RE-CASTING THE FAC NET:

PEOPLE, PLATFORMS, AND POLICY IN FORWARD AIR CONTROL

BY

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APPROVAL

The undersigned certify that this thesis meets master's-level standards of research, argumentation, and expression.

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DISCLAIMER

The conclusions and opinions expressed in this document are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.

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ABSTRACT

This paper seeks to answer the question: does the United States Air Force still need to execute the forward air controller (FAC) mission from the air? Since World War II, air and ground FACs have acted as communication links to connect air and ground forces and to coordinate air strikes within close proximity of ground forces. Three tasks have comprised the primary role of the FAC: finding a target, communicating the target location to supporting fighters, and clearing fighters to release weapons on the target. To accomplish these tasks in conflicts subsequent to World War II, FACs adapted technology and training to meet ground commanders' requirements and to address military, political, and environmental limitations. In Korea and Vietnam, FACs evolved from the ground to aerial platforms to execute the three FAC tasks effectively. After Vietnam, the inclusion of enlisted FACs led to an air-and-ground FAC team, which dominated the battlefield during Desert Storm. After Desert Storm, technological advances, such as satellite communications and the global positioning system (GPS), provided the architecture to distribute the functions of a controller to entities other than the actual FAC. While FACs in previous conflicts executed the three tasks mostly on their own, FACs in Afghanistan acted as information gatekeepers and coordinated the actions of dislocated actors specializing in specific FAC-related functions. For example, remotely piloted vehicles gathered visual intelligence but did not attempt to coordinate that intelligence to supporting fighters without a FAC directing them to do so. FACs returned from the air back to ground during the conflict in Afghanistan as coalition forces employed a "FAC-net" to find, fix, and destroy targets in coordination with the position, movement, and purpose of ground forces. The FAC-net was highly effective but also highly reliant upon air superiority, a robust communications and intelligence infrastructure, and GPS. These capabilities were asymmetrical advantages for the United States during Operation Enduring Freedom, which future enemies may seek to deny. The ability of the FAC-net to coordinate airstrikes resided in the inherent flexibility of network components. In future conflicts, Airmen and soldiers will require the capability to coordinate their actions, which necessitates the construction of secure targeting, navigation, and communications networks. Furthermore, high intensity and mobile warfare place unique stresses on FAC networks and will likely require airborne FACs to help coordinate airstrikes within close proximity to ground forces.

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Introduction

Through the first six months of Operation Enduring Freedom, Airmen on the ground in Afghanistan coordinated air strikes against Taliban forces. These Airmen, called forward air controllers (FACs), acted as the link between the ground commander, pilot, and headquarters, creating an effective air support network. Their expertise in finding and communicating the location and composition of targets to waiting support aircraft with precision weapons decimated the Taliban, and ground commanders trusted FACs to clear airstrikes within just yards of friendly positions. On March 2, 2002, special operations forces (SOF) joined with conventional Army forces in an operation called Anaconda. These forces used air strikes, in part, to kill trapped Taliban fighters in the valleys around Khowst in Eastern Afghanistan. Within hours, though, the ground FAC network broke down. The Taliban fought more fiercely than expected from fortified positions in the mountains. The enemy immobilized coalition forces with mortar and AK-47 fire. Too many FACs located too close together requested air support at the same time. Aircraft quickly overwhelmed the communications network and could not provide critical support within close proximity to the beleaguered forces on the ground.[1]

Less than 24 hours later, the combined forces air component commander (CFACC), General Michael Moseley, directed A-10s to act as airborne forward air controllers (FAC(A)) to help create order from the unfolding chaos. When FAC(A)s from the 74th Expeditionary Fighter Squadron arrived over the Shahi Kot valley, they experienced what could be described as a melee. Aircraft nearly flew into each other while bombs fell past their windscreens. The soldiers on the ground could not

[1] Richard B. Andres and Hukill, Jeffrey, "Anaconda: A Flawed Joint Planning Process," *Joint Force Quarterly*, no. 47 (Quarter 2007).

communicate with their supporting fighters. When the FAC(A)'s made their first radio call, three different ground FACs screamed for help.[2]

As the FAC(A)s talked to multiple ground FACs taking fire from different locations around the valley, the controllers set priorities. They contacted the ground forces to find out the distance and direction to the enemy guns. They communicated with the other aircraft to prevent midair collisions; and, after finding the enemy, they bombed the Taliban positions, quieting the incoming gunfire while coordinating for other fighter aircraft to strike targets in the vicinity.[3] As a result of effective airborne coordination to kill the enemy, coalition forces continued to employ A-10 and F-16 FAC(A)s for the duration of Operation Anaconda.[4]

After their successful intervention in Operation Anaconda, the presence of FAC(A)'s diminished almost entirely. In their place, coalition forces executed the elements of the FAC mission through a network of intelligence, surveillance, and reconnaissance (ISR) platforms, ground FACs; strike aircraft; and precision weapons to kill Taliban fighters threatening friendly forces. Robust communication networks enabled this "FAC-net" of combatants, sensors, and weapons, which expanded in scale and scope throughout the duration of OEF and effectively replaced the FAC(A). If the CFACC considered the FAC(A) mission critical during Operation Anaconda, why did coalition forces not employ FAC(A)s for the rest of the conflict? Does the United States Air Force still need to execute the forward air controller (FAC) mission from the air?

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[2] LtCol Scott Campbell, interview by Laurence Lessard, May 15, 2009, Combat Studies Institute, Fort Leavenworth, KS.
[3] Campbell, interview.
[4] AF/XOL, *Operation Anaconda: An Airpower Perspective* (Headquarters USAF, February 7, 2005), http://www.au.af.mil/au/awc/awcgate/af/anaconda_unclassified.pdf.

Problem Background and Significance

The use of air strikes to kill the enemy when in close proximity to friendly soldiers is not a new problem. As early as World War I (WWI), pilots failed to determine friend and foe from the air.[5] FACs act to interpret the ground situation and communicate the correct course of action to supporting fighters, which helps to overcome this confusion. In this manner, FACs act as the coordination mechanism between the air and ground domains. They improve the effectiveness of close air support. To accomplish their mission, FACs must overcome challenges with regard to the target, threats, friendlies, environment, and political constraints.[6]

The primary objectives for FACs are to find, fix, and coordinate the destruction of enemy targets. Target identification, however, is a challenge during conflicts because the enemy moves and camouflages targets to prevent identification. For example, a green tank in a tree line is almost impossible for a FAC to identify by eyesight alone. The enemy also employs fake targets, such as inflatable vehicles to confuse aerial reconnaissance.[7] Moreover, multiple targets present a challenge for FACs and friendly ground forces. With limited ordinance on aircraft, the FAC must determine target priorities based upon the ground commander's requirements. Once FACs find a target, they must choose the correct weapon and direction of attack. For example, in Desert Storm the Iraqis placed their tanks in dug-out revetments. Only precise attack angles from the air will destroy tanks in a revetment, otherwise the bomb might miss the target and explode harmlessly. Additionally, FACs help select the appropriate weapon to employ against targets. For example, against a

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[5] Lee Kennett, *The First Air War: 1914-1918* (New York: Free Press, 1999), chap. 2.
[6] For a detailed description of all factors the FAC must maintain awareness of in addition to means of .mitigation see JP 3-09.3.
[7] During Operation Allied Force, Bosnians regularly used inflatable tanks and moved vehicles with the express purpose of frustrating the allied air campaign.

tank, the FAC may request supporting fighters use the Maverick anti-armor missile vice a general-purpose bomb, which is better for soft targets. During combat, the FAC matches capability with the ground commander's intent for an elusive enemy.

In addition to passive measures to avoid detection and destruction, enemy forces employ active measures like deploying anti-aircraft threats and jamming communications. Threats, such as radar-guided surface-to air-missiles (SAMs), anti-aircraft artillery (AAA), and small arms deny the use of airspace.[8] Threats force FACs to circle farther away from targets, which frustrates attempts to identify and track those targets and restrict attack options for supporting fighters. SAM threats keep supporting fighters at greater distances from targets, while AAA keeps aircraft at higher altitudes. Furthermore, the enemy can employ both communication and global positioning satellite (GPS) jamming.[9] Jamming slows the targeting process because FACs must use secondary methods to glean and then communicate target locations to supporting fighters. FACs must identify, locate, and mitigate the threat of enemy systems to ensure the safety of supporting fighters and effectiveness of air strikes.

To provide safe and effective close support to ground forces, FACs must locate and coordinate with the ground forces, artillery fires, special operation forces (SOF), and supporting aircraft. FACs identify and track other friendly forces in the area to prevent fratricide. Tracking forces is a challenge because large units may not actively track the movement of every soldier or piece of equipment. Special operations forces also move quickly and with little notice. Even if the FAC identifies the location of supported ground forces, other friendly forces may be transiting the battlespace unknown. Along with the difficulty of tracking friendly forces in battle, FACs must also coordinate their actions with friendly artillery

[8] See chapter 3 for a detailed discussion of enemy threat systems and countermeasures.
[9] For examples and tactics to overcome jamming, see chapter three.

support. The army typically places its artillery behind the front line. If uncoordinated, friendly artillery shells can fly through the air directly where FACs and supporting fighters are waiting to help. Additionally, FACs coordinate supporting aircraft by acting as airborne air traffic controllers. They must know the different capabilities and requirements of every type of aircraft that could provide support. For example, a B-1 bomber circles higher, further away, and carries different weapons than an A-10 attack aircraft. Furthermore, the FAC must ensure all of the aircraft holding remain clear of each other.

FACs must also account for environmental factors such as weather and battlefield effects like smoke. Weather and smoke hinder a FACs ability to see targets. These visual obstructions obscure targets and can force FACs to use different weapons than desired, such as a GPS guided bomb when the best weapon may be an air-ground missile. Furthermore, to mitigate the effects of weather, FACs may need to operate lower than desired or in area not conducive to observing the battlefield. Small changes in holding altitudes can cause a cascade of changes to artillery fires, other aircraft in the area, and even weapons delivery.

After FACs mitigate the threat, comply with the ground commander's intentions, and plan attacks considering the weather, they must still adhere to political restraints such as the Law of Armed Conflict (LOAC) and rules-of-engagement (ROE). The United States military follows the Law of Armed Conflict, which dictates military action follows four principles: necessity, distinction, proportionality, and limitation.[10] Each of these principles serves to limit the use of force during combat. Rather than expect each FAC to evaluate whether every target and attack meets the principles of LOAC, the military simplifies the problem by defining ROE. ROE dictate specific actions or restrictions during war. For

[10] *Law of Armed Conflict Handbook* (Charlottesville, Virginia: The Judge Advocate General's Legal Center and School, U.S. Army, International and Operational Law Department, 2012), 34, http://www.loc.gov/rr/frd/Military_Law/pdf/LOAC-Deskbook-2012.pdf.

instance, an ROE may state that aircraft cannot strike structures for fear of killing civilians. By following ROE, FACs should fall within the LOAC boundaries and ensure their efforts further the political purpose of warfare.

FACs solve complex problems and improve a ground commander's ability to wage war. FACs translate a ground commander's desires and communicate those to supporting aircraft. Subsequently, FACs coordinate their actions with ground forces, artillery, and supporting aircraft to ensure all act in concert with the overall objectives. Simultaneously, FACs identify and mitigate enemy threats while checking to ensure attacks meet relevant ROE. FACs mark targets and provide weapons release clearance after they confirm the safety of ground forces. All together, these tasks link efforts in the air domain to the ground domain to help create an effective air and ground network for the purposes of striking targets within close proximity to ground forces.

With the advent of satellite radios and precision weapons, some view a shift in warfighting towards a technologically networked warfighter, reducing the need for an airborne FAC. In "Winning with Allies: The Strategic Value of the Afghan Model," the authors argue that the future of warfare will primarily use satellite radios to link ground forces directly to aircraft to coordinate precision-guided air support.[11] In this model, there is no need for specialized FACs, other than special operations forces, because technology will solve communications and targeting problems. Similarly, French Colonel Geraud Leborie argues the Afghan model is only applicable in certain contextually equivalent situations, such as Iraq and Afghanistan.[12] Alternatively, Stephen Biddle explains the current model of technologically supported, network-based

[11] Richard B. Andres, Craig Wills, and Thomas E. Griffith, "Winning with Allies: The Strategic Value of the Afghan Model," *International Security* 30, no. 3 (Winter 2005): 124–60.
[12] Col Geraud Laborie, "The Afghan Model More than 10 Years Later: An Undeminished Relevance," *Air & Space Power Journal Africa & Francophonie*, Quarter 2013, 49–60.

warfare as a minor adjustment to the more traditional method of battle focused on massing against an enemy's weaknesses.[13] He argues that the Afghan model of warfare was a unique solution to a specific problem rather than an effective strategy to employ outside the context of Afghanistan. Those who have evaluated network-centric warfare have treated strike networks as singular entities and have not explored how people, technology, and training have expanded and contracted to create adaptable networks to find, fix, and destroy fielded forces in a variety of conflicts and contexts.

Methodology

This paper is a qualitative and historical analysis to understand how FACs coordinated air and ground forces on the battlefield from World War I through Operation Enduring Freedom. To the extent possible, this paper uses primary source material for the two major conflict periods, Vietnam and OEF. Air Force history consolidated into Contemporary Historical Examination of Current Operations (CHECO) reports forms the foundation of the Vietnam chapter. As most of the information is still not declassified, newspaper, journal articles, and interviews comprise most of the OEF chapter. Secondary source material covers each of the interwar periods. Throughout the evolution of the FAC, three tasks have constituted the primary role of the FAC: finding a target, communicating the target location to supporting fighters, and clearing fighters to release weapons on the target. To accomplish these tasks in subsequent conflicts, FACs adapted technology and training to meet ground commanders' requirements and to address specific military, political, and environmental limitations. Understanding how and why the

[13] Stephen D. Biddle, "Allies, Airpower, and Modern Warfare: The Afghan Model in Afghanistan and Iraq," *International Security* 30, no. 3 (Winter 2005): 161–76.

FAC evolved to accomplish these tasks might help to shape the future for the FAC mission.

This paper focuses on Vietnam and Operation Enduring Freedom (OEF) in Afghanistan due to apparent similarities between the conflicts and the puzzling differences in the tactical application of the FAC mission. Each conflict was a counterinsurgency. In both Vietnam and Afghanistan, the Air Force operated from within the contested country and could build an extensive command-and-control network. Lastly, both wars lasted for over a decade, leading to significant developments in military tactics, techniques, and procedures. For these reasons, Vietnam and Afghanistan provide the historical framework for the evolution of the FAC mission and set the stage for its future.

The first chapter follows the formation of the FAC mission from World War I through the Korean War. This time period highlights the enduring requirement to coordinate airstrikes with ground forces, leading to the formation of the FAC mission and functions. WWI illustrated the unique capabilities of airpower and what it could bring to the battlefield. It highlighted the difficulties inherent in coordinating airstrikes within close proximity to friendly ground forces. Through the interwar years, FACs languished as the proponents of an independent Air Force pushed doctrine towards the strategic missions deep behind the front lines. World War II reintroduced the operational requirement, however, for a FAC who could coordinate efforts in the air with those on the ground.

While FACs took to the air in limited ways during WWII, the character of the Korean conflict required FACs to evolve into an airborne mission. Rugged terrain and poor communications prevented ground FACs from coordinating and controlling air strikes. By moving into the air, FACs improved both communications and reconnaissance. Once airborne, FAC(A)s saw added benefit to executing control from the air. Since FAC(A)s were also fighter pilots, they could communicate requirements in terms supporting pilots could easily understand.

Additionally, FAC(A)s could travel to geographically dispersed ground units and provide control as required to increase the effectiveness of close air support. FAC(A)s provided an elevated reconnaissance platform to see behind hills and walls. This practice restricted the enemy's ability to move freely or find sanctuary in battle.

Chapter two chronicles FACs from the Korean War through the Vietnam War. After the Korean War, the Air Force prioritized other missions above the FAC mission, because the grand strategic plan of the nation focused on strategic bombers and nuclear warfare. In Vietnam, national strategic objectives required the Air Force to train Vietnamese partners on the air support system, which, however, included the FAC mission. Air Force SOF initiated efforts to train the Vietnamese FACs. Shortly thereafter, SOF FACs learned that FACs could not effectively control fighters from the ground because they could not easily identify targets in the complex terrain. As a result, FACs once again took to the air. Once airborne, FACs could see targets better and communicate more effectively with ground forces, supporting fighters, and controlling agencies.

Once airborne, execution of the FAC mission in Vietnam continued to evolve to meet the changing operational requirements of the conflict. In 1965, the conventional Air Force took over the FAC mission from SOF to meet the increased personnel requirements. In South Vietnam, FAC aircraft evolved from the O-1 Birddog to the OV-10 Bronco. The OV-10 improved communications and response times, because unlike the O-1, it had air-to-ground weapons on board to strike fleeting targets on its own. In the North, where the threat was greatly increased, FACs used F-100 Super Sabres and F-4 Phantom IIs to improve chances of survival. Finally, the enemy continued to adapt during the war causing FACs to update tactics, techniques, and procedures to remain effective.

The third chapter explores the evolution of the FAC mission and technology from the end of the Vietnam War to Operation Enduring

Freedom. During this period, personnel changes along with improvements in communications and precision weapons enabled FACs to distribute many of the core FAC functions to other combatants and platforms. During the Cold War, personnel requirements drove the creation of an enlisted FAC called the enlisted terminal air controller (ETAC). The ETAC and FAC(A) team in Desert Storm validated the Cold War training philosophies of integrating air strikes into mobile and mechanized warfare. Due to political restrictions, the operations in the Balkans, Deliberate Force, and Allied Force saw greater utilization of the space domain through satellite communications and Global Positioning System (GPS). These technologies enabled the dislocated command and control of supporting aircraft and reconnaissance platforms. Furthermore, GPS and satellite communications enabled over-the-horizon Remotely Piloted Vehicles to support ground missions.

These space-based technologies aided the creation of a communications architecture that transformed the FAC mission. By the onset of hostilities in OEF, FACs acted as the central node of an extended communications and reconnaissance network. FACs communicated to supporting commands through a network of satellite communications. They used dislocated sensors, such as Predator Remotely Piloted Aircraft (RPAs), to find and track targets. They used GPS handsets and laser range finders to generate and pass target coordinates to awaiting aircraft and then cleared those fighters to attack. Space-based technologies enabled the distribution of the FAC mission to other platforms that specialized on specific tasks.

The reliance on this technological backbone, though, limited the capability of FACs during high-tempo operations. During Operation Anaconda, the increased requirement for air support in a geographically limited area prevented the implementation of a FAC network. Specifically, ground FACs could not maintain awareness over the air and ground battlespace. As a result, the Combined Forces Air Component

Commander (CFACC) directed FAC(A)s into the battlespace to organize supporting aircraft. Unlike Vietnam and Korea FAC(A)s did not remain in Afghanistan, however. Once the robust communication systems enabled coalition forces to organize the control and coordination of airspace and aircraft, FAC(A)s drifted into obscurity. The CFACC quickly improved the communications infrastructure to support FACs on the ground, but was this the most effective and efficient method for ensuring close air support?

Scope

This paper seeks to communicate the intricacies of the FAC mission to policy makers, soldiers, and Airmen alike. The language is purposely non-doctrinal nor service-specific. Additionally, this paper addresses FACs only as a coordination party between Air Force airplanes and Army ground forces. While much FAC history is explored, some conflicts, such as Operation Iraqi Freedom, were purposely omitted, since the lessons learned from these conflicts were similar to those of other wars.

