on the RQ-11B Raven and RQ-20 Puma sUAS.⁸⁵ Although there is not currently a UAS platoon embedded in the SFAB's Training Teams, the creation of a UAS training platoon would easily fit in and align with the Military Intelligence Training Team or Infantry maneuver elements within the SFAB (see Figure 5).

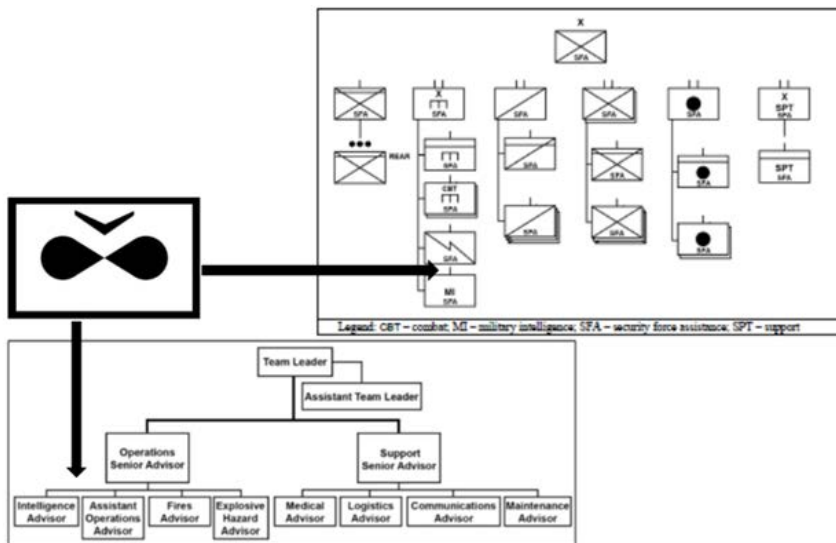


Figure 5. Proposed Security Force Assistance Brigade Task Organization. (Adapted from Army, ATP 3-96.1, "Security Force Assistance Brigade," May 2, 2018.)

The SFAB already has the experience with the same direct support Army sUAS systems that partner nations require. Additionally, the SFAB is familiar with the JAGIC air control concept, Army operations, as well as working with and advising foreign militaries. These combined qualities provide the right skill set to do UAS FID. The best potential UAS FID trainers as well as lead functional organization should therefore be the Army's SFAB.

Afghan UAS FID Case Study—the ScanEagle

The ANDSF has already demonstrated that UAS can be a viable option in Afghanistan. Since 2016, the ANDSF ground forces have received and been trained on the Boeing-Insitu RQ-27A ScanEagle which is a rail-launched sUAS that provides ISR capability and can be operated by ANA Corps across Afghanistan without an airfield. The ScanEagle assets are managed by the Afghan Army General Staff's Intelligence Directorate (GSG2) with associated personnel for operating the sUAS assigned to the G2's of the ANA Corps through detachments.⁸⁶ The ANDSF receives UAS advisory support primarily through coalition intelligence advisors. This has been helpful for synthesizing the intelligence gathered into effective ANDSF operations at both the national and corps levels but there is still a lack of advisors specifically for UAS equip-

ment operation. With the implementation of the ScanEagle program, the ANDSF has become more effective at providing situational awareness to commanders, coordinating forces on the battlefield, directing artillery fire, and preventing ambushes or other surprise attacks on ANDSF positions. Since 2016, a total of 57 ScanEagles have been delivered and 67 pilot operators trained (see Table 4).⁸⁷ Six independently operated ScanEagle detachments have been fully integrated into the regional ANA Corps as well as the Capital Division. The ANDSF will complete fielding by the end of 2020 bringing the total number of systems to 65 and enabling the activation of the final two remaining detachments.⁸⁸ Compared to the acquisition of a manned aircraft, which generally cost more than \$10 million per aircraft, each ScanEagle only costs \$100,000 making them a sustainable and economical option.⁸⁹

Table 4. ScanEagle status, aircraft, and pilots. (DOD, “Enhancing Security and Stability in Afghanistan, 1225 Report to Congress,” December 2019).

ScanEagle Aircraft Status	ScanEagle Trained Personnel (Pilots)	Operational Units
57 Fielded	67 Operators	6 of 8 Op-Dets. at each ANA Corps and Capital Division
65 Total Required	Training Program: Contractor - Train-the-Trainer	1 Training Det.

The Afghans have shown the ability to maintain control and accountability of the ScanEagles and ground station equipment even in remote locations. Before the implementation of the ScanEagle program, the ANDSF were almost completely reliant on international forces to provide ISR to their ground units.⁹⁰ The AAF has a few PC-12 and C-208 planes to conduct surveillance missions, but they are usually only available to support Afghan Special Forces. For this reason, the ANDSF has adopted the ScanEagle sUAS as a practical, economical, and effective airborne ISR capability.

The ScanEagle has significant advantages for the ISR and CAS missions. ScanEagles are equipped with similar high-definition and infrared cameras as those on the PC-12 and C-208. They can also produce live video feeds and be operated remotely at ANA field locations. The ScanEagle can stay airborne for up to 24 hours at an altitude of 15,000 feet giving the ANDSF a persistent picture of the battlefield.⁹¹ Also, they can provide ISR for both day and night operations. ScanEagle operators are now also working directly with ANA Corps ground units to target and enable CAS airstrikes, often partnering with

the AAF in an integrated operation directing strikes and CAS for the AAF aircraft.⁹² For example, ANDSF use the ScanEagle to locate and identify potential targets, then they submit a target package to the ANA Corps Headquarters, the corps then validates and forwards the package to the Afghan General Staff at the National Military Coordination Center (NMCC) for approval. After approval, the AAF receives the target package and then communicates directly with ScanEagle Detachment throughout the attack for positive identification. Corps commanders have attributed the increased number of timely and successful MD-530 and A-29 CAS strikes to the target development process supported by the ScanEagle.⁹³ With the ScanEagle program, the ANDSF has demonstrated that sUAS can provide mission-enhancing capability for their forces.

Currently there is no defined advisory function for UAS which requires the coalition to rely on Boeing contractors to provide the bulk of operator-maintainer training, advising, and assisting. The ScanEagle training is conducted at a training detachment outside the city of Kabul. Since April 2016, the school has been producing regular classes of pilots and maintainers at 6-month intervals.⁹⁴ The program produces approximately 10 pilots per class as well as the associated maintainers, mission coordinators, and analysts who will direct the aircraft over targets and analyze the ISR collected. The ScanEagle program demonstrates that sUAS operators can be trained in one-third the time it would take to train traditional aircrews. Additionally, some experienced pilots, mission commanders, and maintainers are then brought back to be instructors at the training detachment. Afghan trainers manage the school themselves and coteach with the Boeing contractors. The ScanEagle training program is built on a train-the-trainer (T3) concept which has been effective at building a sustainable cadre of Afghan trainers and operators. By the end of 2020, the program will replace the contracted ScanEagle instructors and field support advisors completely with ANDSF soldiers.⁹⁵ The ANA Chief of the General Staff recently stressed the requirement for ANA Corps to integrate the ScanEagle into all operations. As a result, ANA Corps now brief numbers of missions flown and their results.⁹⁶ From 2016 to 2020, the ScanEagle UAS case has demonstrated that the ANDSF are capable of economically and sustainably implementing, operating, and training sUAS to provide air support to their military forces.