Forward air controllers coordinate airstrikes within close proximately to ground forces. They communicate across service cultural divides to ensure the appropriate application of airpower to the ground commander. They operate from the ground or the air and originate from every service. FACs use a combination of doctrine, training and technology to accomplish their mission.[14] Notwithstanding, the definition and qualifications of the FAC are not constant. In Vietnam, regulations demanded FACs be a qualified fighter pilot who could control from the air or ground. Over the past 70 years, FACs have diversified, however, into officer, enlisted, and rated and non-rated positions. The term "FAC" now

[14] "Joint Publication 3-09.3," July 8, 2009, 1–1, 1–2.

denotes “An officer (aviator/pilot) member of the tactical air control party who, from a forward ground or airborne position, controls aircraft in close air support of ground troops.”[15] Unfortunately, this definition is overly restrictive as Joint Terminal Air Controllers (JTACs) and Air Liaison Officers (ALOs) perform the functions of the FAC but may be enlisted and not aviators. Therefore, unless specifically denoted, this analysis uses the term FAC in the general sense of a trained and qualified terminal air controller who provides clearance for fires from aircraft onto targets to meet the ground commander’s objectives. Lastly, for the purposes of this paper, the FAC mission equates to the terminal-air-control (TAC) and air-strike-control (ASC) missions.

Discerning Operational Requirements

On 2 October 1973, the prominent military historian, Sir Michael Howard, gave a speech in response to receiving the Chesney Memorial Gold Medal.[16] In this speech, Howard outlined a method for the military professional to evaluate military science in the interim between major conflicts.[17] Of note, he disdains the apparent ability to predict the future stating, “I am tempted indeed to declare dogmatically that whatever doctrine the Armed Forces are working on now, they have got it wrong. I

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[15] “Joint Publication 3-09.3,” GL–12.

[16] The requirements for receiving the Chesney Gold Medal are as follows: “The conditions ordain that this medal shall be awarded by the Council of the Institution from time to time, as funds admit, to the author of ‘an original literary work treating of Naval or Military Science and Literature, and which has bearing on the welfare of the British Empire.’” The first medal was awarded to A.T. Mahan on 31 May, 1900. For additional information see “The Chesney Medal,” *The RUSI Journal* XLIV, no. 272 (October 1900): 1097–98.

[17] Sir Michael Eliot Howard, OM, CH, CBE, MC (born 29 November 1922) is a retired British military historian, formerly Chichele Professor of the History of War and Regius Professor of Modern History at Oxford University, and Robert A. Lovett Professor of Military and Naval History at Yale University. Howard was educated at Wellington College and Christ Church, Oxford (with service in World War II in between). For a complete biography see: “Professor Sir Michael Eliot Howard,” *King’s College, London*, accessed March 24, 2015, http://www.kcl.ac.uk/sspp/departments/warstudies/people/emeritus/howard.aspx.

am also tempted to declare that it does not matter that they have got it wrong. What does matter is their capacity to get it right quickly when the moment arrives."[18] Howard explains that predicting the future involves the interplay of technical feasibility, financial capability, and operational requirement.[19] Howard argues that the military professional can influence only operational requirements and that the other two are beyond the scope of the practitioner.

Operational requirements are fundamental to military strategy. As Howard explains, the basic question is not how much of a certain capability can we provide, but what is the purpose of that capability?[20] This paper uses Howard's theoretical foundation to analyze the development of the FAC. Specifically, this paper attempts to identify the operational requirements that led to the development of people, technology, and tactics throughout the first 100 years of air-and-ground coordination to determine a strategy to meet the operational requirements for coordinated air strikes in future conflicts. After evaluating the FAC history, this paper contends that the requirement remains for a dedicated FAC to coordinate between air and ground forces. To cover the spectrum of warfare, the FAC network requires SOF, conventional ground FACs, and FAC(A)s. Furthermore, this paper recommends that the FAC should strengthen and build redundant communications links, train without the aid of GPS, and exercise the entire air-and-ground network in scenarios when the communication links between the network components are degraded.

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[18] Michael Howard, "Military Science in the Age of Peace," *The RUSI Journal* 119, no. 1 (1974): 4.
[19] Howard, "Military Science in the Age of Peace," 5.
[20] Howard, "Military Science in the Age of Peace," 6.

Chapter 1

The Missing Link:
The Genesis of the FAC Mission Prior to Vietnam

The mission and tasks of the FAC did not materialize from the introduction of airpower in World War I (WWI), but evolved as soldiers and Airmen addressed needs on the battlefield, filled shortfalls experienced during exercises, and learned from the Wehrmacht's success in World War II (WWII). The United States first used airpower in support of ground forces during WWI as a reconnaissance tool, and Europe became a proving ground in WWII for integration of air and ground forces, which resulted in the creation of the forward air controller (FAC). In conflicts from WWI to the Vietnam War, the FAC evolved to fill the missing link that coordinated air strikes and ground forces, while terrain, communication advances, and aircraft technology shaped the implementation of the FAC mission and elevation of the FAC from the ground to the air.

The purpose of this chapter is to describe the operational requirements that shaped the development of the FAC mission prior to the Vietnam War. Additionally, this chapter will determine the contextual factors, such as technology and terrain, which caused the FAC to go airborne. This chapter follows the origination and evolution of the FAC from WWI through the Korean War. It explains how the idea of aerial observers developed in WWI as a need to find the enemy and how the observation mission evolved into the FAC and the airborne FAC (FAC(A)) in the Korean War

Spotting the Enemy: Airpower in WWI

The FAC mission grew from needs of the ground commander to find and kill the enemy. Specifically, ground forces needed to see beyond the front line to understand the enemy's position, strength, and movement. To accomplish this during WWI, opposing forces first used balloons to see into the enemy's rear area and gain critical intelligence. Intelligence gathering evolved to incorporate the airplane because balloons could not survive against aerial attacks. Soon, Airmen discovered they could strike enemy forces from the air. Aerial attacks introduced a variety of challenges, such as discriminating friendly from enemy positions. This required improved communications technology. WWI Airmen attempted to refine communication methods to prevent confusion, improve their bombing effectiveness, and coordinate artillery fires against dug-in enemies.

The earliest use of airpower on the battlefield developed from the need to gain intelligence. By the end of 1914, the WWI battlefield in Western Europe devolved into a continuous line of trenches from Switzerland to the English Channel.[1] Most of the critical functions of the opposing armies happened out of sight behind the enemy's trenches. Spotters in balloons saw beyond the enemy's trench line to provide a means of gaining intelligence. They could see reinforcements and logistical supplies moved to specific locations on the enemy's lines. Once a spotter identified enemy positions, he dropped notes over the side of the balloon to soldiers on the ground, which they could use to direct and correct artillery barrages to increase the lethality and effectiveness of fires.[2]

Reconnaissance soon evolved from balloons to airplanes, but communications technology did not keep pace. Airplanes were more

[1] Kennett, *The First Air War*, 24.
[2] Kennett, *The First Air War*, Chap. 2.

resilient to enemy anti-aircraft artillery. Therefore, pilots used airplanes to supplement and then supplant balloons for the reconnaissance mission. While they were more resilient, aircraft of the time still could not communicate with ground forces effectively. Initially, spotter aircraft relied upon memory, handwritten notes, and maps dropped to friendly troops. To improve communications, pilots experimented with wireless communication, but the war ended before the technology improved enough to be effective.[3]

The use of airplanes during WWI illustrated airpower could provide great effects upon the battlefield. Airplanes could find enemy targets but only crudely communicated their positions to ground forces below. As the war progressed, airplanes directly attacked targets. As the use of airplanes increased, incidents of fratricide illustrated the need for pilots to discriminate friendly from enemy forces on a chaotic battlefield. Communication techniques of the time, including hand dropped notes and nascent wireless, could not overcome the confusion, which limited the potential of airpower.

The Interwar Years through WWII: From Reconnaissance to Control

The FAC mission developed from the need to control air strikes in close proximity to ground troops. Airmen and soldiers jointly developed the process to strike targets close to friendly positions in the interwar period and further refined the process in the early WWII Tunisian and North African campaigns. These experiences illustrated that aircraft could strike targets; but, to prevent fratricide air and ground forces required effective communication links. To create those links, the Army and Army Air Forces developed the air control party, which soon evolved into the modern FAC who coordinated air strikes.

[3] Kennett, *The First Air War*, Chap. 2.

While military aviation developed initially from the needs of ground commanders, advocates of airpower theory quickly sought independence from the Army. As Colonel William "Billy" Mitchell advocated in *Winged Defense*, proponents of an independent service envisioned squadrons of bombers that destroyed the enemy deep behind their front lines. Mitchell's idea of an independent Air Force centered strategic bombers protected by pursuit airplanes.[4] He argued an independent strategic Air Force could strike the enemy homeland to reach a political end. Unsurprisingly, the AAF prioritized resources towards the development of strategic bombing rather than support efforts to develop attack aviation for the direct support of ground forces.

As WWII approached, Army commanders recognized the lack of coordination between air and ground forces and the need for a robust communications plan, air-ground signaling, and a liaison network. The ease by which the Wehrmacht progressed through Poland and France surprised many in the United States. German tactics relied upon close coordination between air and ground forces to overwhelm enemy forces.[5] During the interwar years, the Germans developed a joint air-and-ground doctrine to coordinate efforts on the ground.[6] To help accomplish this, the Luftwaffe trained Airmen as liaisons to help coordinate air strikes with ground maneuvers.[7] Army Chief of Staff General George Marshall recognized the combined air-and-ground method of warfighting as a new paradigm in battle.[8] Prior to 1941, the United States Army did not engage in large force exercises. Anticipating the requirements of war, in June

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[4] William Mitchell, *Winged Defense: The Development and Possibilities of Modern Air Power--Economic and Military* (Tuscaloosa, AL: Fire Ant Books, 2010), Chap. 9.
[5] James S. Corum, *The Luftwaffe: Creating the Operational Air War, 1918-1940* (Lawrence: University Press of Kansas, 1997), 284.
[6] Corum, *The Luftwaffe*, 285.
[7] Corum, *The Luftwaffe*, 137.
[8] Gabel, Christopher R, *The U.S. Army GHQ Maneuvers of 1941* (Washington D. C.: Center of Military History, 1992), 38.

1942, Marshall ordered a series of tests at Fort Benning to evaluate the effectiveness of United States airpower on the battlefield.[9]

These tests included a variety of maneuvers that exercised the coordination between air and ground forces. Marshall wanted his forces to practice the coordination of armor, mechanized infantry, and the nascent air forces prior to actual battle.[10] In these mock battles, the Army attempted to coordinate the movement of mechanized forces with artillery support and air strikes. The mock battles taught commanders how to maneuver small units and entire armies through the swampland.[11] The battles added realistic communication and coordination complexities not seen in the highly structured tests of the past.

The Fort Benning tests identified organizational and practical problems with the coordination of air strikes and the movement of ground forces. At the organizational level, ideological friction between the air and ground components hampered efforts to strike targets from the air. Doctrine stated, "Air support command is habitually attached to or supports an army in the theater of operations," but airpower advocates thought the policy restricted air operations and prevented the efficient use of limited air resources.[12] The commander of the air task force for the tests emphasized the doctrinal friction and stated, "Unless the situation is critical, targets will usually not be selected within the effective range of the weapons of ground forces."[13] Army leadership perceived that the Army Air Forces did not provide adequate resources for the tests, let

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[9] Gabel, Christopher R, *The U.S. Army GHQ Maneuvers of 1941*, 37–39.
[10] Gabel, Christopher R, *The U.S. Army GHQ Maneuvers of 1941*, 5.
[11] Gabel, Christopher R, *The U.S. Army GHQ Maneuvers of 1941*, 5, 120.
[12] Lt Col Kent R. Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation, Study No. 35* (Fort Monroe, Virginia: Historical Section - Army Ground Forces, 1948), 12; "War Department Field Manual: 31-35: Aviation in Support of Ground Forces" (United States Government Printing Office, April 9, 1942), par 2 a.
[13] Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation, Study No. 35*, 12.

alone for a prospective conflict.[14] The Fort Benning tests illustrated how intra-service rivalries hampered the distribution of limited airpower resources to Army commanders.

The organizational problems translated into practical problems as pilots could not talk to the ground forces that requested support. Once in the combat area, pilots had to find the specific target and deliver ordinance while avoiding friendly troops. The maneuvers demonstrated the difficulty of close support execution. By design, front line troops did not have radio equipment that could communicate with airplanes to prevent unauthorized air requests.[15] The lack of communications equipment led to excessive delays as troops on the ground routed target corrections through the air request network.[16]

In response to the Fort Benning tests, the Army published TC No. 52, *Employment of Aviation in Close Support of Ground Troops*, on 29 August 1941, which dictated new communications procedures between air and ground forces. Army General Headquarters Chief of Staff, General Lesley J. McNair, concluded from the Benning tests that "the recognition and identification of air targets continues to be the most difficult and undeveloped part of air support."[17] TC 52 forged a radio-communications

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[14] Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation, Study No. 35*, 12.

[15] Gabel, Christopher R, *The U.S. Army GHQ Maneuvers of 1941*, 120.

[16] At this time, the air request network consisted of an Air Liaison Officer at the Corps echelon only. Army officers passed air requests at the platoon and company echelon through the battalion and brigade to the Corps via telephone and radio. The ALO then called the air support and directed them to the ground location along with amplifying information, such as friendly and enemy location. If changes in the local situation arose, the front line forces had to relay those changes through this same communication network. The pilots, therefore, received untimely information at best. On a battlefield with much movement between friendly and enemy forces, pilots became hopelessly confused. The information pilots received did not reflect the actual situation on the ground, which lowered awareness. The Air Force approved of this system because it retained apportionment decisions with an Air commander rather than a supported ground commander. Gabel, Christopher R, *The U.S. Army GHQ Maneuvers of 1941*, 120.

[17] Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation, Study No. 35*, 12 Gen McNair was subsequently killed in Normandy by an errant bomb dropped during the invasion.

link between the ground party and attack aircraft.[18] TC 52 standardized the format of position and composition reports about enemy forces, which streamlined the communications process between ground forces and attacking aircraft. It directed a standardized target-request format including designation of target, location by coded template, time of attack, bomb-safety-line location, special instructions, and time signed.[19] Finally, TC 52 directed observation or reconnaissance aircraft to aid target acquisition for attack aircraft.[20] These procedures formalized the transfer of information and provided a solution to the communications problems discerned at Fort Benning.

In 1942, the Army published Field Manual 31-35, "Aviation in Support of Ground Forces," to further streamline the air-and-ground coordination necessary for Allied operations in North Africa. FM 31-35 directed requests for air support to travel from the ground unit in need to the first command post with an operational "air party."[21] The air party forwarded the request to the corps command post's "air control party," where Army commanders approved or disapproved the request for air support. [22] If approved, the air control party forwarded the attack order to the supporting air unit.[23] While simple in theory, the process proved exceptionally slow because of underdeveloped communications technology. In one division, the average time between the request and reception of air support was one hour and twenty minutes.[24] Both air and ground leaders wanted to conduct more exercises to refine the coordination process, but events in WWII interrupted the Army's training schedule.

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[18] "TC No. 52: Employment of Aviation in Close Support of Ground Troops," August 29, 1941, 8.
[19] "TC No. 52: Employment of Aviation in Close Support of Ground Troops," 9.
[20] "TC No. 52: Employment of Aviation in Close Support of Ground Troops," 9.
[21] "War Department Field Manual: 31-35: Aviation in Support of Ground Forces."
[22] "War Department Field Manual: 31-35: Aviation in Support of Ground Forces."
[23] "War Department Field Manual: 31-35: Aviation in Support of Ground Forces," par 37.
[24] Gabel, Christopher R, *The U.S. Army GHQ Maneuvers of 1941*, 120.

The Fort Benning tests foreshadowed United States' Army and Air Force execution at the onset of American participation in the WWII. In March of 1943 during the North Africa campaign, Allied forces attempted to defeat the highly trained and well-coordinated German force. Initially, AAFs failed to provide adequate support to the Army for a multitude of reasons.[25] There was no centralized command to organize the efforts of air-superiority fighters and attack aviation, which led to unsustainable loss rates as bombers attacked targets without aerial cover.[26] Additionally, the question of control continued to plague the services. Ground commanders interpreted FM 31-35 as placing air support under their control and further restricted air-support pilots from lending help to other units. [27] This inefficient management of air resources led AAF leadership to claim the Army "penny-parceled" airpower.[28] In fixing the problems of the Tunisian Campaign, the War Department gave the AAF equal status with the Army and directed centralized command and control of air-support forces.[29] Equal status ensured air commanders retained centralized command of limited air resources, which gave them the flexibility to provide air support for several units over a large area with a central pool of aircraft.

On the ground, communication systems evolved to meet the operational requirements of mobile warfare, resulting in the creation of ground FACs moving with the fighting forces. Initially, pilots relied upon preflight study of photographs and briefings to determine target locations, similar to pilots who participated in the Fort Benning tests before the war.[30] Ground forces used large canvas markers and smoke to

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[25] See chap 4 in Benjamin F. Cooling, *Case Studies in the Development of Close Air Support* (Washington, D.C: Office of Air Force History, 1990) for a detailed discussion of the command and control difficulties in the Tunisia campaign.
[26] Cooling, *Case Studies in the Development of Close Air Support*, 164.
[27] Cooling, *Case Studies in the Development of Close Air Support*, 165.
[28] Cooling, *Case Studies in the Development of Close Air Support*, 165.
[29] Cooling, *Case Studies in the Development of Close Air Support*, 184–185.
[30] "Development of Close Air-Ground Support" (Fifth Air Force, March 31, 1945), 3, 680.4501-2, AFHRA.

discriminate friendly positions from targets.[31] During the Battle at El Hamma, rapidly shifting battle lines caused confusion and rendered air support ineffective. In response, air-support officers put radios into armored cars, which followed directly behind the forward line of tanks.[32] The air-support teams could then communicate directly with supporting aircraft. The support officer, positioned on the front line, offered a better view of the battlefield and provided direction to pilots, which improved bombing performance. The Tunisian campaign highlighted the need for better air and ground coordination, which resulted in an expanded role for forward controllers.

As air-support officers gained experience in North Africa, they continued to refine tactics, which led to a cogent air support structure centered on the FAC. In the Sicilian Theater, a program called "Rover Joe" placed an experienced fighter pilot with army ground units.[33] The fighter pilot rode in a well-marked forward vehicle with the ground troops so he could develop a clear picture of the battle area.[34] From this position, the Rover Joe could see both the aircraft and target, which allowed much greater control of where the bombs landed.[35] Pilots attempted to watch artillery impacts and used map coordinates to find targets.[36] The forward controller communicated and confirmed ground features, which surrounded the target location to help the pilot confirm the target position and improve accuracy and safety.[37] In one instance, during the breakthrough in France, controllers aided the destruction of approximately 2,000 motor vehicles, 80 field artillery pieces, and nearly

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[31] "Development of Close Air-Ground Support," 5.
[32] Bryn Evans, *The Decisive Campaigns of the Desert Air Force 1942-1945* (Pen & Sword Books, 2014).
[33] "Development of Close Air-Ground Support," 4.
[34] Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation, Study No. 35*, 89.
[35] Cooling, *Case Studies in the Development of Close Air Support*, 208–209.
[36] Cooling, *Case Studies in the Development of Close Air Support*, 207.
[37] "Development of Close Air-Ground Support," 3.