Analysis of Future UAS Alternatives for Afghanistan

This study provides a snapshot of the missions and capabilities that UAS have and how they compare to the manned aircraft currently in the AAF. In

this case, the concept of operations and mission requirements were modeled around those that the ANDSF would use to conduct COIN. To fully support ground forces with airpower, this study evaluated candidates against the four primary COIN air support mission groupings: ISR, sensor, and targeting; communication link and node; weapon, attack, and CAS; and cargo and lift.⁹⁷ In the scope of this research, UAS were not evaluated for unmanned personnel transport as it has not yet been fully tested or certified. The candidate UAS covered multiple sizes and types and provided a representative spectrum of the costs and capabilities of UAS as well as their manned alternatives. All variants considered were commercially available aircraft used by the Army or already in the Afghan inventory which facilitates US led training and interoperability.⁹⁸ One candidate was the Switchblade tube-launched micro-UAS, a guided loitering munition that can provide CAS for troops-in-contact. The RQ-11B Raven is an Army hand-launched sUAS that has been prevalent across the Army forces and the SFAB. The RQ-7B Shadow UAS is a rail-launched system commonly used by Army Brigade Combat Teams. The RQ-27A ScanEagle was also considered and is currently employed in Afghanistan. For a vertical lift rotary variant, the MQ-8 Fire Scout unmanned helicopter was considered. The MQ-1C Gray Eagle is an Army-variant of the Predator and represented a full-scale Category 4–5 high-altitude UAS. Incidentally, the Gray Eagle is now included in most Combat Aviation Brigades. Representing the manned aircraft is the UH-60 Blackhawk which is currently the primary lift-mover in Afghanistan. The A-29 light attack aircraft is the primary CAS platform used by the AAF. Finally, for ISR variants, the AAF's C-208 and PC-12 were considered. These COIN aircraft solutions are presented in Table 5, and represent the spectrum of missions for manned and unmanned alternatives.

Looking at the aircraft alternatives for Afghanistan presented in Table 5, the first observation was that sUAS variants (Categories 1–3) are most practical for colocation with ground force units since they can be launched from any location on the towed rail systems or by hand. sUAS also work better if they are to be an asset directly in the control of the ground force units in the Army-controlled airspace of the JAGIC model. These aircraft are controlled from ground stations in line of sight and operate below 15,000 feet which are typical of missions below the coordinating altitude for Army-controlled airspace. Therefore, the sUAS variants were most compatible for inclusion in Army units.

All the evaluated sUAS have long-duration station time over the battlefield. Even the hand-launched Raven can remain aloft for 90 minutes. The slightly larger ScanEagle extends the time aloft to 24 hours which makes it capable of persistent overwatch. These systems can be maintained at the field level within

Table 5. Analysis of alternatives for ANDSF air support. (compiled from multiple sources).

Platform	Mission Type	Launch	Altitude Ceilings	Mission Duration	Aircraft Unit Cost	FID Training	Maintenance / Sustain
Switchblade	CAS Strike	Tube Launch	2,000' AGL	10 min/ 1X Use	\$50K	N/A	N/A
RQ-11B Raven	CAS Strike	Tube Launch	2,000' AGL	10 min/			
RQ-27A Scan Eagle	ISR	1X Use	\$50K	N/A	N/A		
RQ-7B Shadow	ISR	Hand	1,200' AGL	90 min	\$86K	N/A	Field
MQ-8 Fire Scout	ISR	Towed Ramp	15,000' ASL	24 hrs	\$100K	Contract for T3	Field T3–Depot CLS
MQ-1C Gray Eagle	ISR&T/Comm/Mab	Towed Ramp	15,000' ASL	8 hrs	\$750K	N/A	Field–Depot CLS
UH-60	Attack/ISR&T/CAS/Comm	Level ground	20,000' ASL	14 hrs	\$24.2M	N/A	Field–Depot MIL
A-29	Mob/Attack/CAS/ISR&T/Comm	Airfield	25,000' ASL	40 hrs	\$21.5M	N/A	Field–Depot MIL
C/AC-208	Attack/CAS/ISR&T/Comm	Level ground	19,000' ASL	4.5 hrs	\$57M	Air Advisors	CLS+T3–Afghanistan
PC-12	Attack/CAS/ISR&T/Comm/Mob	Airfield	20,000' ASL	6.5 hrs	\$18M	Air Advisors	CLS+T3–Afghanistan
	ISR&T/Comm	Airfield	25,000' ASL	6.9 hrs	\$12.3M	Air Advisors	CLS+T3–Afghanistan
		Airfield	30,000' ASL	6.8 hrs	\$16.5M	Air Advisors	CLS–Afghanistan

the units, which improves the turn-around time and equipment availability. In this case, the major limiting factor has been the lack of a military-run UAS FID program and therefore the training and initial sustainment has been through contractor based programs. The unit costs are remarkably inexpensive. The Raven is \$86,000 and ScanEagle is \$100,000 which makes them less than one percent of the unit cost of a comparable manned ISR platform like the PC-12 or C-208s which cost around \$15 million. The one sUAS CAS exception was the Switchblade. Since it is one time use only, and \$50,000 each, it would not be economical other than for emergency situations or against a high-value target.

The Gray Eagle is an option for the future but would be more applicable for traditional Air Force CAA advising as the system requires an airfield and is more complex to operate. Also, it is equivalent to or even more costly than most of the light attack options that the AAF are currently employing. The Category 4 UAS such as the Fire Scout and Gray Eagle, display potential for future implementation, but would need to be located at a major airport or base. Therefore, there would only be a few acceptable locations in Afghanistan for Category 4 UAS. The Category 4 systems rely on satellite communication and guidance links which are more complex to operate and control. Similarly, these large UAS would need to be trained and maintained more like a traditional aircraft platform such as a UH-60 or A-29. These types of UAS would most likely need to be included in the AAF structure and operators trained with traditional Air Advisors. Finally, large UAS are similar in cost to the manned aircraft of the AAF (\$21.5 million for the Gray Eagle), which eliminates any specific economic advantages of changing to UAS.⁹⁹ The Category 4 UAS and the manned aircraft operate in the AOC or AWACS-controlled airspace and are subject to Air Tasking Orders and civilian air traffic control protocols. In those cases, the Category 4 UAS would be less responsive or flexible to meet ground commander's requirements. However, Category 4 UAS have the potential to provide more options for payloads and attack capabilities for CAS. The MQ-8 Fire Scout can carry cargo loads of up to 2,650 lbs. (or about one-third of a Blackhawk's payload).¹⁰⁰ This unmanned lift option would provide a significant risk-reducing capability to prevent losses of valuable crew or equipment from ground fire when used for forward operating base resupply.

The manned aircraft platforms, including the UH-60, A-29, C/AC-208, and PC-12s, all have more multi-role mission capabilities compared to the UAS variants. A fleet of UH-60s can still provide the personnel lift missions, and the light attack aircraft like the A-29 have the most responsive and precise CAS capability. However, all these manned platforms have drawbacks for

training, maintenance, and sustainability. Almost all maintenance and logistic support is done through foreign contractors. A large portion of the AAF's budget is designated for AAF sustainment costs (\$842.1 million in FY 2019, or 51 percent). These contracts cover maintenance, major and minor repairs, and procurement of parts and supplies for the AAF.¹⁰¹ In comparison, the ScanEagle fleet costs \$22 million annually for Boeing contractors to sustain which is about a fourth of the cost of an aircraft like the A-29.¹⁰² By the end of 2021, these costs will be further reduced as the ScanEagle will be self-sustained by the Afghan forces and no longer require foreign contractors. While the manned AAF can conduct many of the required missions, the aircraft are not cost effective for the Afghans to procure and sustain without continued international support.