100 tanks in one week.[38] In addition, the forward controller directly communicated with supporting airfields and the Army operations center via radio and telephone.[39] This provided a means to request additional air support if required.[40] Through effective communications, target identification, and understanding the ground commanders' plans, forward controllers improved the effectiveness of air support to ground troops.

The FAC mission had developed during the interwar years as a solution to coordinating air support with ground forces. The lack of large-scale exercises forced a rapid learning curve through the early years of WWII. During the war, the need to strike targets close to troops on the move highlighted the criticality of the FAC. These same requirements drove innovations such as placing the FAC in tank formations along with the Rover Joe program. After 4 years of air and ground coordination, the Fifth Air Force leadership best explained the efforts of the FAC:

> It was fully realized how absolutely necessary a complete understanding and cooperation between all echelons, both air and ground, was necessary to bring about a successful, coordinated attack, and it was also realized that unless the attack is thoroughly coordinated the heaviest bombardment from the air will not put the infantry on its objective."[41]

By the end of WWII, the Air Force and Army had developed a fully integrated method of delivering air support to ground forces.

In 1946, the Army codified the experiences of WWII in an updated FM 31-35, now titled "Air-Ground Operations."[42] FM 31-35 formalized the forward air controller position and directed the positioning of Tactical Air Control Parties (TACPs) with forward ground units. The TACP consisted of an air liaison officer and a FAC. The ALO remained at the

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[38] Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation, Study No. 35*, 90.
[39] "Development of Close Air-Ground Support," 4.
[40] Cooling, *Case Studies in the Development of Close Air Support*, 208.
[41] "Development of Close Air-Ground Support," 1.
[42] "War Department Field Manual: 31-35: Aviation in Support of Ground Forces."

command post and provided advice to the ground commander with respect to the capabilities of airpower. FACs primarily initiated requests for air support and then directed that support onto targets.[43] The lessons of WWII also highlighted the importance of communications in relating priorities and force locations and led to formation of a dedicated radio specialist position within the TACP.[44] Shortly thereafter in 1947, the Air Force became independent of the Army and the TACP remained an Air Force organization within the Army.

Korea: From the Ground to the Air

The next major evolutionary leap for the FAC occurred during the Korean War, when fast moving front lines and rough terrain required the FAC to go airborne. While the Army experimented with airborne FACs through the interwar years and WWII, communication and manpower limitations prevented their full utilization. In Korea, enterprising air-support officers borrowed light reconnaissance planes from the Army to direct fighter aircraft onto ground targets. Airborne FACs found and killed more targets than ground FACs, and the Air Force developed the mission of the airborne FAC to meet the requirements of the ground commander.

The next major conflict, the Korean War, illustrated how FACs could provide airpower to integrate air and ground forces.[45] On 25 Jun 1950, the North Korean People's Army (NKPA) attacked South Korea with

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[43] Cooling, *Case Studies in the Development of Close Air Support*, 207.
[44] "War Department Field Manual: 31-35: Air-Ground Operations" (United States Government Printing Office, August 1946), 2–5.
[45] While the FAC primarily remained on the ground during WWII, the Fifth Army experimented with airborne FACs briefly in its Italian Campaign. In June of 1944, the Fifth Army put controllers into L-5 Sentinels to track targets in the mountainous Italian terrain. The airborne controller was not widely used because communications problems plagued the program from the beginning. The Army recognized the airborne FAC mission could eventually control airpower, but the war ended prior to further development of the concept. For further reading, see Greenfield, *Army Ground Forces and the Air-Ground Battle Team Including Organic Light Aviation, Study No. 35*, 80.

the intent of unifying the peninsula. American forces retreated south trying to slow the attacking NKPA while simultaneously setting a defensive perimeter. Due to a lack of artillery, the overwhelmed ground forces requested air support to prevent the NKPA from taking the entire peninsula.[46] Responding to the call for help, the first Air Force fighter-bomber missions attacked NKPA forces three days later on 28 Jun 1950.[47] Close air support and interdiction helped to complicate the problems for the North Koreans, which provided the Americans time and space to retreat and consolidate forces. Due to a lack of ground controllers, though, supporting aircraft could drop ordinance only far from the friendly lines to prevent fratricide. Within weeks, though, FACs allowed the United Nation forces to bring CAS within 50 yards of friendlies.[48] The 24th Infantry Division Commander, Maj Gen William F. Dean, attributed FACs with saving his forces at Taejon.[49] FACs coordinated hundreds of close-air-support sorties to weaken the NKPA attacks. "Without question," said Dean, "the Air Force definitely blunted the initial North Korean thrust to the southward. Without this continuing air effort, it is doubtful that the courageous combat soldiers, spread thinly along the line, could have withstood the onslaught of the numerically superior enemy."[50] The initial success of FACs that directed support ensured their continued use throughout the conflict.

After the enemy forces slowed, Fifth Air Force planners encountered many problems in applying traditional air support to the Korean Conflict. Following WWII, the Air Force had started to shift toward new jet aircraft and the air superiority mission. Ironically, the new aircraft technology hindered the close-support mission in Korea. The Air Force wanted to use the new F-80 jet fighter to support ground forces

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[46] Gary Robert Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller* (Maxwell Air Force Base: Air University Press, 1997), 30.
[47] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 27.
[48] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 30.
[49] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 31.
[50] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 31.

but it did not have the loiter time to provide sustained coverage. The Air Force stationed the F-80 in Japan forcing a long transit flight and thereby limiting time over the target area to a mere 15 minutes. Even with fuel tank modifications later in the war, F-80 pilots could support ground troops for only 45 minutes.[51] Even though pilots in WWII-era B-29s and F-51s flew the bulk of the initial support missions in Korea, the Air Force continued to put F-80 flights over targets because air-support requests vastly outnumbered available aircraft.[52]

The long distances between the F-80 aircraft bases and ground forces further hindered effective air support to ground troops. Ground forces needed to forward requests through the Air Force network, which then launched aircraft from Japan. The time messages took to traverse the communications network led to extremely long delays between request and support. To overcome this, Fifth Air Force launched F-80 aircraft at predetermined intervals. Unfortunately, this plan did not align with the actual requirements for support on the ground. Regardless of need, the Army received only a predetermined amount of support, leading to an over- or under-abundance of airpower.

Overloaded and outdated radio networks compounded the air-support-request problems. The large number of air-support requests from the Army quickly overwhelmed the limited radio equipment in Korea.[53] The terrain and rapidly shifting lines of the conflict made it difficult for ground FACs to communicate exact target locations to airborne platforms. In Korea, ground FACs used radios in jeeps as their primary method to communicate with air-support aircraft. The Army, however, moved primarily by foot through the mountainous terrain,

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[51] Robert F. Futrell, *The United States Air Force in Korea*, 3rd ed. Reprint (Washington D. C.: U.S. Government Printing office, 1996), 87.
[52] J Farmer and M. J. Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, October 1967, 12, http://www.rand.org/content/dam/rand/pubs/research_memoranda/2005/RM5430.pdf.
[53] Futrell, *The United States Air Force in Korea*, 78.

which reduced the effectiveness of wheeled radio support. In addition, the Jeep-mounted radios failed frequently, and even skilled maintainers could not fix the communications equipment on the road. In the end, many controllers never even made contact with supporting aircraft.[54] Even if fighters were overhead, many were not able to talk to the FAC on the ground.

Once in contact with support aircraft, ground controllers experienced further problems due to terrain. Even though bombs seem to create devastation, the effective blast radius for most aerial delivered weapons was less than 100 feet. A pilot had to see the exact aiming point to ensure the target was destroyed. In ideal cases, a FAC used terrain features, such as a river or road intersection, to relay the precise target position.[55] Attack pilots described the terrain feature to confirm the correct location. In mountainous terrain, though, this process could take time as the pilot saw the target from a different perspective than the FAC on the ground. With only 15 minutes of loiter time, many F-80 pilots simply failed to find the correct spot on the ground to bomb. The problems of the poor request network, communication, and the terrain resulted in many non-effective F-80 missions.[56]

Air Force TACPs, who supported Army units under constant NKPA attack, needed a better method to provide timely and accurate control. On 10 July 1953, Fifth Air Forces Operations Officer, Lt Col Stanley P. Latiolas, directed two junior officers, Lts James A. Bryant and Frank G. Mitchell, to fly an Army L-17 observer aircraft to act in the FAC role for the next series of air strikes.[57] The next day, the officers each directed 10 strikes against enemy targets that both pilots and ground forces deemed

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[54] Futrell, *The United States Air Force in Korea*, 80.
[55] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 54.
[56] John Schlight, *Help from Above: Air Force Close Air Support of the Army 1946-1973* (S.l.: Diane Pub Co, 2003), 166.
[57] Futrell, *The United States Air Force in Korea*, 84. Different historians dispute the exact sequence of events, which led to airborne FAC. Futrell provides the best evidence for sequence as listed above.

successful.[58] From this inauspicious start, the airborne FAC program grew into a dedicated mission. The success of the initial battlefield experiences led to the almost immediate formation of the 6171th Tactical Control Squadron (Airborne). The 6171th pilots flew L-19 and T-6 aircraft armed with only smoke rockets and radios. They soon acquired the designation Tactical Air Coordinators-Airborne (TAC-(A)s) and reserved the callsign "Mosquito."[59] By the end of the war, airborne Mosquito FACs flew over 40,000 sorties.[60] The TAC-As proved an effective method of control, and through the first 18 months of the war, they controlled 93 percent of all close air support strikes.[61]

Figure 1: L-19 Liaison. The Army used the L-19 as a spotting and reconnaissance platform through WWII and Korea. Air Force "Mosquito FACs" used the L-19 until the T-6 arrived in theater.
Source: http://www.transportation.army.mil/museum/transportation%20museum/koreafixwing.htm (11 Dec 14)

Other than the initial use of the L-19, Air Force TAC-As in Korea primarily relied upon the T-6 "Texan" aircraft to support the TAC-A mission. The T-6 flew fast enough to lead jet fighter aircraft to the target

[58] Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 19–20.
[59] Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 21.
[60] "Mosquitos in Korea," *National Museum of the Air Force*, accessed December 10, 2014, http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=15079.
[61] "Mosquitos in Korea"; Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 57.

area but slow enough to find targets in rugged terrain.[62] The slower airspeed and long loiter time proved an excellent combination to find targets in mountains.[63] The NKPA hid targets well to avoid detection, so pilots could see the targets from only one direction.[64] By slowing down, the T-6 pilot looked at the sides of mountains and into revetments longer for enemy targets. The longer loiter time helped provide continuous intelligence about enemy movements to the Army ground forces.[65]

Figure 2: T-6 Texan. Airborne FACs desired the T-6 "Texan" airplane for its long loiter time, relatively fast speed and high maneuverability. Armed with smoke rockets and four radios, the T-6 served Mosquito FACs through the Korean conflict.
Source: http://www.nationalmuseum.af.mil/shared/media/photodb/photos/071026-F-1234S-007.jpg (10 Dec 14)

Air Force fighter pilots relied upon the Mosquito TAC-As to find and mark targets of opportunity that the faster fighter-bombers could not locate.[66] By regulation, the TAC-A was an experienced fighter pilot.[67] As a

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[62] Futrell, *The United States Air Force in Korea*, 82.
[63] Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 23–26.
[64] Capt. Samchagrin, "Tactical Air Power," 1951, 35, K168.15-43, Albert F. Simpson Historical Research Center, Maxwell AFB.
[65] Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 27–28.
[66] Futrell, *The United States Air Force in Korea*, 71.

fighter pilot, the TAC-A communicated to the support fighters using common terminology. TAC-As communicated the ground situation as fighter support checked onto the radio. The ground situation consisted of friendly location and disposition, ground commander intentions, and enemy troop sightings.[68] The TAC-A organized supporting aircraft by what weapons they carried and how much time they could remain overhead.[69] For example, the TAC-As circled fighter aircraft at higher altitudes in case enemy fighters attacked while aircraft low on fuel dropped their ordnance quickly. TAC-As acted as air traffic controllers to accomplish this organization. By providing altitudes and geographic positions for circling aircraft, the TAC-A ensured that aircraft missed each other while efficiently delivering weapons to the target area.[70]

Since TAC-As were pilots, they understood how to communicate the unique strengths and limitations of air support. Once the TAC-A located the target, he called for a specific set of fighters to support. He rendezvoused with the fighters and led them to the target.[71] Since TAC-As saw the target from a pilot's perspective, they could more easily communicate the target description to supporting fighters. If the target was distinct enough, he might have "talked" the fighter pilots eyes onto the objective. Otherwise, the TAC-A could mark the target with a smoke rocket, which made it distinct from the air.[72] Overall, the TAC-A improved air support to ground troops by enabling fighter aircraft to drop their weapons more accurately.

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[67] Futrell, *The United States Air Force in Korea*, 79.
[68] See "Joint Publication 3-09.3," V–50 for the modern description of this process, called "the brief."
[69] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 53.
[70] See "Joint Publication 3-09.3," V–50 for examples of this in modern doctrine, called "the stack."
[71] Futrell, *The United States Air Force in Korea*, 83.
[72] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 54–55, 67. Marking the target alters its appearance making it more visible from the air. Examples of this are smoke rockets and artillery impacts.

Mosquito TAC-As provided the link between ground units and air support. Command-and-coordination elements did not always keep up with front line troops because battle lines could shift rapidly. The support system developed during WWII and codified in FM 31-35 inadequately met the needs of ground force because TACPs could not relay requests for support to the approval authorities quickly.[73] To help, Mosquito TAC-As interpreted and communicated requests to the Tactical Air Control Center (TACC).[74] The Mosquito TAC-As flew at higher altitudes, carried four radios, and could maintain line-of-sight communications with the ground commander and the air support system. Eventually, both air and ground personnel trusted the system so much that a portion of Mosquito missions evolved into airborne TACCs, which directed airborne sorties to the most remote areas.[75]

Despite the success of the Mosquito, the inter-service organizational fight over command and control of aerial support prevented further growth of the program. The soldiers at the front declared the Mosquito program an unqualified success as one RAND study explains:

> The biggest problems in the Mosquitos' relations with ground commanders stemmed from the success of the Mosquitos. The Airborne FAC proved to be so effective in locating and destroying targets that he became the ground commander's source of tactical and emotional security.[76]

Regardless of its successes on the battlefield, both Army and Air Force senior leadership felt dissatisfied with the Mosquito program. Army leaders wanted to retain control over the FACs by keeping them on the ground. The TAC(A)s were also vulnerable to enemy aircraft and could find it difficult to provide support to the Army in a contested

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[73] Cooling, *Case Studies in the Development of Close Air Support*, 381.
[74] Cooling, *Case Studies in the Development of Close Air Support*, 351.
[75] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 52.
[76] Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 57.

environment. Air Force leaders, on the other hand, did not want to offer up the required resources to cover an extended front through aerial means.[77] Even though the Mosquito TAC-A served to fulfill multiple needs, it was abandoned after the war.

The unique character of the Korean War, such as terrain and the character of conflict, changed how the FAC operated. The mountainous terrain and front lines that shifted rapidly restricted the effectiveness of the ground FAC. To overcome the environment, the FAC went airborne to better see the enemy and communicate to fighter support. Regardless of the form the FAC took, the basic functions remained the same. The FAC found the friendlies and the target, coordinated with the ground commander and prioritized targets, then communicated those priorities to support aircraft. He helped the support fighters find the target and subsequently cleared those fighters to drop their ordinance if within safe parameters. This process improved target destruction and decreased fratricide, which led to effective close air support being associated with the Mosquito TAC-A.[78]

Conclusion

Through WWI, WWII and the Korean War, operational requirements of war shaped the foundations of modern air-ground coordination systems. The FAC mission fulfilled the need to coordinate air strikes within close proximity to ground forces. It aligned ground-force needs with Air Force capabilities, which led to the effective use of airpower. In WWI, the need to see over the front lines led to the creation of aerial reconnaissance. In WWII, the need to coordinate air support to ground forces drove the development of the TACP and the FAC. Different requirements in Korea, such as terrain and a front line that moved,

[77] Schlight, *Help from Above*, 172–174.
[78] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 46–47.

launched the FAC into the air. As the FAC mission evolved to meet the needs of each conflict, it fractured into specialized branches. On the ground, the FAC developed to ensure effective airpower coordination with ground maneuver. In the air, the TAC-A evolved to help support aircraft find and destroy targets. The evolution of the FAC helped to keep the air and ground forces connected even while the Air Force sought and gained independence from the Army.

Subsequently, the Air Force lost much of the FAC experience gained in Korea due to organizational priorities within the Air Force and the strategic landscape. The next war created an operational need to relearn the FAC mission. The needs of the ground commander and context of the Vietnam War eventually resulted in a FAC platform designed to deliver instantaneous firepower in support of ground forces as well as a high-speed FAC to penetrate complex air-defense systems.

Chapter 2

Rebuilding the Link:
The Reconstruction of the FAC Mission in Vietnam

From WWI through Korea, the FAC mission evolved to complete a set of tasks to coordinate air strikes against fielded forces. After the Korean War, inter-service politics killed the airborne FAC (FAC(A)) program, and by 1954, the FAC(A) ceased to exist. However, in 1961, the FAC(A) mission once again became prominent as Air Force advisors deployed to teach the South Vietnamese how to apply airpower. The air war in South Vietnam focused on supporting a counterinsurgency, which contrasted with previous conflicts focused on defeating conventional forces. Despite the different mission requirements, the FAC mission in Vietnam evolved from the ground to the air to ingrate the capabilities and needs of ground and air forces. Unlike Korea, the FAC in Vietnam developed from a strategic requirement to assist and advise counterinsurgency rather than to support conventional troops. It evolved to support United States conventional forces against an insurgent enemy. In the end, it evolved again to strike targets independent of friendly forces in South Vietnam. The FAC adapted to the specific political situations and physical environments in and countered an enemy that also evolved.

This chapter explores the Vietnam War FAC. It includes an examination of the national strategy after the Korean War along with a description the character and context of the Vietnam War. This context helps explain how the FAC mission adapted with respect to operational requirements. Then this chapter discusses platform development with relation to the capabilities and limitations of ground-forces dictated operational requirements and specifically focuses on the O-1, OV-10, and fast FAC programs.

Korea to Vietnam: Grand Strategy and the Grounding the FAC

During the years between Korea and Vietnam, the FAC mission failed to thrive, in part, because President Dwight D. Eisenhower's "New Look" policies focused on strategic nuclear war with the Soviet Union and not limited or guerrilla warfare. The President thought Korea was an aberration that the United States should not repeat. He directed the Joint Chiefs of Staff not to plan "the same policies and resources to fight another war as were used in the Korean Conflict."[1] Eisenhower stated, "There [is] no sense in wasting manpower in costly small wars that could not achieve decisive results."[2] Consequently, the Air Force chose to disband the 6147th Tactical Control Squadron, the only airborne FAC squadron in existence, and subsequently retired the T-6 aircraft.[3]

Along with New Look, inter-service rivalries between the Air Force and Army hampered the development of the FAC mission. Through the 1950s, the Army sought to increase its close-air-support capabilities to regain control over airborne fire support at the front line. The Air Force wanted to retain control over the close-air-support mission and associated resources. Both services sought to maximize firepower on the battlefield independently. During this process, Air Force Chief of Staff, General Nathan Twinning, chose to eschew light aircraft for high-performance jet and missile technology, which he thought could execute both the air superiority role and the close-air-support mission.[4] Army leadership argued that artillery could best accomplish the fire-support mission and regained control over light reconnaissance aircraft left to

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[1] Dwight D. Eisenhower, *Mandate for Change, 1953-1956: The White House Years* (Doubleday, 1963), 454.
[2] Eisenhower, *Mandate for Change, 1953-1956*, 454.
[3] Maj James B. Overton, *FAC Operations in Close Air Support Role in SVN*, Office of Air Force History (Muir S. Fairchild Research Information Center, January 1969), 8.
[4] Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 84.

help direct artillery support.[5] As the two services fought over the execution of air support, joint air and ground operations began to disintegrate.

While the Air Force trained and equipped ground FACs for Army ground-maneuver units, Air Force leadership placed minimal importance on this mission. Poor attendance at inter-service FAC training programs indicated the lackluster support for the FAC program. For instance, the dedicated program to teach the FAC and ALO mission to both Army and Air Force officers experienced historically low numbers of attendees during the 1950s.[6] The commander of the school reported that organizations filled training quotas with junior lieutenants "far removed from activities related to air-ground operations."[7] Furthermore, command and control organizations designed to integrate air and ground operations fragmented, despite overwhelming success in WWII and Korea.[8] As a final indication of the lackluster attitude toward the FAC mission, the Air Force failed to update FAC doctrine from the end of the Korean conflict until the middle of 1965. After four years of using FACs in an airborne role in Vietnam, Tactical Air Control Manual 2-4 stated, "the role of the airborne FAC is an occasional appendage to the TACS to be inserted as a last resort" as well as a "temporary device to be used a little at a time rather than in a comprehensive program."[9]

In 1961, President, John F. Kennedy Jr., drafted "Flexible Response" to strengthen the non-nuclear capabilities of the military in response to a perceived weakness in countering emerging third-world threats. President Kennedy's military programs coincided with a greater

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[5] Lt Col Ralph Rowley, *Tactics and Techniques of Close Air Support Operations: 1961-1973* (Washington, D.C: Office of Air Force History, 1976), 7, http://www.afhso.af.mil/shared/media/document/AFD-110323-037.pdf.
[6] Schlight, *Help from Above*, 186.
[7] "US Air Ground Operations School History," December 1, 1957, v–vi, K417-07A, AFHRA.
[8] Schlight, *Help from Above*, 219.
[9] Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 79–80.

interest in supporting the South Vietnamese against the communist North Vietnamese. In 1961, President Kennedy addressed Congress about setting his military priorities. He expanded the military's scope to include both guerrilla and sub-limited warfare with the coordination of air support. In addition to other requirements, President Kennedy sought to improve key components of the FAC mission, "Target recognition, destruction of all types of targets when extreme accuracy is required, and the control of air space over enemy territory will all continue to be tasks best performed by manned aircraft."[10] President Kennedy's emphasis on tactical aviation along with the conflict in Vietnam provided the foundation for the reemergence of the Air Force's FAC program.

The FAC in Vietnam: Advising and Assisting in a Counterinsurgency

The FAC mission in Vietnam developed directly from the political requirement to support the South Vietnamese. In response to Presidential directives, Air Force Chief of Staff Curtis Lemay directed Tactical Air Command to develop a small, highly trained squadron of Air Force personnel dedicated to the counter-insurgency mission in early 1961.[11] The result was the 4400th Combat Crew Training Squadron (CCTS), nicknamed Jungle Jim.[12] As the 4400th CCTS trained as a counter-insurgency unit, both officer and enlisted squadron members qualified for a variety of missions, including reconnaissance and close support of ground troops.[13]

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[10] John Kennedy, "Special Message to the Congress on the Defense Budget," March 28, 1961, http://www.presidency.ucsb.edu/ws/?pid=8554.
[11] Robert F. Futrell and Martin Blumenson, *The United States Air Force in South East Asia: The Advisory Years to 1965* (CreateSpace Independent Publishing Platform, 2012), 79.
[12] The 4400 CCTS officially started operations out of Eglin on 14 April 1961. Rowley, *Tactics and Techniques of Close Air Support Operations: 1961-1973*, 7.
[13] Futrell and Blumenson, *The United States Air Force in South East Asia*, 80.

The 4400th CCTS Vietnamese National Air Force (VNAF) training mission resulted in the development of USAF FAC operations in Vietnam. President Kennedy wanted to use the 4400th as a deployable training detachment for the floundering South Vietnamese forces. In preparation for deployment to Vietnam, General Lemay defined the objectives of 4400th CCTS as: "[to] convince the Vietnamese Army (ARVN) concerning advantages and methods of utilizing airpower, to train and ready the VNAF to provide the airpower, and to develop the effectiveness of this force in terms of performance, responsiveness and control."[14] In response, the 4400th focused its effort on developing the FAC and liaison programs inside of the VNAF. As one USAF historian declared, "At the very foundations of the concept of the VNAF's strike capability and effectiveness were the FAC and the ALO. Without reliable aircraft direction, sound advice, and planning of ground commanders, VNAF effectiveness in independent actions would be considerably degraded."[15] The 4400th learned how to apply the FAC mission in counterinsurgency and taught the VNAF how to coordinate the efforts of air and ground forces.[16]

The insurgency in South Vietnam placed unique demands on the FAC. Korean War FACs found targets and ensured aircraft did not strike friendly troops. In contrast, the 4400th's mission trained the burgeoning VNAF on how to incorporate airpower into a counterinsurgency campaign.[17] Prior to 1962, however, the Air Force had not trained to fight

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[14] Capt E. Vallentiny, *VNAF FAC Operations in SVN*, USAF Historical Division Liaison Office, (January 28, 1969), 4–5, K717.0413-49, AFHRA, http://www.afhso.af.mil/shared/media/document/AFD-110322-053.pdf.
[15] Vallentiny, *VNAF FAC Operations in SVN*, 7.
[16] Robert J. O'Neill, "USAF Special Air Warfare Center History," December 27, 1962, 196–200, K417-0737, AFHRA.
[17] Maj Ralph Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, Office of Air Force History, (January 1972), 15–19, K168.01-43, AFHRA.

irregular wars.[18] The 4400th quickly found that counterinsurgency warfare included increased political limitations, which required pilots to strike targets precisely to reduce civilian casualties.[19] United States military and civilian leadership who wanted to gain and maintain domestic and international support perceived errant bombing as a threat to the greater war effort.[20] The enemy also hid among the people, which required a tremendous amount of local knowledge and intelligence to determine friend from foe. Potential targets disguised themselves among the population to increase the likelihood of civilian death.[21] One of the primary concerns of FACs in Vietnam became the identification and safety of civilian non-combatants.[22]

The South Vietnamese political leadership also demanded restrictive rules on the conduct of airstrikes to prevent civilian deaths. VNAF regulations required that strike aircraft receive final clearance from a qualified Vietnamese FAC. With this authority, the FAC carried a tremendous amount of responsibility as the government relied upon the support of the South Vietnamese people to be victorious. This resulted in a policy of limited bombing. For every air-delivered weapon, both the local province chief and the ground commander had to grant approval.[23] This put the FAC at the center of air operations, "The FAC [was] the key man in the airstrike… Without this clearance, the [striking aircraft] cannot release ordinance."[24] If support aircraft struck friendly targets,

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[18] Charles Hildreth, *USAF Counterinsurgency Doctrines and Capabilities: 1961-1962*, USAF Historical Division Liaison Office, (February 1964), 21, http://www.afhso.af.mil/shared/media/document/AFD-110322-053.pdf.
[19] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 86.
[20] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 86.
[21] Vallentiny, *VNAF FAC Operations in SVN*, 1.
[22] Warren A. Trest, *Control of Airstrikes, 1961-1966*, CHECO Report, (March 1, 1967), 11, K717.0414-4, AFHRA.
[23] Melvin F. Porter, *Control of Airstrikes, January 1967-December 1968*, CHECO Report, 48, Folder 11, Box 01, The Jan Churchill Collection, The Vietnam Center and Archive, accessed November 8, 2014, http://www.vietnam.ttu.edu/virtualarchive/items.php?item=13550111002.
[24] Vallentiny, *VNAF FAC Operations in SVN*, 17 The authority to identify targets in South Vietnam later passed to US FACs after the Gulf of Tonkin incident.

the South Vietnamese government imprisoned the FAC.[25] The increased responsibility led to a hesitancy to approve targets for destruction. In 1962, over half the strike missions returned home without a weapons release, even though on many of those missions pilots saw valid targets.[26]

The Air Force created procedures to improve bomb-delivery accuracy and align with Vietnamese policies. Seventh Air Force codified the procedures for strike control in its rules-of-engagement (ROE) to restrict errant bomb releases.[27] These ROE stated that either radar or a FAC must control tactical strikes in South Vietnam. ROE required the FAC to find the target, supervise the strike, and then report the results.[28] By restricting bombing and requiring a FAC, Seventh Air Force prompted an increase in the demand for qualified FACs in Vietnam.

Ground FACs faced many physical challenges in South Vietnam beyond the political realm, such as terrain and the environment. Much of South Vietnam consisted of triple canopy forest or rice paddies. The high trees and dense ground cover prevented ground-based controllers from seeing the target or the aircraft, "There was no clear-cut front line. A FAC on the ground in a [firefight] would have no better view of the situation than an ordinary rifleman."[29] As relayed by the Jungle Jim historian, "In these flat paddy lands of IV corps' the man on the ground could rarely see beyond the first dike or tree line and the only person who could observe action was the man in the air."[30] The enemy took advantage of the terrain and kept well ahead of friendly troops until in an

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[25] Porter, *Control of Airstrikes, January 1967-December 1968*, 11.
[26] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 91.
[27] Overton, *FAC Operations in Close Air Support Role in SVN*, 7 Eventually, these procedures would evolve into the modern CAS "9-Line" briefing, which structures critical information about the target and friendlies to supporting aircraft.
[28] Lt Col J. Schlight, *Jet Foward Air Controllers in SEASIA*, CHECO Report, (October 15, 1969), 1, K717.0413-70, AFHRA.
[29] Lester, *Mosquitos to Wolves: The Evolution of the Airborne Forward Air Controller*, 91.
[30] Overton, *FAC Operations in Close Air Support Role in SVN*, 45.

advantageous position.[31] The FAC had to locate the enemy to control airstrikes, which was difficult from the ground in Vietnam.

The 4400th and the VNAF sought to improve support to the ground forces through a variety of means. In South Vietnam, ground forces' requests for support created challenges for the ground FACs because there was no defined front line.[32] Ground forces operated in dislocated pockets separated by dense jungle, which required FACs to cover large distances to provide clearance for attacking fighter aircraft. The Jungle Jim FACs mounted radios on their vehicles to cover more ground and direct aircraft support. Unfortunately, the early-1960s radio equipment could not take the abuse in the back of vehicles on unimproved roads.[33] The supply system compounded the problem, because it could not provide enough radios of good quality. Likewise, the FACs' Army-issued radios could only tune to one frequency, which led to excessive delays and unsafe control of aircraft.[34] Each of these problems provided the Jungle Jim FACs motivation to evolve tactics, techniques, and procedures to address the limitations of their equipment and manning.

The CCTS next tried to use enlisted ground controllers to solve the FAC shortage. Due to the limited number of CCTS personnel, every member of the team was required to execute the FAC mission. The flexible nature of the 4400th mission meant each of the commandos trained in all manner of fire support, which included the control of airstrikes and artillery.[35] The 4400th regularly employed enlisted forces in the ground FAC mission, contrary to Air Force regulation, which stated that the FAC must be a qualified fighter pilot.[36] Additionally, most

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[31] Porter, *Control of Airstrikes, January 1967-December 1968*, 13.
[32] Farmer and Strumwasser, *The Evolution of the Airborne Forward Air Controller: An Analysis of Mosquito Operations in Korea*, 82.
[33] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 39.
[34] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 38–39.
[35] Futrell and Blumenson, *The United States Air Force in South East Asia*, 80.
[36] Schlight, *Help from Above*, 218.

pilots thought only qualified fighter pilots could adequately control airstrikes:

> Any pilot, observed one FAC, can fly the L-19 but it would help him a 1ot if he knows the fighter pilot's problems. For example . . . a fighter pilot can't make a run straight into a hillside or into a boxed canyon or something like that. There are times when it just isn't feasible for fighters to hit targets in a certain place. The FAC should know this.[37]

The enlisted Airmen who acted in the FAC role, though, provided excellent air-strike control in emergencies when no authorized FAC was available.[38] Unfortunately, enlisted FACs directly violated Air Force regulations, preventing any wide-spread use.

The next attempt to increase the Vietnamese FAC force resulted in a forward air-guide program. The restrictive nature of the Vietnamese counterinsurgency meant Vietnamese FACs controlled each airstrike. The limited number of trained VNAF FACs and the large geographic expanse they had to cover led to a dearth of air strikes. The air guide program took Vietnamese support officers and trained them to control air strikes from the ground against the enemy.[39] The air-guide program suffered a quick demise, however, because the rugged terrain, dense vegetation, and poor communications often led to misidentification of enemy forces and even fratricide.[40] Even worse, the inexperienced South Vietnamese guides often fell victim to insurgent forces. The Viet Cong took many guides captive. South Vietnamese forces feared the enemy could use the guides to control strikes against friendly troops.[41] Jungle Jim FACs attempted to increase the ability of the VNAF to find the

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[37] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 96.
[38] Col. Bob Gleason, *Air Commando Chronicles*, n.d., 35, http://www.aircommando.org/shared/media/document/Air-Commando-Chronicles.pdf.
[39] Overton, *FAC Operations in Close Air Support Role in SVN*, 23.
[40] Vallentiny, *VNAF FAC Operations in SVN*, 1.
[41] Overton, *FAC Operations in Close Air Support Role in SVN*, 23.

enemy, coordinate friendly air support, and then strike the enemy through other means because of the failure of the air-guide.

FACs take Flight

The challenges of a comprehensive ground-FAC program led the Jungle Jim FACs to look to the skies. While the Air Force continued to expand the number of ground FACs, the Jungle Jim FACs sought new means to find the enemy. Once airborne, they provided a new perspective of the war to airplanes in support of ground troops. The FAC mission in South Vietnam evolved to meet the specific operational requirements of counterinsurgency warfare. Initially the airborne FACs in Vietnam used the O-1 Birddog (equivalent to the Army L-19) as their primary FAC platform. The O-1 made for a good reconnaissance aircraft due to its four-hour loiter time, slower airspeed, and excellent downward visibility.[42] To illustrate the improved capability of airborne FACs, one FAC squadron reported in 1964 that, "[Viet Cong] activity was appreciably decreased, offensive ground action was more effective with low casualties, interdiction targeting and strikes were more effective, and damage assessment was more accurate and timely."[43] The Birddog suited the advisory mission well. It was an easy plane for the Vietnamese to fly and maintain.[44] As an intermediate measure, many considered the plane well suited to the narrow requirements of the advisors and VNAF in South Vietnam.[45]

The O-1 struggled to meet the demands of ground commanders as the war progressed, however. The O-1 did not have the airspeed to fill many immediate requests for support. While many considered the slow airspeed of the O-1 as an advantage in finding targets, it led to many

[42] Overton, *FAC Operations in Close Air Support Role in SVN*, 49.
[43] Trest, *Control of Airstrikes, 1961-1966*, 21.
[44] Vallentiny, *VNAF FAC Operations in SVN*, 4.
[45] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 49.

missed opportunities. It took 30 minutes for the O-1 to fly just 45 miles.[46] On one mission in 1963, aircraft scrambled to destroy a machine gun nest that shot at friendly forces.[47] To strike the target, support fighters had to wait for the FAC aircraft to arrive per the ROE.[48] The O-1 took so long that the air-support-request network directed other aircraft familiar with the target location to direct the strikes, which killed 12 enemy.[49] Even if the O-1 could direct airstrikes effectively, the slow speed placed friendly lives in danger. When under fire, hour-long delays in support could mean the difference between lives saved or lost.

The enemy shot down many O-1s because of the slow airspeed and lack of armor plating. Cessna designed the O-1 in 1948 as a light civilian aircraft.[50] The Army modified it for use as an artillery spotter and changed very little of the structure other than increasing the flap size.[51] Enemy small-arms fire threatened the Birddog because it had no armor for either the engine or the cockpit, nor did it have self-sealing fuel tanks.[52] Even though it encountered only small arms and remained over South Vietnam, the Vietcong shot down over 120 O-1s from 1965 through 1972.[53] Pilots flew higher to avoid the ground fire, which negated the low-and-slow characteristics that made it good for spotting and tracking targets.[54]

Since Cessna originally designed the O-1 as an Army artillery spotter, pilots creatively marked targets. The Air Force could modify the

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[46] Maj Ralph Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, Office of Air Force History, (May 1975), 28, http://www.afhso.af.mil/booksandpublications/specialstudies-bluebooks.asp.
[47] Trest, *Control of Airstrikes, 1961-1966*, 12.
[48] Trest, *Control of Airstrikes, 1961-1966*, 12.
[49] Trest, *Control of Airstrikes, 1961-1966*, 12.
[50] *Timeless Classic: The Cessna 170 Book*, 4th ed. (International Cessna 170 Association, 1999).
[51] *Timeless Classic: The Cessna 170 Book*.
[52] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 33.
[53] Chris Hobson, *Vietnam Air Losses: United States Air Force, Navy and Marine Corps Fixed-Wing Aircraft Losses in Southeast Asia 1961-1973* (Hinckley, England; North Branch, MN: Midland ; Specialty Press ;, 2001).
[54] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 33.

Birddog to carry up to four smoke rockets but not every plane received the upgrade.[55] Even if the O-1 carried rockets, they only worked in ideal situations. When smoke rockets hit swampy areas, they would frequently fizzle and provide poor reference for supporting fighters.[56] Consequently, O-1 pilots developed a variety of other methods to mark targets. Pilots flew over the target and dropped a smoke grenade out the window. If the pilot was out of smoke grenades, he flew over the target and called to the strike aircraft when his shadow passed over the target's location.[57] Environmental factors like sun angle and clouds limited the application of these marking methods, however.

The O-1 also did not meet the communication needs of the FAC mission. Airborne FACs required timely communications on multiple radios. In Vietnam, the FAC "was in constant contact with the ALO, the fighters, and the ground unit that aircraft supported since the ground commander had to give the final approval for the strike."[58] Each of these organizations operated on different frequencies that required different types of radios.[59] Due to the jungle and lack of operational equipment, early FACs could communicate with ground forces only if directly overhead.[60] Furthermore, the radio technology in the early 1960s could not operate on enough frequencies to accommodate the requirements of the FAC.[61] Only in 1966 did the Seventh Air Force approve requests for tunable radios.[62]

Once FACs went airborne, the Viet Cong dispersed their operations and moved at night to prevent observation.[63] Since the Birddog carried only a low-frequency direction finder and a marker beacon, it could not

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[55] Overton, *FAC Operations in Close Air Support Role in SVN*, 49.
[56] Vallentiny, *VNAF FAC Operations in SVN*, 18.
[57] Vallentiny, *VNAF FAC Operations in SVN*, 18.
[58] Trest, *Control of Airstrikes, 1961-1966*, 47.
[59] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 15 (footnote).
[60] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 38.
[61] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 54.
[62] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 31.
[63] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 74.

fly in weather and only sparingly at night.[64] It did not take long for the Viet Cong to take advantage of these shortcomings.[65] The enemy hid so well from counterinsurgent forces that one Air Force airborne FAC explained in frustration, "he had never seen anyone on the ground that he could have positively identified as Viet Cong."[66] The evolution of the enemy drove the FAC to adapt new tactics and eventually seek new aircraft.