Recommendations

To lessen the requirement for international support in Afghanistan, innovative FID approaches must be considered to provide the ANDSF enough airpower to continue to sustain their COIN fight. The US and their coalition advisors should not try to template airpower in the same way that the coalition has previously used their own modern jet air forces to support ground forces for COIN operations. As the mission transitions to Afghan-led and Afghan-owned operations with less foreign advisor assistance, introducing UAS FID and using UAS as an alternative to manned AAF will produce mission-enhancing results. Also, UAS training can be done inside Afghanistan and does not need to be conducted through international or US-based programs. This will lead to reduced attrition rates, accelerated training timelines, and retention of personnel. Increasingly, UAS are becoming easy to use; some models are even capable of being controlled from a cell phone or tablet. The type of ground support operations that the Afghans would conduct do not need to operate in commercial or international airspace and therefore should be operated like the Army Aviation construct and controlled within the JAGIC.¹⁰³ Using UAS within Afghan Army units themselves will greatly increase the ground commander's fires and warfighting maneuver capabilities by providing accurate and timely battlefield awareness through ISR.¹⁰⁴ As noted in the ScanEagle example, the Afghans are already using UAS for ISR and targeting information. Especially in the nonkinetic operations like ISR, UAS offer the opportunity to provide more force protection for Afghan bases and remote security posts which are vulnerable to attacks.¹⁰⁵

Additionally, UAS represent a more manageable option for developing countries like Afghanistan that do not yet have the personnel, equipment, or

proficiency to operate more complex manned aircraft and may lose manned aircraft and aircrew to accidents, mismanagement, poor maintenance, theft, corruption, or actual combat. For example, when the US supplied Stinger missiles to the Afghans during the Soviet Afghan War, accountability of these advanced weapons was quickly lost after the end of the war. Conversely, the sUAS that have been provided to the ANDSF through Security Assistance-based FMS programs have extensive end use monitoring inspections, security, and inventory requirements. Thus, it is recommended to expand and implement FMS case managed sUAS for the ANDSF to provide a lower risk, more cost effective airpower option that can provide many of the mission area capabilities of the over-tasked manned aircraft of the AAF.

UAS also offer the ability to task and organize platoon-sized combat aviation elements throughout the Afghan Army. A traditional manned Combat Aviation Brigade for each of the Afghan Army Corps would be ideal but given the challenges of producing aircrew and sustaining aircraft, the alternative is to leverage the UAS platoon model. Manned aircraft or large frame UAS, such as the Predator, operate in high-altitude airspace and have highly technical satellite controls, sensitive sensors, and armament capabilities which require national level management as air force assets. However, most types of sUAS can be operated in any terrain and co-located with the ground units. To still provide command, control, accountability, and integration within the national decision-making system, the ANDSF should utilize the JAGIC model at the NMCC to disseminate intelligence and targeting data between units as well as provide command authority when necessary. Therefore, it is recommended that the ANDSF have a UAS platoon at the brigade level or at least one per regional corps or division.

UAS are a force multiplier for FID in Afghanistan because they allow the ANDSF to quickly build significant airpower capability from the ground up, directly in the Army units while streamlining support to ground operations critical for COIN. It is recommended therefore, that UAS training platoons be included in the SFAB and the SFAB be the functional and primary mission owner for UAS FID. The SFAB represents an ideal match for UAS FID advising as they are already familiar with Army ground support and integration as well as the UAS equipment and advising operations. Air Force CAA MTTs such as the 6th SOS or other US and Allied Special Forces can provide supplemental and additional surge capability for UAS FID or provide support for specific partner units. However, the SFAB would lead the overall inclusive UAS FID mission. UAS FID is a growing area for FID advising and therefore it is critical to develop and assign a UAS FID mission for the SFAB.

UAS FID is not just applicable for Afghanistan but should also be considered in other theaters. For example, UAS are ideal for United States Africa Command (AFRICOM) missions with countries like Nigeria operating their own UAS systems to fight their insurgencies.¹⁰⁶ UAS for COIN in places like Africa or South America provide a low cost, sustainable solution just like they do for Afghanistan. Even the basic airpower provided by UAS can enable small and poorly trained ground forces the ability to achieve strategic effects.¹⁰⁷ Many of the developing nation's government forces who are fighting COIN are evenly matched, or overmatched, by the insurgents and struggle to hold ground. Airpower seeks to tip the balance in the government's favor by giving the government forces the offensive initiative and eliminating the insurgent's ability to operate freely.