Despite the O-1's deficiencies, the pilots of the 4400th CCTS continually adapted the Birddog to the problems of counterinsurgency. They provided critical reconnaissance to ground commanders. They developed target-marking and aircraft-control tactics, which used available technology.[67] They worked diligently to integrate with the United States Army to ensure that Vietnamese air and ground forces understood the capabilities and limitations of airpower.[68] Most importantly, the FACs of the 4400th CCTS passed their experience and knowledge to the next generation of FACs.[69] Every instructor at the basic FAC course at Eglin Air Force Base, Florida, flew as a FAC in combat.[70] This ensured that the collective knowledge of how to find targets and control aircraft in an unfamiliar environment smoothly translated to the next generation of FACs.

The Jungle Jim FACs learned that a fast-moving enemy in rugged terrain required a persistent airborne platform to find and then direct airstrikes onto enemy positions. Ground-based FACs did not have the ability to find the target or the communication means to direct air

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[64] Lawrence J. Hickey, *Night Close Air Support in RVN*, CHECO Report (Muir S. Fairchild Research Information Center, March 15, 1967), 7.
[65] O'Neill, "USAF Special Air Warfare Center History," 185–188.
[66] Overton, *FAC Operations in Close Air Support Role in SVN*, 91.
[67] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 99.
[68] Vallentiny, *VNAF FAC Operations in SVN*, 10.
[69] Vallentiny, *VNAF FAC Operations in SVN*, 11.
[70] Capt Joseph Potter, *OV-10 Operations in SEAsia*, Project CHECO, (September 15, 1969), 10–11, K717.0413-60, AFHRA.

support.[71] Col W. L. Stringer, a former Vietnam FAC, summed up the experience of airstrike control, "the problems that we encountered, in guerrilla warfare… basically stem from inadequate intelligence or inadequate communication."[72] To overcome the targeting problems, Jungle Jim advisors taught and later controlled airstrikes from light aircraft. Airborne FACs effectively struck targets from the air, while ground FACs continued to control airstrikes in the more traditional manner.

Arming the FAC: OV-10 Operations

As the Vietnam War progressed, Air Force leadership sought to replace the O-1 for the FAC mission to increase capabilities. By late 1964, nearly fifty percent of air-support requests went unfilled due to the lack of FAC aircraft. Seventh Air Force needed more and better aircraft to fulfill the Army's requirements. General Lemay advocated for jet aircraft for both the FAC and advisor missions.[73] Initially, he argued for the propeller-driven T-28 as a desirable FAC airplane because it could keep up with faster jet fighters. Seventh Air Force produced various studies which determined that propeller-driven aircraft were more susceptible to enemy ground fire, however, and demanded a jet FAC.[74] Many thought that faster jet aircraft could not identify small targets under trees in South Vietnam.[75] Other critics feared increasing Air Force capabilities meant an expanded role for the United States in Vietnam.[76]

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[71] O'Neill, "USAF Special Air Warfare Center History," 196–200.
[72] Col W. L. Stringer and Maj J. C. Pettijohn, interview by Col Archie S. Mayes, 1966, 1, K239.0512-349, AFHRA.
[73] James S. Corum, *Airpower in Small Wars: Fighting Insurgents and Terrorists*, Modern War Studies (Lawrence, Kan: University Press of Kansas, 2003), 249.
[74] George Lemmer, *Strengthening USAF General Purpose Forces: 1961 - 1964* (USAF Historical Division Liaison Office, January 1966), 43, http://www.afhso.af.mil/shared/media/document/AFD-110322-048.pdf.
[75] Lemmer, *Strengthening USAF General Purpose Forces: 1961 - 1964*, 37.
[76] Rowley, *Tactics and Techniques of Close Air Support Operations: 1961-1973*, 48.

Consequently, General Lemay directed his staff to seek intermediate solutions until the Air Force could develop a dedicated airframe.

The Air Force attempted to use the O-2 "Super Skymaster" to correct the deficiencies and shortage of the O-1. Through 1966 there remained a "critical shortfall" of O-1 aircraft to meet the demands of ground commanders.[77] To fulfill the deficit, the Air Force wanted to rely upon the O-2. Like the O-1, the O-2 was a civilian airplane modified for use in the Vietnam War. Unlike the O-1, though, the Air Force tested the O-2 against desired performance requirements for FAC aircraft, such as climb and turn rate, capability to provide marks, and visibility.[78] These tests resulted in a plane considerably more capable than the O-1 with respect to all-weather and night instrumentation, tunable radios, and equipment to target the enemy.[79] While Seventh Air Force in Vietnam requested the capability in 1963, the O-2 did not fly in Vietnam until 1967.[80] By the time it entered service, the need for FAC airplanes increased at such a rate that the O-2 supplemented the O-1 rather than replaced it.

In 1968, the OV-10 entered the Vietnam War and solved many of the known deficiencies in FAC aircraft to that point. It was fast enough to respond to air requests in just minutes. For instance, maximum response to any immediate air strike request was less than 20 minutes from a distance of 60 NM, which covered the typical Army Corps.[81] The OV-10 also carried more and better radios to aid communications. Pilots could coordinate with Army ground forces, support aircraft, and the tactical air control system easily.[82] Multiple radios allowed the FAC to

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[77] Porter, *Control of Airstrikes, January 1967-December 1968*, 42.
[78] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 34–35.
[79] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 35.
[80] Rowley, *USAF FAC Operations in Southeast Asia: 1961-1965*, 54.
[81] Lt Col Stuart Kane, *Draft Report: OV-10A Introduction, Evaluation, and Assistance Program in Southeast Asia*, November 1968, 12, K-GP-SUP-504-HI OCT-DEC 1968 V.1, AFHRA.
[82] Potter, *OV-10 Operations in SEAsia*, 5.

gain an intricate knowledge of the ground situation and brief it to the fighters. If the FAC required a different type of ordinance or additional fighters, he could easily request the forces through the tactical air control system. Also, pilots considered it more survivable. The aircraft included a computer-aided aiming system, which allowed the FAC to mark targets at greater distances from the target while remaining above small-arms threats.[83]

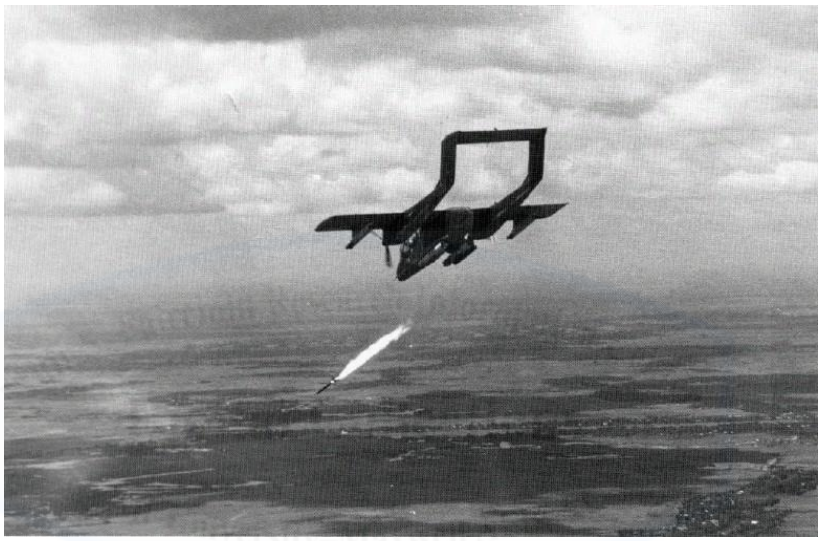

Figure 3: OV-10 Bronco. The OV-10 provided an ideal platform for the FAC mission with a range of ordinance, higher top speed, and good visibility.
Source: http://www.pacificaviationmuseum.org/pearl-harbor-blog/north-american-f-100f-super-sabre-s-n-58-1232

Other innovations included in the OV-10 improved the FAC mission, such as a starlight scope and nascent laser-targeting equipment. The starlight scope provided pilots an early night-vision device to aid target identification.[84] Seventh Air Force initially debated

[83] Potter, *OV-10 Operations in SEAsia*, 4; Maxwell Sidner, *Armed OV-10A Evaluation*, Support Document from Project CHECO Report #156 (Headquaters 7th Air Force, July 1969), Folder 1097, Box 0007, Vietnam Archive Collection, The Vietnam Center and Archive, http://www.vietnam.ttu.edu/virtualarchive/items.php?item=F031100071097.
[84] *Final Report: OV-10A Aircraft Introduction, Evaluation, and Assistance Program in Southeast Asia*, 1964, -10, K417.02-24, AFHRA.

putting laser-designation devices in the OV-10. Lasers could guide bombs to precise locations, but Seventh Air Force thought only interdiction aircraft should carry them. In 1971, Seventh Air Force finally decided to equip the OV-10 with a Pave Nail laser designator.[85] The OV-10 represented the forefront of FACs guiding precision weapons onto targets located near friendly positions.[86] The evolution of the OV-10 illustrates that throughout the Vietnam conflict, FACs continued to evolve their tactics and equipment to meet the challenges of a jungle environment and an insurgent enemy.

Laser-guided weapons increased the accuracy of air strikes, which improved the ability for FACs to provide support to ground forces. OV-10 and F-4 aircraft carried the Pave Nail laser guidance system in a pod underneath the aircraft.[87] The FAC used the pod to aim a laser beam onto target. Air-delivered munitions, such as the Paveway laser-guided bomb (LGB) and the Maverick air-to-ground missile (AGM), released from support aircraft, followed the reflected laser energy to the target.[88] Guided munitions rarely missed their targets, which decreased both fratricide and collateral damage.[89] Laser weapons reduced the communications required to find targets. Pilots needed to see only the approximate location of a target rather than the exact position of the target. Additionally, since laser weapons enabled support aircraft to deliver weapons without pointing at the target, they could remain above certain AAA threats from the ground. In the early years of laser-guided deliveries, the Vietnamese shot down no aircraft dropping LGBs.[90]

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[85] *Gulf War Air Power Survey*, vol. IV: Weapons, Tactics, Training and Space Operations (Washington D.C., 1993), 106.
[86] Walter J. Boyne, *Air Warfare* (Santa Barbara, CA: ABC-CLIO Inc., 2002), 461.
[87] Paul G. Gillespie, *Weapons of Choice: The Development of Precision Guided Munitions* (Tuscaloosa: University of Alabama Press, 2006), 117.
[88] For a complete description of laser-guided munitions and how they operate, see Gillespie, *Weapons of Choice*, 118.
[89] Gillespie, *Weapons of Choice*, 114–118.
[90] Gillespie, *Weapons of Choice*, 114.

As the war continued into 1972, FACs experimented with LGBs for close support missions and against moving targets. For example, on a routine patrol in South Vietnam, "A Vietcong sniper was harassing American troops at a road junction. [Supporting aircraft] were able to flush him from a tree and he proceeded to pedal his bicycle down the road. The laser operator continued to track the Vietcong and after the explosion and the dust cleared all that was left was a bent up bicycle on the edge of the crater."[91] While designed for interdiction targets, LGBs, with the FACs help, evolved to a wider range of targets. FACs embraced LGB technology and improved their ability to coordinate air strikes within close proximity to ground forces.

Ground commanders in Vietnam consistently requested faster prosecution of targets, which the OV-10 provided. The enemy in South Vietnam continued to learn from years of combat. They struck friendly forces with a few rounds and then disappeared into the underbrush. Effective CAS needed to be fast. The OV-10 quickly rendezvoused with fighters, marked the target, and provided clearance to the fighters to expend ordinance, which provided advantages over previous aircraft. For example, after an OV-10 identified a target, it could rendezvous with strike aircraft at 10,000 feet above and away from the target area. Then, after the Bronco led the fighters to the target area, they reacquired the target and commenced the marking run. The lead fighter, meanwhile, rolled into position and was ready for the bomb run as soon as the OV-10 completed the mark. After firing a smoke rocket at 5,000 feet above the ground, the Bronco FAC completed a full 180-degree turn before the rocket impacted. Then the FAC observed the rocket's smoke and gave necessary corrections and information to the first fighter now on its bomb pass. In most cases, just 20 seconds elapsed between target

[91] Gillespie, *Weapons of Choice*, 114.

mark and ordnance drop.[92] The increased speed and ability of the OV-10 to mark meant a faster response to air-support requests. The speed helped to prevent the escape of targets.

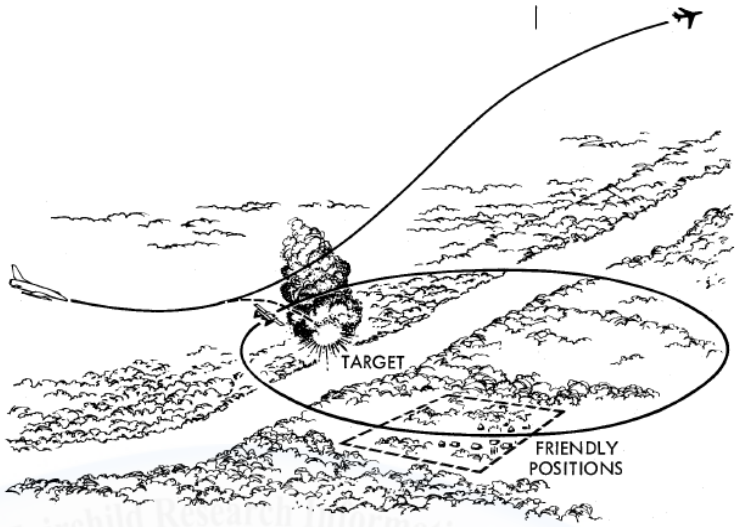

Figure 4: Vietnam FAC Control Procedures. An example of marking and controlling the fighters in Vietnam. The FAC positioned himself to keep the friendly troops in sight while ensuring the fighter support pointed at the target.
Source: Maj Ralph Rowley, USAF FAC Operations in Southeast Asia: 1965-1970, Office of Air Force History, May 1975, 91.

In June 1969, Seventh Air Force conducted tests, called Misty Bronco, to determine if an armed OV-10 could further improve response times. The Misty Bronco tests, "were an evaluation of using the OV-10 for limited but highly responsive air strike capability to support US Army Forces requesting immediate close air support and to use against FAC acquired targets until heavier fire support could respond."[93] The Air Force, Navy, and Marine Corps had jointly designed the OV-10. The Navy and Marine Corp had planned to use the OV-10 primarily as an attack platform while the Air Force merely wanted a FAC aircraft. After the Air

[92] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 41.
[93] *Final Report: OV-10A Aircraft Introduction, Evaluation, and Assistance Program in Southeast Asia*, ii.

Force debated the merits of an armed OV-10, it decided to allow the Broncos to act only in the FAC role and limited their ordnance to marking rockets.[94] FAC pilots, however, saw an operational need for rapid application of firepower to prevent enemy escape. As Captain Robert Erler, one of the initial OV-10 pilots, discussed, "FACs had been trying to explain that the OV-10 could be used to suppress ground attack or fix the enemy ground forces until the fighters could be called in for the kill."[95] The Air Force wanted to determine if the OV-10 could prevent the enemy from escaping before supporting firepower arrived overhead.

Successful Misty Bronco tests led to the arming of all OV-10s with offensive ordinance. The OV-10 could carry 2,000 rounds of 7.62-millimeter ammunition and high explosive rockets in addition to marking rockets.[96] The OV-10 having its own weapons on board reduced the time from air-support request to weapons release by over 50 percent.[97] Furthermore, the test reported many occasions when ground commanders no longer required follow-on fighter support due to OV-10 target destruction.[98] On two occasions, army ground forces requested air support to engage snipers. The OV-10 FAC on station fired upon and killed the sniper with the intent to prevent the enemy from escaping. In both cases, sniper fire ceased without the need for heavier fire support.[99] The armed FAC met the requirements of the ground commander without wasting limited air resources.

As FAC pilots experimented with the OV-10, ground troops recognized that the improved capabilities allowed for increased firepower.

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[94] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 38.
[95] Capt. Robert Erler, Transcript, June 23, 1970, K239.0512-376, AFHRA.
[96] Kane, *Draft Report: OV-10A Introduction, Evaluation, and Assistance Program in Southeast Asia*, 16.
[97] Rowley, *Tactics and Techniques of Close Air Support Operations: 1961-1973*, 132.
[98] *Final Report: OV-10A Aircraft Introduction, Evaluation, and Assistance Program in Southeast Asia*, ii.
[99] *Memo Re: Misty Bronco Daily Summary: Support Document from Project CHECO Report #156*, May 23, 1969, Folder 1129, Box 0007, Vietnam Archive Collection, The Vietnam Center and Archive, http://www.vietnam.ttu.edu/virtualarchive/items.php?item=F031100071129.

Ground commanders developed trust in the OV-10 FACs to put ordnance very close to friendlies. For example, OV-10 FACs initially marked away from a target located close to friendlies and then "walked" ordnance ever-closer to the friendlies to destroy the enemy positions. In some cases this meant that the friendlies also felt the effects of the weapons. In Vietnam, OV-10 FACs regularly employed ordnance well within safe ranges:

> I called in and controlled a couple of air strikes. The ordinance – 750 pound bombs, napalm, and 20 mm cannon- was placed 200 meters in front of the friendlies. I can recall the Yank ground commander yelling into his radio, "Its bloody close, I'm being lifted off the ground by the explosions. I'm covered in mud and shit, but keep it coming" – which I did.[100]

As this example highlights, air support to ground troops rested upon trust and skill. The improved capabilities of the OV-10 gave both the pilots and supported ground troop's confidence in consistent accuracy, which increased the FAC's ability to provide support.

The OV-10 improved the effectiveness of pilots to coordinate air strikes within close proximity to ground forces. The multiple tunable radios ensured the Bronco pilot could maintain a high level of awareness about the ground-and-air situation. The electronic armament systems improved the marking ability of the pilot. The offensive ordnance decreased response times to calls for support and made airstrikes more effective. The increased speed and visibility allowed OV-10 FACs to control faster planes more effectively. The purpose-built OV-10 solved many of the air-and-ground coordination problems of the counterinsurgency in South Vietnam.

Fast FACs

[100] C. D Coulthard-Clark, *Hit My Smoke: Targeting the Enemy in Vietnam* (St Leonards, N.S.W.: Allen & Unwin, 1997), 78.

The OV-10 Bronco seemed a panacea the FAC mission, but operations outside of the relatively safe area in South Vietnam led to the development of Fast FACs. Air operations in South Vietnam enjoyed freedom of movement, since there was no enemy-air or radar-missile threat. Once the FAC moved into North Vietnam, however, the threat increased significantly and pilots in Seventh Air Force had to develop a new variation of FAC. The result was the F-100 Fast FAC. As Col Raymond Kampe explained, "Why was there a need for a FAC in an expensive, high speed aircraft such as the F-100 or F-4? Very simply, the environment became too dangerous in [North Vietnam] for coverage by the light, relatively slow-moving, FAC aircraft."[101] In 1967, enemy resistance in North Vietnam and Laos prevented the O-1, O-2, and OV-10 from safely executing the FAC mission.[102] The North Vietnamese maintained a large number of anti-aircraft artillery (AAA), surface-to-air missiles (SAMS), and fighter aircraft.[103] Seventh Air Force responded by ordering a test to evaluate if the F-100 "Super Saber" could act in the FAC role in these areas.[104] The test, Commando Sabre, demonstrated jet aircraft could operate as FACs in North Vietnam and Laos effectively. Their speed and altitude precluded the enemy from use of AAA.[105] This program eventually expanded to include the F-4 as well.

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[101] Col Raymond L. Kampe, interview by Maj S. E. Riddlebarger, January 21, 1969, K239.0512-101, AFHRA.
[102] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 172.
[103] Michael McCrea, *U.S. Navy, Marine Corps, and Air Force Fixed-Wing Aircraft Losses and Damage in Southeast Asia (1962-1973)*, Office of Naval Research, (August 1976), 3–1, Folder 03, Box 43, Douglas Pike Collection: Unit 03 - Statistical Data, The Vietnam Center and Archive, http://www.vietnam.ttu.edu/virtualarchive/items.php?2234303002.
[104] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 173.
[105] Col William H. Holt, "Analysis of Propeller vs Jet Aircraft in Laos," January 4, 1968, K143.5072-86, AFHRA The jet vs propeller survivability argument expanded to include the A-1 in the CAS role. The argument about effectiveness vs survivability continued through the end of the war.

Figure 5: F-100 Misty FAC. In the higher threat North, this Misty FAC provides a mark for follow-on fighters.
Source: http://www.pacificaviationmuseum.org/pearl-harbor-blog/north-american-f-100f-super-sabre-s-n-58-1232

The characteristics that made jets survivable hindered the FAC mission in finding targets. To remain survivable, the F-100's flew at 500 feet above the ground at 500 knots airspeed. The low altitude and high speed meant the jet aircraft used fuel significantly faster than propeller aircraft. The fast airspeed limited their observation and control time to as little as 20 minutes. Furthermore, low wing design of jet aircraft required a bank of 60 degrees to maintain sight of targets.[106] Higher banked turns required the pilot to spend more attention flying the aircraft rather than doing other tasks, such as finding targets. The greatest problem for jet FACs was their speed. The commander of the 510th Tactical Fighter Squadron explained, "Our chief function is to destroy enemy troops, however, it is virtually impossible to visually acquire this type of target when flying [the F-100]. Ordnance deliveries are made at speeds and

[106] Capt. Williams, "366th Tactical Fighter Wing F-4 FAC Capability - Support," August 31, 1968, 3, Folder 0502, Box 0020, The Vietnam Center and Archive.

altitudes that are excessive for man-size target acquisition, and, therefore proper target destruction is difficult."[107] To frustrate enemy AAA, F-100 pilots continually changed direction and flew at airspeeds over 400 knots.[108] The speed and maneuvers that kept pilots alive made the identification of targets difficult, however.[109]

Fast FACs succeeded in North Vietnam due to the difference in targeting requirements. In the South, FACs located and marked targets in close proximity to ground forces. In the North, however, the fast FACs acted against targets in North Vietnam, Laos, and Cambodia where there were no friendly troops.[110] They scoured the countryside for troops and trucks that resupplied the enemy in South Vietnam. Once FACs found valid targets, they coordinated for air support to strike them.[111] Since there were no friendlies in the area, there were fewer concerns with collateral damage and fratricide.

The rapid success of the jet-FAC program was a direct result of the expertise and experience gained during the previous six years of developing the FAC mission. Experienced FACs from other platforms transitioned to the F-100 to help train pilots. As a result, the F-100 FAC trainee received only two days of training followed by six orientation flights in the basic execution of the FAC mission. After orientation, trainees flew with an instructor for 20 missions before they received a flight check.[112] By pulling from a pool of FAC experts, the fast-FAC program enjoyed successful results in a very short period.

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[107] Hickey, *Night Close Air Support in RVN*, 4–5.
[108] Lt Col Phil M. Haun, "Airpower versus a Fielded Force: Misty FACs of Vietnam and A-10 FACs of Kosovo-A Comparative Analysis" (School of Advanced Air and Space Studies, n.d.), 37.
[109] Haun, "Airpower versus a Fielded Force: Misty FACs of Vietnam and A-10 FACs of Kosovo-A Comparative Analysis," 37.
[110] Haun, "Airpower versus a Fielded Force: Misty FACs of Vietnam and A-10 FACs of Kosovo-A Comparative Analysis," 28.
[111] Haun, "Airpower versus a Fielded Force: Misty FACs of Vietnam and A-10 FACs of Kosovo-A Comparative Analysis," 28–33.
[112] Rowley, *USAF FAC Operations in Southeast Asia: 1965-1970*, 172.

The fast-FAC program represented a specialized mission to meet specific survivability requirements in North Vietnam. FACs flew the mission in the North as the requirement to control airstrikes moved into North Vietnam, Laos, and Cambodia. The high volume of AAA, SAMS, and enemy aircraft quickly highlighted the weaknesses of the slower O-1, O-2, and OV-10. Seventh Air Force introduced the F-100 as a new FAC platform. The F-100 demonstrated that faster aircraft could find and direct airstrikes against troops and vehicles, just not as effectively as the slower aircraft. The survivability of the faster F-100 trumped the effectiveness of the slower FACs.

Conclusion

The evolution of the FAC in Vietnam contrasted greatly with that of Korea due to the character of warfare and SOF-led program initiation. The Air Force implemented the FAC in Vietnam in an advisory role through special operations pilots in the 4400th CCTS. The advisory role provided a unique situation where the Jungle Jim FACs could develop tactics in response to the unique character of counterinsurgency warfare. Airborne FACs became an indispensable feature over the South Vietnam battlefield. They found targets, coordinated airstrikes within close proximity to ground troops, and provided battle-damage assessments for thousands of fighter missions. The FAC aircraft evolved into a strike platform to kill fleeting targets. Through the war, the FAC mission bifurcated into fast-FACs to increase survivability in North Vietnam, Laos, and Cambodia. As in the Korean War, the FAC mission continued to specialize in response to the environment and characteristics of the conflict.

Chapter 3

Building the Network: Specialization and Distribution of FAC Tasks from Vietnam through Afghanistan

After Vietnam, the Air Force focused on integrating closely with the Army to defend against a possible Soviet invasion in Germany, which enabled the creation of enlisted FACs to fulfill manning requirements. Desert Storm proved the capabilities within the air-land team and validated the decade of training and planning prior to the war. Operations Deliberate Force and Allied Force marked the technological pivot from conventional warfare to highly networked warfare. In these conflicts, technologies such as GPS and satellite communications facilitated striking targets from the air without a large ground presence. The Air Force linked individual units to supporting airpower in Operation Enduring Freedom. Personnel requirements, technological advancements, and politics drove the specialization and distribution of the FAC mission tasks. The purpose of this chapter is to explore how Air Force FACs integrated improvements in technology to construct a networked system, which distributed the FAC tasks and enhanced their ability to coordinate air power with the fire and movement of ground forces.

The FAC, ETAC, and AirLand Battle

Even as the Vietnam War simmered, the Air Force examined how to fight a conventional war with the Soviet Union. Once the Vietnam War ended in 1975, the Air Force and the Army focused on developing a plan to defeat Soviet forces in Western Europe. The plan resulted in a new operational concept called AirLand Battle. AirLand Battle concentrated on air and ground forces to strike front-line forces while air forces

simultaneously attacked the enemy's second and third supporting echelons.[1] The FAC mission evolved along with other missions to support the AirLand Battle concept in the high-threat, Eastern European theater of operations.

As the United States shifted from Vietnam to its main threats in the Cold War, operational concepts shaped the Army's notion of war, which led to changes in the FAC personnel structure. The 1973 Arab-Israeli War illustrated how new weapons and improved mobility increased destructiveness on the modern battlefield.[2] The Egyptians employed Soviet anti-tank missiles, which demonstrated to Army and Air Force leaders that the Army must improve flexibility and maneuverability to survive. General William E. Dupuy, the commander of Training and Doctrine Command (TRADOC) revised Army doctrine to shape a more flexible and maneuverable ground force. The new doctrine, called "Active Defense," espoused slowing a Soviet attack into Western Germany though air and ground forces.[3] The plan caused General Dupuy to collaborate with Tactical Air Command (TAC). At the heart of this doctrine, airpower attacked the operational reserve of the enemy's forces while armored ground forces maneuvered to stop a Soviet advance.[4]

In 1977, General Donn A. Starry took command of TRADOC and gave Active Defense an offensive rather than defensive posture. He called the concept AirLand Battle, which struck the second and third echelons of the Soviet Army while air support simultaneously attacked the enemy's front-line troops.[5] It differed significantly from Air Force experience during the Vietnam War since it concentrated on large

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[1] John L. Romjue, "The Evolution of the AirLand Battle Concept," *Air University Review*, June 1984, 4, http:/www.airpower.maxwell.af.mil/airchronichles/aureview/1984/may-jun/romjue.html.
[2] Romjue, "The Evolution of the AirLand Battle Concept," 2.
[3] Michael Gambone, *Small Wars: Low-Intensity Threats and the American Response since Vietnam* (Knoxville: University of Tennessee Press, 2012), 65.
[4] Maj Paul H Herbert, "Deciding What Has to Be Done: General William E. DuPuy and the 1976 Edition of FM 100-5" (Leavenworth Papers no. 16, July 1988), 83.
[5] Romjue, "The Evolution of the AirLand Battle Concept," 4.

maneuver formations and mobile warfare. Tank and mechanized infantry pierced the enemy front lines and scrambled to strike second-and-third echelon forces. This meant friendly tanks and personnel carriers could intermix with enemy forces, which could confuse supporting aircraft. For the Air Force, AirLand Battle posed significant challenges, since pilots had to track friendly and enemy tanks during the melee of battle.[6] General Starry, like his predecessor, continued to work closely with TAC, now led by General William Creech, to ensure close coordination between air and ground forces.[7]

In 1984, the Army and Air Force agreed to place ground FACs at the Battalion level to help mitigate the coordination requirements of AirLand Battle. Before this, FACs only integrated at the Brigade level because the Air Force did not retain enough fighter pilots to employ them permanently at lower echelons.[8] AirLand Battle required air-and-ground coordination at the lowest level possible, however. This integration requirement led the Air Force to retrain enlisted radio operators into enlisted terminal air controllers (ETACs), which increased FAC personnel. In April of 1981, TAC developed an ETAC training program, with emphasis on neutralizing the Soviet threat.[9] In 1984, doctrine caught up with practice, when the Air Force explicitly stated in regulation that FACs no longer had to be pilots, which changed 60 years of tradition.[10] In the new tactical air control party (TACP) structure, Air Force Officers

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[6] Harold R. Winton, "Partnership and Tension: The Army and Air Force Between Vietnam and Desert Shield," *Parameters*, Spring 1996.
[7] Paul Meilinger, *The Paths of Heaven: The Evolution of Airpower Theory* (Maxwell Air Force Base: Air University Press, 1997), 419.
[8] Maj Raymond O. Knox, "The Terminal Strike Controller: The Weak Link in Close Air Support" (School of Advanced Military Studies, 1989), 17.
[9] *History of 3D Air Support Operations Center Flight: April - June 1981* (Fort Richardson, Alaska, June 1981), K-Flt-Sup-3-HI 1 Apr-30 Jun 81, AFHRA.
[10] Richard G. Davis, *The 31 Initiatives: A Study in Air Force - Army Cooperation* (Washington D. C.: Office of Air Force History, 1987), 113.

remained at the Brigade level while ETACs staffed permanently at the Battalion.[11]

Just as the 1973 Arab-Israeli conflict influenced Army operations, Soviet-made surface to air missiles (SAMs) illustrated the need for the Air Force to rethink close-air-support operations.[12] Militaries designed air defense systems to deny the use of airspace over a given piece of land. For example, during the Vietnam War, the North Vietnamese integrated radar, anti-aircraft artillery (AAA), and SAM systems to deny United States freedom of movement over North Vietnam. In this model, the SAMs forced pilots to fly lower than desired and directly into the range of AAA. The radar acted as the cuing agent, which tied it all together.[13] The Soviets learned from and expanded on the Vietnamese model. Between the years of 1973-1978, the total number of Soviet SAMS increased 300%.[14] Moreover, the Soviets developed mobile missile systems, such as the SA-6 GAINFUL, to keep pace with armored columns.[15] Modern SAMS, like the radar guided SA-8 GECKO and the infrared guided SA-9 GASKIN, increased the lethality of the airspace directly above friendly troops when they requested close air support.[16]

Modern missile systems meant FAC aircraft and pilots could not provide the same level of support as they did in Vietnam. In Vietnam, most of the friendly troops were located in South Vietnam, away from integrated air-defense systems. Small-arms fire posed the only threat to FAC aircraft in the South. In response to the AAA threat, aircraft merely climbed above the range of the enemy's guns. North Vietnam threat

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[11] Knox, "The Terminal Strike Controller: The Weak Link in Close Air Support," 17–18.
[12] During the Arab-Israeli war, the Soviet SA-6 GAINFUL created tactical and operational problems by denying the Israeli's freedom of movement in the air. Carlos Kopp, "Surface to Air Missile Effectiveness in Past Conflicts," *Defense Today* 8, no. 2 (March 2010).
[13] Maj William A. Hewitt, "Planting the Seeds of SEAD: The Wild Weasel in Vietnam" (School of Advanced Air and Space Studies, 1992), 6–12.
[14] MAJ Tyrus W Cobb, "Tactical Air Defense: A Soviet - US Net Assessment," *Air University Review*, April 1979.
[15] Cobb, "Tactical Air Defense: A Soviet - US Net Assessment."
[16] Infrared missiles identify and track the hot exhaust from aircraft engines.

systems integrated radar SAMs into their defenses, however, which posed a greater problem for pilots. While the range on AAA may have been a few miles, the North Vietnamese radar guided SAMs could fly greater than 60 miles to strike an aircraft. Since planes could not easily overfly or avoid the radar threat, pilots flew very low and fast to counter the threat.[17] This tactic, while acceptable to find targets of opportunity, degraded the FAC's ability to provide reliable support to ground troops.[18] After the Vietnam War, Soviet air-defense forces mounted their missile systems on vehicles and moved the threat to wherever needed.[19] If a FAC climbed above the range of small-arms fire, the enemy could now fire upon the FAC with mobile, short-range SAMs.

TAC modified the FAC-mission profile for high-threat areas because of the mobile Soviet air defenses. The FAC mission evolved into a team effort between airborne FAC and ETAC because an increased number of FACs populated the Army with the inclusion of the ETAC. The FAC(A) communicated to an Air Force FAC on the ground instead of directly with the ground commander. In the highest-threat environments, rather than act as both a reconnaissance and marking platform, FAC(A)s primarily relayed radio messages between ETACs and supporting fighters.[20] Ground FACs found the targets and then passed the target information through FAC(A)s to fighters overhead. Unfortunately, this process required excessive time and extensive training, since aircraft spent much of their time aloft exposed to the missile and AAA threat.[21]

The Air Force turned to technology to help solve the weapons-delivery problem within close proximity to ground forces in high-threat

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[17] For a description of radar avoidance and mitigation tactics see Maj Michael Pietrucha, "Needles in the Haystack: Hunting Mobile Electronic Targets," *Air & Space Power Journal*, Spring 2003, 31–34.
[18] For a full summation of slow versus fast FACs, see chapter two.
[19] Cobb, "Tactical Air Defense: A Soviet - US Net Assessment."
[20] *Close Air Support: Airborne Controllers in High-Threat Areas May Not Be Needed* (Government Accountability Office, April 1990), 3.
[21] *Close Air Support: Airborne Controllers in High-Threat Areas May Not Be Needed*, 17.

environments. In late 1979, the Air Force developed targeting pods for ground-attack A-10 and F-16 aircraft.[22] Lockheed designated the first purpose-built targeting pod for attack aircraft the Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN).[23] Pilots used the LANTIRN pod to find targets at night and under poor weather and then designated them with a laser spot. Sensors on supporting aircraft could see the reflected laser energy, which facilitated target identification.[24] The LANTIRN pod increased the effectiveness of the FAC's reconnaissance and marking capabilities tremendously.[25] Through the 1980s, the Air Force only outfitted the F-16 and F-15E with the new technology because of budget overruns and a desire to consolidate the capabilities of the A-10 into the F-16.[26]

Regardless of the platform, LANTIRN significantly changed the ability for aircraft to find targets. To help find and then mark targets, the targeting pod contained an infrared (IR) sensor and laser designator. IR sensors identify differences in thermal energy.[27] In a sense, the target pod acted as infrared binoculars, which displayed heat signatures on a small television screen in the cockpit. For instance, a hot tank might appear as a white mass against a black background, which represented the relatively colder ambient environment. Specifically, the LANTIRN helped to identify and track those targets, which simplified the pilot's task load. The aircraft could strike targets themselves or mark a target with laser energy for other aircraft to strike.[28] The laser provided an aiming reference, which laser guided bombs (LGBs) or missiles followed

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[22] *The Air Force LANTIRN Program Must Surmount Some Formidable Difficulties* (Washington D. C.: Government Accountability Office, February 25, 1982).
[23] Carlos Kopp, "The Air Land Battle: USAF Close Air Support and Battlefield Air Interdiction," *Australian Aviation*, September 1990, http://www.ausairpower.net/air-land-battle.html.
[24] Susan Bodilly, *Case Study of Risk Management in the USAF LANTIRN Program* (Santa Monica, CA: RAND, 1993), 3.
[25] During OEF, the targeting pod evolved to transmit real-time video to ground units.
[26] Kopp, "The Air Land Battle: USAF Close Air Support and Battlefield Air Interdiction."
[27] "Joint Publication 1-02," November 14, 2014, 98.
[28] Bodilly, *Case Study of Risk Management in the USAF LANTIRN Program*, 6.

to the target.[29] The IR sensor found targets at greater distances than the human eye could see and allowed airplanes to remain clear of threats.

To overcome communications jamming prevalent in Soviet doctrine, Lockheed Martin adapted Army datalink technology to a prototype F-16.[30] The Automatic Target and Handoff System (ATHS) provided ground controllers the means to identify a target and then send it via a datalink to an attacking aircraft.[31] The aircraft's heads-up display (HUD) presented the target as a square the system superimposed on a pilot's view of the ground.[32] This system reduced the amount of communications required to strike multiple targets in high-threat environments. The ATHS illustrated the possibilities of integrating global positioning system (GPS), laser designators, and precision-guided weapons into a datalink system.[33]

The Air Force struggled to find a suitable FAC airplane to overcome the spectrum of Soviet threats. After the Vietnam War, Tactical Air Command (TAC) retained limited airborne FAC capability. TAC kept the slower FAC platforms rather than continue the Fast FAC program. After the reduction in aircraft, the FAC fleet consisted of the OV-10 and a few converted T-37 trainers.[34] In 1987, TAC proposed a three-tiered FAC model to overcome advanced threat systems. The OV-10 and OA-37 remained the primary FAC aircraft for low-threat environments. TAC then renamed the A-10 to the OA-10 for medium-threat environments. For the highest threat environments, TAC wanted to convert the F-16 to

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[29] Gillespie, *Weapons of Choice*, chap 4.
[30] Datalink is the generic term for automatic data transfer between to computers over a dedicated radio network.
[31] Frank Camm, *The F-16 Multinational Staged Improvement Program: A Case Study of Risk Assessment and Risk Management* (Santa Monica, CA: RAND, 1998), 31.
[32] Kopp, "The Air Land Battle: USAF Close Air Support and Battlefield Air Interdiction."
[33] Almost all modern fighter aircraft now employ a version of the datalink. Through extensive use in Operation Enduring Freedom, the datalink is used as a way to pass information in a secure manner between parties equipped with the equipment.
[34] The Air Force designated the T-37 FAC/Light Attack aircraft "A-37 Dragonfly." For more information about the reduction of FAC aircraft after the Vietnam War see John D. Morrocco, "USAF Plans to Introduce A-10s Into Forward Air Control Fleet," *Aviation Week and Space Technology*, February 9, 1987, 23.

the A-16.[35] The A-16 would have become the new fast FAC and a replacement CAS platform for the A-10. While the first two parts of this plan took effect in 1988, the Air Force never won support for the A-16 program, and Congress ordered the A-16 cancelled on 26 November 1990.[36] Unfortunately, this resulted in a doctrinal gap for the FAC when assigned tasking in the highest level of threats. Furthermore, many of the technologies developed for the A-16 program, such as the ATHS, languished following the program's demise.