Finally, an additional consideration that is often overlooked is the hazards and implications of UAS on civilian aviation or airport operations. In the US, there are robust control measures being implemented such as altitude restrictions and mandatory licensing.¹⁰⁸ Soon, an identification device such as the Automatic Dependent Surveillance-Broadcast (ADS-B) or a transponder will also be required. In an underdeveloped country that is fighting an insurgency, like Afghanistan, civil administration and control of airspace is often poor or nonexistent. With the proliferation and increase in UAS, airspace deconfliction becomes a challenge and even a sUAS flying near an airport can disrupt operations and endanger manned and other unmanned aircraft.¹⁰⁹ Even though many airports and military bases are developing electronic countermeasures, lasers, and jamming capabilities, the risk of aircraft collisions or enemy UAS attacks remain. Integrating military UAS operations into the JAGIC concept would provide effective deconfliction within both the battlespace and civilian airspace.

Conclusion

The research found that Afghanistan and its coalition advisors have struggled to produce the number of pilots and aircraft for their air force. The history of AF FID in Afghanistan has shown that it is not a permissive or easy place to conduct whole air force or military development. The AAF in its current form is not sufficient to fully support the ANDSF ground forces as they fight a difficult and persistent insurgency. Without continued international support, the Afghan government and the ANDSF would most likely not succeed against the resurgent Taliban. However, UAS, with their ease of use, low cost, and applicability for many of the same missions that manned aircraft are currently conducting, offer a promising capability to develop mil-

itary airpower quickly and directly for the Army units that need it most. The research investigated the use of UAS in modern COIN warfare and conducted a brief feasibility study of potential alternatives noting that Army-owned sUAS like the Raven, Shadow, or ScanEagle, especially in the ISR mission area, can provide immediate mission-enhancing capability for ground forces in a cost effective and sustainable way. The further implementation of UAS for Afghanistan is possible and actionable. UAS FID advising provides the framework to build and train partner capacity. This paper found that UAS FID as a function of the US military still lacks a defined lead organization. In this regard, the SFAB was recommended as an ideal fit for establishing UAS FID to produce the operators and implement the programs.

This research determined UAS FID is a viable alternative for AF FID in Afghanistan as well as potentially in other locations such as Africa where partner countries frequently lack an adequate manned air force capability. Afghanistan provides a representative case study of the requirement to build a UAS FID model, especially for small variants, and to designate an implementing organization like the SFAB. The experiences of Afghanistan's development of airpower, both manned and unmanned, offers a baseline from which other FID and COIN air force building missions can learn and expand. UAS have been and will continue to be a central part of small wars. In Afghanistan, the AAF will continue to require manned aircraft, however, UAS can supplement the manned air force when they are either unavailable or in insufficient supply for the mission. For sustainable airpower, UAS are the best alternative for Afghanistan.

Notes

(All notes appear in shortened form. For full details, see the appropriate entry in the bibliography.)

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Abbreviations

AAF	Afghan Air Force
AFRICOM	United States Africa Command
ANA	Afghan National Army
ANDSF	Afghan National Defense and Security Forces
AOC	Air Operations Center
ASOC	Air Support Operations Center
ASSF	Afghan Special Security Forces
CAA	Combat Aviation Advisors
CAS	Close Air Support
CLS	Contractor Logistics Support
COIN	Counterinsurgency
DARPA	Defense Advanced Research Projects Agency
FID	Foreign Internal Defense
FMS	Foreign Military Sales
ISIS-K	Islamic State of Iraq and Al-Sham-Khorasan
ISR	Intelligence, Surveillance, Reconnaissance
JAGIC	Joint Air-Ground Integration Center
MTT	Mobile Training Team
NMCC	National Military Coordination Center
RPA	Remotely Piloted Aircraft
RSM	Resolute Support Mission
SAM	Surface-to-Air Missile
SEAD	Suppression of Enemy Air Defense
SFAB	Security Force Assistance Brigade
SMW	Special Mission Wing
SOAG	Special Operations Advisory Group
SOS	Special Operations Squadron
TACP	Tactical Air Control Party
UAS	Unmanned Aircraft System

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