In sum, after the Vietnam War, the Army and Air Force entered a period of intense collaboration to develop an operational strategy to defeat the Soviets. The result of this collaboration was AirLand Battle. The requirement to integrate at the lowest level to ensure smooth operations helped spur the development of the ETAC. Furthermore, Soviet defenses forced the Air Force to develop new tactics and technologies for the FAC mission. GPS, integrated laser designators, and datalink each provided new methods of communicating target information. These advancements resulted in a FAC force designed purposely for mechanized warfare.

The Gulf War: The Distribution of FAC Functions

The battlefield test of the Cold War FAC system occurred during Operation Desert Storm. Before the conflict, the FAC specific OA-10 represented the Air Force's contribution to the FAC mission. Air Force leadership feared the Iraqi air defense network would devastate the older propeller driven OV-10 and therefore refrained from deploying the

[35] Morrocco, "USAF Plans to Introduce A-10s Into Forward Air Control Fleet," 23.
[36] Robert F. Dorr, "F-16 Fighting Falcon: A Major Review of the West's Universal Warplane," *World Airpower Journal*, Spring 1991, 80.

Bronco.[37] The OA-10 excelled while operating in Iraq but could not effectively cover all of the requirements of the Army. As a result, Air Force leadership reintroduced the fast FAC for missions deep in enemy territory. Additionally, new remotely piloted aircraft (RPA) offered a means to distribute some FAC tasks.

The United States strategy in Desert Storm relied upon mechanized troops to encircle the Iraqi Army.[38] Strategists feared friendly-fire incidents as positions changed more rapidly than commanders could track.[39] To overcome this problem, the Army and Air Force agreed that all ground or airborne FACs must control airstrikes short of the Fire Support Coordination Line (FSCL).[40] FACs enabled the destruction of the Iraqi Army and brought disproportionate effects through the application of air strikes. For instance, on the second day of the ground war, ETACs and OA-10 FACs controlled two A-10s and destroyed 23 Iraqi tanks.[41]

Beyond the FSCL, the terrain and enemy reiterated the need for a Fast FAC platform. Just over two weeks into the war, the focus shifted from close air support to striking the Republican Guard deep in enemy territory. Unfortunately, thick smoke, clouds, and the low visibility of the desert environment hindered many fighters from finding their targets.[42] Furthermore, the enemy defensive systems still endangered aircraft straying too far beyond the FSCL. To overcome these challenges,

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[37] The Marines, however, deployed the OV-10 in the FAC role. According to the Gulf War Power Survey, they lost two OV-10s during the entire conflict.
[38] *War in the Persian Gulf: Operations Desert Shield and Desert Storm, August 1990-March 1991* (Washington D. C.: Center of Military History, 2010), 28, http://www.history.army.mil/html/books/070/70-117-1/CMH_70-117-1.pdf.
[39] *Gulf War Air Power Survey*, vol. II: Operations and Effects and Effectiveness (Washington D.C., 1993), 556.
[40] *Gulf War Air Power Survey*, 1993, II: Operations and Effects and Effectiveness:557 The FSCL was an imaginary line placed an arbitrary distance in front of friendly ground troops. Inside of the line, all strikes must be under positive control. Beyond the line aircraft could fire upon any military target.
[41] William L. Smallwood, *Warthog: Flying the A-10 in the Gulf War* (Washington, D.C.; Dulles, Va.: Potomac Books Inc., 2005), 543.
[42] Lt Col Mark A. Welsh, "Day of the Killer Scouts," *Air Force Magazine*, April 1993, 66.

Brigadier General Buster Glosson directed F-16s equipped with GPS to scout the desert for targets and then relay the enemy's position to awaiting fighters. While technically called "killer-scouts," the F-16 pilots drew their example from the Vietnam Misty FACs and acted in the "Fast FAC" role.[43]

The Gulf War introduced the use of remotely piloted aircraft (RPA) to provide real-time imagery provided to direct fires. The RPA found and communicated targets, which represented one method of distributing FAC tasks. The United States had used RPAs in every major conflict since WWII. Real-time surveillance feeds came about only in the early 1980s, however. In the 1982 Lebanon War, the Israelis fitted small RPAs with cameras to gain intelligence on the enemy.[44] The United States Army developed its own version called the Pioneer, which the Navy and Marines soon adapted for their own use.[45]

In Desert Storm, the United States Army, Marines, and Navy each used RPAs to find targets and direct artillery fire onto the enemy.[46] On one occasion, an RPA operator spotted a column of tanks approaching a friendly position. The RPA pilot then relayed the location of the enemy to supporting aircraft for destruction.[47] The requirement to remain within sight of the operator limited the range of early RPAs. Regardless, RPAs provided an additional means of finding targets and communicating their position to supporting aircraft.[48]

Neither FAC(A)s nor ground FACs guided significant numbers of LGBs to targets during Desert Storm despite the development of the

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[43] Welsh, "Day of the Killer Scouts," 66.
[44] "Unmanned Aerial Vehichles in the Service of the Israel Air Force," *Rubin Center: Research in International Affairs*, September 7, 2010, http://www.rubincenter.org/2010/09/rodman-2010-09-07/.
[45] John D. Blom, "Unmanned Serial Systems: A Historical Perspective" (Occasional Paper 37, US Army Combined Arms Center, 2010), 88.
[46] Blom, "Unmanned Serial Systems: A Historical Perspective," 90.
[47] Blom, "Unmanned Serial Systems: A Historical Perspective," 90.
[48] Other systems, such as the Joint Surveillance and Targeting System also provided a means of locating targets and directing airstrikes.

capability during the Vietnam War. As early as 1985, TAC and TRADOC developed close-air-support procedures for ground-based and airborne lasers to designate targets for LGBs.[49] Even though the media heralded the advent of precision weapons, they consisted of only a small percentage of the actual weapons dropped.[50] Weather often precluded the effective use of laser-guided systems. Moreover, the high cost of LGBs discouraged their actual use.[51]

As the capstone assessment of AirLand Battle, Desert Storm illustrated the effectiveness of the FAC in mobile warfare. The OA-10 along with ETACs guided hundreds of attacks within close proximity to friendly forces, while F-16 killer-scouts scoured the desert for targets of opportunity. Additionally, the RPA presented new opportunities to distribute traditional FAC tasks. After Desert Storm, FACs continued to train for mobile and integrated warfare. The next two conflicts, however, challenged the existing model of air and ground coordination.

Deliberate Force and Allied Force: Seeking Precision and Exploiting Space

Operations Deliberate Force and Allied Force represented the opposite end of the conflict spectrum from the highly integrated air-and-land battle of Desert Storm. Political considerations prevented the extensive use of ground troops and required more precise weapons-delivery to prevent civilian casualties. The two air wars illustrated how new technologies could facilitate the FAC in future conflicts. By the end of the Kosovo conflicts, medium-altitude RPAs, satellite communications,

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[49] "Tactical Air Command: Pamphlet 50-25," December 11, 1985.
[50] *Operation Desert Storm: Evaluating the Air Campaign* (Washington D. C.: Government Accountability Office, 1997), 44 Only five percent of weapons dropped during Desert Storm were precision guided.
[51] In 1990 dollars, the laser guided weapons cost an average of $31,920 vs $2,057 for unguided weapons. Additionally, it took an average of 4 guided weapons per target to completely destroy a target. For a complete discussion on costs of weapons during Desert Storm see *Operation Desert Storm: Evaluating the Air Campaign*, 177–178.

and GPS-guided bombs provided the technological foundation for prosecuting warfare with a limited ground force.

The political character of Operation Deliberate Force prevented the use of unrestricted force, which limited the FAC mission. The rules of engagement (ROE) restricted the types of weapons and number of targets because the operation fell under the auspices of the North Atlantic Treaty Organization (NATO) for the purposes of humanitarian relief.[52] ROE restricted weapons-release authority in all cases, even with regard to close air support.[53] For close-air-support missions, the United Nations Secretary General was the approval authority to strike.[54] Ground FACs requesting immediate air support initially took over 6 hours from request to employment.[55] Much of this delay resulted from operators who communicated the required information through incompatible radios.[56]

The coalition could not allow airstrikes that caused civilian casualties or collateral damage and thereby required improvements in weapons technology. To prevent collateral damage, the coalition relied primarily upon precision-guided weapons. While five percent of weapons dropped in Desert Storm were LGBs, in Deliberate Force, LGB use rose to nearly 67 percent.[57] LGBs may have decreased errant attacks, but they created problems for the aircraft that dropped them. NATO ROE required pilots to identify visually most targets prior to weapons release. Unfortunately, poor weather reduced visibility, and the obscuration of targets prevented the release of many weapons.

When NATO forces again planned for hostilities in support of Operation Allied Force, they employed satellite-radio technology to

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[52] Col Robert C. Owen, *Deliberate Force: A Case Study in Effective Air Campaigning* (Maxwell Air Force Base: Air University Press, 2000), 401.
[53] Owen, *Deliberate Force: A Case Study in Effective Air Campaigning*, 401–403.
[54] Owen, *Deliberate Force: A Case Study in Effective Air Campaigning*, 401.
[55] Owen, *Deliberate Force: A Case Study in Effective Air Campaigning*, 403.
[56] Eric Larson et al., *Interoperability of U.S. Allied Air Forces: Supporting Data and Case Studies* (Santa Monica, CA: RAND, 2003), 40.
[57] 708 out of the 1,070 bombs employed were LGBs. Walter J. Boyne, *Air Power in UN Operations* (Burlington, VT: Ashgate Publishing Limited, 2014), 234.

prevent the communications problems encountered in Deliberate Force. To overcome radio interoperability problems and clearance-of-fires requirements, ground FACs tested civilian satellite-communications handsets.[58] Iridium handsets enabled ground units to communicate directly with whomever held a similar handset anywhere in the world. For example, ground FACs could operate out of sight from higher headquarters and still receive clearance to employ weapons. While satellite communication was not a new technology, the miniaturization of the technology provided a means to equip individual soldiers and tactical aircraft with the capability.[59] Satellite communications reduced the number of links in the radio chain and improved the effectiveness of ground FACs.

In addition to improved communications, planners also incorporated new precision-weapons technology into Operation Allied Force, which enabled pilots to strike targets without visual acquisition. After Desert Storm, weapons designers sought to develop a precision weapon unaffected by weather.[60] The increased requirements for precision during Operation Deliberate Force only amplified the need for a new type of weapon. The result was the Joint Direct Attack Munition (JDAM). JDAM acquired a satellite signal and then "flew" to a preprogrammed spot on the ground.[61] It was an all-weather weapon,

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[58] "Will Iridium Become SatCom of Choice," *SpaceDaily*, January 22, 1999, http://www.spacedaily.com/news/satcom-99a.html.
[59] "Will Iridium Become SatCom of Choice."
[60] "JDAM: A GPS-INS Add-on Adds Accuracy to Airstrikes," *Defense Industry Daily*, November 14, 2014, https://www.defenseindustrydaily.com/jdam-a-gpsins-addon-adds-accuracy-to-airstrikes-03313/.
[61] Thomas G. Mahnken, *Technology and the American Way of War* (New York: Columbia University Press, 2008), 185.

which required only coordinates to strike a target.[62] Pilots no longer had to see the target to strike it.[63]

During Allied Force, Predator crews along with the CFACC attempted to expand the role of the Predator RPA to include communication of target coordinates to supporting aircraft in real time.[64] While the Air Force operated Predators primarily for reconnaissance and weapons-effects assessment, RPA pilots could not communicate what they saw to outside agencies.[65] This frustrated both operators and leadership alike, as "once they saw something threatening… …they were often powerless to do anything about [it]."[66] During Allied Force, Air Combat Command leadership recognized the capabilities a real-time reconnaissance platform could bring to the operators on the battlefield and attempted to link the Predator and supporting fighters with a line–of-sight radio.[67] The Predator onboard UHF radio did not work reliably due to electro-magnetic interference. Predator crews then attempted to use satellite radio to communicate with pilots. Unfortunately, most fighter aircraft at that time did not carry SATCOM-capable radios. The commander of the United States Air Forces Europe called the failure of communication between Predators and supporting fighters the "dialogue of the deaf."[68]

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[62] JTACs can generate GPS coordinates from either portable mapping devices or from GPS systems linked to laser range finders. For a full description of equipment, see Gary Kinne, John Tanzi, and Jeffrey Yaeger, "FA PGMs: Revolutionizing Fires for the Ground Force Commander" 11, no. 3 (n.d.): 21.

[63] *Kosovo/Operation Allied Force After-Action Report*, Report to Congress, (January 31, 2000), 91 B-2 stealth aircraft flying out of Whiteman Air Force Base delivered the first JDAMs to targets in support of Allied Force. JDAMs were not used in close support missions until OEF.

[64] *Kosovo/Operation Allied Force After-Action Report*, 57.

[65] LtCol Timithy M. Cullen, "The MQ-9 Reaper Remotely Piloted Aircraft: Humans and Machines in Action" (Massachusetts Institute of Technology, 2011), 202.

[66] Cullen, "The MQ-9 Reaper Remotely Piloted Aircraft: Humans and Machines in Action," 242.

[67] Cullen, "The MQ-9 Reaper Remotely Piloted Aircraft: Humans and Machines in Action," 242.

[68] Cullen, "The MQ-9 Reaper Remotely Piloted Aircraft: Humans and Machines in Action," 242.

Air Force Chief of Staff, General John Jumper, went a step further and added a laser-designation capability to the Predator.[69] The laser designator acted like the LANTIRN designator and reflected energy off targets, which supporting pilots could see in their heads-up display. With a laser designator, the Predator could become an extension of the FAC as a tool specifically designed to find and mark targets, and the aircraft could stay airborne for 12 hours. While tested during OAF, the Predator's laser-designation capability did not see action until the wars in Iraq and Afghanistan.[70]

The restricted character of Deliberate and Allied Force prompted the Air Force to develop new reconnaissance, communications, and marking technologies. Improved communications allowed more decentralization of operations. Ground units could operate a from their operations center and still rely upon air support. Precision weapons enabled aircraft to drop weapons in all weather based only on coordinates. Lastly, RPAs found, tracked, and marked targets, which provided a new way for FACs to distribute tasks.

Operation Enduring Freedom: The FAC Net

During Operation Enduring Freedom (OEF), the modern FAC enabled a significant departure in strategy to previous wars. Political concerns required an expeditious entry into combat while keeping civilian casualties to a minimum. Small teams of highly mobile special operators integrated with Afghani rebels and wreaked destruction upon the Taliban. These FACs relied upon precision-guided munitions and satellite communications to kill the enemy. When the conventional army entered Afghanistan and executed Operation Anaconda, the volume of

[69] Richard Whittle, *Predator: The Secret Origins of the Drone Revolution* (New York, NY: Henry Holt and Co., 2014), 165–175.
[70] Cullen, "The MQ-9 Reaper Remotely Piloted Aircraft: Humans and Machines in Action," 243.

air-support requests quickly overwhelmed the SOF system of strike control, which required FAC(A)s to establish more traditional methods of control. After Anaconda, air and ground coordination rapidly evolved back to a ground role to meet the requirements of counterinsurgency warfare in Afghanistan. The FAC in OEF relied upon an integrated communications network and a wide range of reconnaissance tools to enable the destruction of Taliban forces.

Operation Enduring Freedom balanced the destruction of a regime against protection of the civilian population, which demanded a precise application of airpower. In his first declaration of airstrikes against the Taliban, President George W. Bush outlined the competing priorities for airpower, "By destroying camps and disrupting communications, we will make it more difficult for the terror network to train new recruits and coordinate their evil plans… The United States of America is a friend to the Afghan people, and we are the friends of almost a billion worldwide who practice the Islamic faith."[71] President Bush's stated policy targeted the regime only, not the population.

Secretary of Defense, Donald Rumsfeld, developed a plan designed for rapid retaliation. Rumsfeld wanted to strike the Taliban fast to prevent any more attacks. Furthermore, a quick response would make an example of the Taliban and increase the United States' advantage over other state supporters of terrorism.[72] The fast response combined with President Bush's policy of limited air strikes near the civilian population kept the military presence on the ground to a minimum.[73] Secretary

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[71] President George W. Bush, "President Bush Announces Military Strikes in Afghanistan" (The White House, October 7, 2001), http://www.globalsecurity.org/military/library/news/2001/10/mil-011007-usia01.htm.
[72] Sec of Defense Donald H. Rumsfeld, "U.S. Strategy in Afghanistan," October 30, 2001, http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB358a/doc18.pdf.
[73] Benjamin S. Lambeth, "Airpower Against Terror: America's Conduct of Operation ENDURING FREEDOM" (RAND Corporation, 2005), 88.

Rumsfeld chose to combine special operations forces with airpower to achieve hasty results.

With Rumsfeld's guidance, United States Central Command (CENTCOM) strategists created a new method of integrating air and land forces.[74] The air-ground-coordination strategy in Afghanistan was entirely new, "this is a different kind of war against a different kind of enemy. The enemy is not a nation -- the enemy is terrorist networks that threaten the way of life of all peaceful people."[75] Secretary Rumsfeld wanted to "attack from the air enemy capabilities, to facilitate success of Afghan forces on the ground."[76] Rather than fight a conventional battle or an air-only war, Secretary Rumsfeld envisioned a hybrid war where FACs linked airpower and SOF-led Afghani forces.

Initially in OEF, indigenous Afghani forces, not the conventional Army, provided the bulk of ground combat power.[77] SOF forces integrated into Afghan tribes acted as advisors. Since the enemy dispersed quickly after the initiation of hostilities, these same SOF teams provided target information to supporting aircraft overhead, which then pummeled the enemy with precision weapons.[78] The FAC provided target information for precision weapons to supporting aircraft, which made this model of warfare effective.[79]

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[74] For further discussion of the Afghan Model of war see: Andres, Wills, and Griffith, "Winning with Allies: The Strategic Value of the Afghan Model"; Biddle, "Allies, Airpower, and Modern Warfare: The Afghan Model in Afghanistan and Iraq."

[75] "The Global War on Terrorism: The First 100 Days," Archive, *Department of State*, (2009 2001), http://2001-2009.state.gov/s/ct/rls/wh/6947.htm.

[76] Rumsfeld, "U.S. Strategy in Afghanistan."

[77] *The United States Army in Afghanistan: Operation Enduring Freedom, October 2001-March 2002*, CMH pub 70-83.1 (Center of Military History), 8, accessed January 18, 2015, http://www.history.army.mil/brochures/Afghanistan/Operation%20Enduring%20Freedom.htm.

[78] Stephen D Biddle, *Afghanistan and the Future of Warfare Implications for Army and Defense Policy* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2002), 1.

[79] The large number of precision weapons provided the President plausible evidence that the US was trying to prevent civilian casualties. "Fact Sheet: U.S. Military Efforts to Avoid Civilian Casualties," *United States Embassy Press Section*, October 25, 2001,

After initial strikes against infrastructure and leadership targets, FAC(A)s attempted to meet the requirements of SOF-centric warfare. To reduce the possibility of inadvertent civilian death, every target required validation from a qualified FAC(A) prior to engagement.[80] Additionally, the FAC(A) ensured friendly troops remained clear of the target area. This required the FAC(A) to coordinate with the air-operations center, which then confirmed there were no SOF forces in the area.[81] Not surprisingly, the communications process was excessively slow, which let valid targets escape unharmed.

As the war progressed, the enemy dispersed into the civilian population, which frustrated the efforts of FAC(A)s. The Taliban moved operations into residential areas, businesses, and Mosques.[82] When airstrikes killed civilians, the Taliban quickly used extensive propaganda to exploit the event. After only three days of airstrikes, the media questioned the ability of pilots to identify targets on the ground, which prompted public affairs to defend the aircrews' actions.[83] The pilots themselves lost confidence in the ability to separate civilian from enemy even though they used targeting pods.[84] Targeting pods, unlike the advanced imaging systems on RPAs, only refined coordinates rather than identified features on individual people. Unlike the Vietnam War where Vietnamese personnel identified every target to be struck, United States FAC(A)s relied upon judgment and intuition alone. There were very limited ways for the FAC(A) to contextualize the image in the targeting

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http://www.usembassy-israel.org.il/publish/peace/archives/2001/october/102603.html.

[80] Lambeth, "Airpower Against Terror: America's Conduct of Operation ENDURING FREEDOM," 94.

[81] Lambeth, "Airpower Against Terror: America's Conduct of Operation ENDURING FREEDOM," 95.

[82] Lambeth, "Airpower Against Terror: America's Conduct of Operation ENDURING FREEDOM," 100.

[83] "Fact Sheet: U.S. Military Efforts to Avoid Civilian Casualties."

[84] Robert Wall, "Navy Adapts Operations for Afghan Hurdle," *Aviation Week and Space Technology*, November 19, 2001.

pod. The existing methods to identify targets by air were just not effective.

Despite the perceived overwhelming success of airpower in ODF and OAF, the senior staffs of the coalition partners expected to use a ground presence to find and mark targets. British Prime Minister, Tony Blair expressed, "I don't think we have ever contemplated doing this by air alone."[85] Secretary Rumsfeld went further, stating, "aircraft cannot really do sufficient damage… They can't crawl around on the ground and find people."[86] SOF teams inserted into Afghanistan solved many of the target identification problems. These teams, which included ETACs, used locals to help contextualize the situation on the ground and identify valid targets to strike.

SOF teams blended satellite-enabled technology and traditional Afghan warfighting techniques to adapt to the environment quickly. As one RAND study explained of modern air support, "Unlike traditional close air support that entails concurrent air and ground schemes of maneuver, SOF units in Afghanistan enabled precision air strikes against enemy ground forces even when there were no friendly ground forces in direct contact."[87] SOF ETACs traveled on horseback while they used laser range finders linked to global positioning systems to pinpoint coordinates of targets.[88] Simultaneously, they used satellite phones to communicate requests for air support to headquarters.[89] Unlike the deserts of Iraq, conventional radios failed to work over long distances due to the mountainous Afghan terrain. Once aircraft arrived overhead, the SOF ETACs used conventional UHF radio sets to pass the GPS

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[85] Thomas E. Griffith and Vernon Loeb, "Special Forces Open Ground Campaign," *Washington Post*, October 19, 2001.
[86] Griffith and Loeb, "Special Forces Open Ground Campaign."
[87] *Operation Enduring Freedom: An Assessment*, Research Brief (RAND, 2005), 2.
[88] *The United States Army in Afghanistan: Operation Enduring Freedom, October 2001-March 2002*.
[89] Robert K. Ackerman, "Special Operations Forces Become Network-Centric," *Signal*, March 2003.

coordinates of targets directly to the aircraft, which released JDAMs onto those coordinates. If the aircraft carried only laser-guided weapons, the ETAC could mark the target with hand-held designators. The ETACs gave final clearance and results of the strike back to the aircraft.[90] In this model of warfighting, the FAC used satellite communications and GPS receivers to link supporting aircraft to ground forces.

In OEF, Predator RPAs changed how aircraft supported the ground commander. ETACs on the ground contacted Predators operated by pilots in Nevada to scout requested areas. The Predator then passed suspicious activity back to ground forces. If required, Predators could lase the target for supporting fighters.[91] In some cases, the Predator could also send video to other locations around the theater, which allowed higher headquarters to make decisions based on real-time information.[92] The Predator became a part of the air-ground network and acted as a persistent airborne means to find targets.

In Afghanistan, where manned fighters could not distinguish enemy from civilian, the Predator could stay over a target area for hours and use a powerful sensor ball to observe and identify the enemy.[93] As early as November 2004, Predator RPAs identified targets for AC-130 aircraft.[94] General Atomics, the company that makes the Predator, even modified some Predators to broadcast targeting video directly to supporting aircraft.[95] With improvements to communication equipment, the RPA became part of the air-and-ground coordination team. In Afghanistan, slow rather than fast airspeed equated to effectiveness.

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[90] Robert K. Ackerman, "Operation Enduring Freedom Redefines Warfare," *Signal*, September 2002, 3–5.
[91] Russell Parker, "The Predator's War," *Airman*, December 2002, 31.
[92] Parker, "The Predator's War," 31.
[93] For a complete discussion on the RPA mission and process, see Cullen, "The MQ-9 Reaper Remotely Piloted Aircraft: Humans and Machines in Action."
[94] Richard J. Newman, "The Little Predator That Could," *Air Force Magazine*, March 2002.
[95] Newman, "The Little Predator That Could," 51.

Precision weapons also changed how FACs directed supporting fighters to employ weapons. In Vietnam, Desert Storm, and OAF, fighters had acquired the target visually prior to weapons release. Precision weapons negated that requirement. Aircraft did not need to release precision weapons near the target. Instead, the weapon flew to preprogrammed coordinates or followed laser energy to the target. Platforms, such as the B-1 and B-52, which had never before performed the close-support mission, now became viable platforms. They could be loaded with large numbers of weapons, circle overhead until needed, and release their weapons on precise coordinates.[96] Precision weapons improved the effectiveness of the FAC because single aircraft could provide support to multiple ETACs.

This model of warfighting worked only in limited scenarios, however. In OEF, on more than one occasion, ETACs passed incorrect coordinates and aircrew entered targets into the computer wrong, which resulted in friendly deaths and civilian casualties.[97] In one case of fratricide, the ETAC merely replaced the batteries in his GPS receiver, which caused the output of the device to default to his own location. The supporting aircraft released a JDAM in accordance with standard operating procedures, and the bomb struck the friendly location.[98] The Air Force incorporated new procedures and technology when executing close air support because of instances of fratricide. Pilots and ground crews re-read and confirmed coordinates prior to weapons releases. In addition, bomber aircraft received targeting pods to help confirm the aim-point location. Regardless, the SOF-centric model illustrated the importance of air-and-ground training with new technologies.

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[96] "The Global War on Terrorism: The First 100 Days."
[97] Joe Pappalardo, "Afghanistan Taught U.S. 'Hard Lessons' in Close Air Support," *National Defense Magazine*, August 2005, https://www.nationaldefensemagazine.org/archive/2005/august/pages/afghanistan_taught_us_hard_lessons_in_close_air_support.htm.
[98] Mark Thompson, "The Curse of 'Friendly Fire,'" *Time*, June 10, 2014, http://time.com/2854306/the-curse-of-friendly-fire/.

Furthermore, the decentralized character of SOF warfare worked only on a small scale. When SOF forces required air support, they directly contacted the combined air operations center (CAOC), located in Qatar. At the CAOC, a special-operations-liaison officer coordinated air support and confirmed the location of friendly forces on the ground. Once a sortie was launched, no command-and-control organization existed to reorganize supporting aircraft. Aircraft merely flew at pre-coordinated altitudes until they contacted their respective ETAC. At this point, the ETAC cleared aircraft to other altitudes.[99] Since there was no coordination authority on-scene, aircraft could not react quickly to events.

On 2 Mar 2002, the Coalition started the largest campaign of the war, Operation Anaconda. The Army incorporated air support late into the planning process, which led to problems during execution.[100] To coordinate air support, 37 different ETACs supported army and SOF forces in a nine-by-five-kilometer rectangle. To put this in perspective, two aircraft generally support one ETAC in an area of five-by-five kilometers.[101] Furthermore, the plan did not include coordination frequencies or altitudes for supporting aircraft to hold.[102] While the ETACs could positively identify targets, they could not talk to or organize air support.[103]

At the onset of the operation, the enemy attacked in force, which surprised coalition forces. ETACs requested more airstrikes than the disorganized system could provide. Aircraft continued to arrive overhead but they could not communicate with ground forces effectively. By the

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[99] Maj Edgar Fleri et al., *Operation Anaconda Case Study* (Maxwell Air Force Base: College of Aerospace Doctrine, Research and Education, November 13, 2003).
[100] AF/XOL, *Operation Anaconda: An Airpower Perspective*, 41–42.
[101] AF/XOL, *Operation Anaconda: An Airpower Perspective*, 55.
[102] Campbell, interview.
[103] For a detailed description of Operation Anaconda from the air perspective see: AF/XOL, *Operation Anaconda: An Airpower Perspective*; Fleri et al., *Operation Anaconda Case Study*.

end of the first day of operations, multiple flights of supporting airplanes circled like moths around a bulb.[104] On that night, the Combined Forces Air Component Commander, General Michael Mosely, directed A-10 FAC(A)s into Afghanistan to help create order from the chaos.[105] The FAC(A)s successfully untangled the communications problems and provided close air support and coordinated air strikes with additional fighters. In this instance, General Moseley used the FAC(A)s more for their airborne-communications capabilities rather than to spot targets and control air strikes.[106]

Operation Anaconda highlighted the shortcomings of the SOF centric networked model of warfare, which the Air Force quickly worked to alleviate. The communications network established in Afghanistan could handle only a limited number of supporting aircraft. To increase capacity, the Air Force sought to build a communications network to sustain the modern distributed FAC. Initially, Central Command moved an air support operations center (ASOC) into Afghanistan. A robust system of radio repeaters followed later, which special teams placed and maintained on high terrain throughout the country.[107] The Air Force also outfitted tactical aircraft with satellite radios.[108] Eventually, the system evolved into a centralized control module carried aboard a variety of aircraft called the battlefield airborne communications node (BACN). BACN elevated the communication nodes, thereby providing data and communication relays for larger portions of the country.[109] Many of the

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[104] Andres and Hukill, Jeffrey, "Anaconda: A Flawed Joint Planning Process."
[105] Adapted from Campbell, interview.
[106] John Andreas Olsen, *Air Commanders* (Washington, D.C: Potomac Books, 2012), 412.
[107] Freedburg, Sydney J., "The Afghanistan Air War." *National Journal*, 12 May 2015. http://www.nationaljournal.com/magazine/the-afghanistan-air-war-20100925.

[108] *Air National Guard: 2013 Weapons Systems Modernization Program*, accessed February 25, 2015, http://ngrcc-hunter.house.gov/sites/nationalguardcaucus.house.gov/files/2013%20Weapons%20Systems%20Modernization%20Priorities.pdf.
[109] "BACN," *Northrup Grumman Factsheet*, accessed February 25, 2015, http://www.northropgrumman.com/Capabilities/bacn/Pages/default.aspx.

areas, which relied on satellite radio previously, could now use traditional radios because BACN-equipped aircraft maintained line-of-sight communications into deep valleys and over long distances. BACN helped link JTACs and aircraft earlier, providing for better air-strike control. The FAC in Afghanistan relied upon each of these communication systems to coordinate air support in remote locations against Taliban fighters.

Additionally, Anaconda highlighted the need for a standardized ground FAC. Prior to OEF, the Air Force trained all FACs as ETACs, Air Liaison Officers (ALOs), or FAC(A)s. SOF teams traditionally used their own terminal controllers called combat controller teams (CCTs). If required, the Air Force could also assign ETACs to SOF teams.[110] Different backgrounds and missions caused each unit to request and communicate with supporting aircraft differently. Non Air-Force-trained ground FACs did not follow prescribed tactics and procedures when they requested support. Additionally, in networked warfare, supporting aircraft now included platforms not specifically versed in close-air-support procedures, such as strategic bombers. These aircrews needed standard procedures to provide effective support to ground forces.

After Anaconda, the Joint Staff investigated FAC training. They sought a single training program throughout the services "to improve joint force interoperability and effectiveness while reducing the potential for mishaps and fratricide."[111] Once complete with the program, controllers from every service were designated joint terminal air controllers (JTACs). The program resulted in a large increase in the numbers of qualified ground FACs. As the number of JTACs increased, the FAC net continued to grow throughout OEF.

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[110] Bruce Pirnie et al., *Beyond Close Air Support: Forging a New Air-Ground Partnership*, Project Air Force (Santa Monica, CA: RAND, 2005), 131–135.
[111] JCAS Executive Steering Committee, *Joint Cloase Air Support Plan DRAFT*, 22 Nov 02, 1.

By the end of 2010, the FAC could communicate to any number of airborne platforms to gain intelligence or deliver weapons. For example, a mission over Central Afghanistan in 2010 illustrates the capabilities of the JTAC.[112] On a summer day in the Horn of Panjaway west of Kandahar near Lashkar Gah, a small platoon of soldiers received fire from a group of insurgents located in a building adjacent to a river. The JTAC called the ASOC for support on his portable satellite radio. The ASOC directed two A-10s to support via the datalink. The A-10s responded via secure voice satellite radio and received the situation update along with contact frequencies and other aircraft in the area.

Once the A-10s arrived over the friendly location, the JTAC passed coordinates of the suspected location of the enemy by radio. The A-10s programmed the coordinates into their GPS and looked at the suspected area in their targeting pods. Simultaneously, the A-10s broadcast the image in the targeting pod to the JTAC. The JTAC looked at the video to confirm the location.[113] Moreover, the JTAC requested JDAMs strike two specific locations on the target building to minimize collateral damage. The A-10s used their targeting pod, lasers, and GPS to refine the target location to within a few feet. As the A-10s readied for the attack, a Predator arrived overhead to provide reconnaissance of the target area. During this mission, the JTAC requested the Predator to report civilians entering or any enemy leaving the target area.

Within minutes, the A-10s released two JDAMs onto the target and destroyed the building. Using satellite radio, the JTAC communicated the successful mission to the ASOC and declared that he needed no additional support. What would have been the responsibility of a single pilot in Vietnam was distributed to an integrated and coordinated team. The distribution of tasks enabled each member of the FAC team to focus

[112] Author's experience.
[113] If the video did not work the JTAC could have marked the target with a hand-held laser designator.

on his individual task. Moreover, the technological network made the team effective in delivering weapons to precise locations in a timely manner.

Satellite communications created a FAC network in Operation Enduring Freedom. Initially, FAC(A)s attempted to find targets for supporting fighters to destroy. They were not as successful as in previous conflicts due to the lack of context and stringent requirements to prevent civilian deaths. Therefore, the FAC returned to the ground supported by a network of sensors and shooters. GPS enabled the JTAC to provide targeting data for fighters and bombers overhead that could release weapons in any weather day or night. This model broke down during large operations, as illustrated by Operation Anaconda. At that moment, traditional airborne FACs employed decades of doctrine and experience to enable air support to ground troops.

Conclusion

From the end of Vietnam through today, the Air Force incorporated technology to distribute the FAC mission tasks of finding the target, communicating that target to supporting fighters, and then clearing the fighters to strike. Starting with improved sensors during the Cold War and ending with a global sensor-shooter network in OEF, the Air Force built a flexible and effective method to coordinate air support and ground forces. Concurrently, the Air Force disseminated the FAC mission to enlisted controllers and even other services through the JTAC program, which enabled a network of air-minded controllers throughout the Department of Defense. As Operation Anaconda illustrates, though, no single solution to air-and-ground coordination will ever solve all problems. Flexibility in the FAC mission comes from developing a robust network that includes people, weapons systems, and ISR platforms linked through an extensive communications infrastructure.

Conclusion

Forward air controllers (FACs) coordinate air strikes within close proximity to ground forces and other situations requiring precise targeting. FACs maintain awareness of friendly positions, enemy locations, and supporting aircraft, which improves the effectiveness and safety of close air support. Throughout the history of airpower, FACs provided the necessary linkage between air and ground forces. The characteristics of FACs, however, changed with the environmental context, political tenor, and character of warfare. Unlike Vietnam where the FAC mission evolved to primarily an airborne platform, in Operation Enduring Freedom (OEF), FACs remained primarily on the ground. During OEF, airborne forward air controllers (FAC(A)s) coordinated only a handful of strikes in the very early months of the war. The question is: why did the FAC mission evolve differently even though the character of war seemed similar? Furthermore, does the Air Force still need to execute the FAC mission from the air? To answer these questions, this paper sought to understand how the FAC mission evolved within specific environmental, political, and military context, to meet the coordination challenges in different wars.

The FAC from WWI through Korea: Creating a Mission

The first use of airplanes to bomb the enemy in World War I illustrated the complicated nature of pilots' efforts to coordinate airpower in a close support role. The war ended before Airmen could develop the processes to deliver ordinance near friendlies safely, however. During the interwar years, the Army and Air Corps identified the operational requirement to harmonize their forces, which thereby created the first air control party (ACP). The ACP acted as a communication link between air

and ground forces as well as a liaison and advocate for air power within the Army headquarters.

Ineffectual coordination of airstrikes during the opening battles of WWII in North Africa emphasized the need for the integration of FACs at the tactical level. At the onset of hostilities, the coordination between air and ground forces for mechanized tank battles occurred prior to the battle behind the front lines. Pilots relied upon pre-coordinated ground signals and geographic references to ensure their bombs landed on the enemy. The rapid movement of mechanized forces coupled with smoke and debris caused confusion on the battlefield, which led to ineffective and sometimes dangerous air strikes. Pilots who failed to identify the correct targets returned home, which wasted sorties. Even worse, pilots who misidentified enemy targets could drop their bombs on friendly troops. Subsequently, FACs moved from headquarters' tents into fighting platoons and carried communications equipment in vehicles right to the front lines. In short, the character of fighting during WWII created the operational requirement to train specific individuals (FACs) who could coordinate air strikes within close proximity of ground forces. FACs found targets, communicated the target's location to supporting fighters, and cleared fighters to release weapons on targets without putting either aircraft or friendly soldiers in danger.

The operational environment of the Korean War initially reduced the FAC's effectiveness. Mountainous terrain and archaic radio technology prevented ground FACs from traveling with front line soldiers. Heavy and fragile radios did not change much in the interim between WWII and Korea. Since FACs could not carry the radios, they chose instead to mount them in vehicles. Unfortunately, jarring on unimproved mountain roads quickly broke the radios, which rendered them useless. Without vehicles, FACs could not keep up with ground forces. Furthermore, mountainous terrain hid the enemy from sight. Ground FACs could not find targets for supporting fighters effectively. Even if

FACs found enemy positions, mountains frequently prevented FAC's communication with supporting aircraft.

Within a short time, ground FACs went airborne to improve their effectiveness. FACs quickly realized the advantages of airborne strike control. FAC pilots could act as the link between friendlies, enemy targets, and supporting fighters. Increased altitude provided pilots a vantage to find targets they could have missed from ground positions. Once airborne, mountain obstructions no longer hampered pilots, who could communicate the location of a target to supporting aircraft and talk to supported ground forces. Finally, airborne FACs saw the target as the supporting fighters did. This perspective enabled FACs to communicate the target location to fighters with better results. The result of going airborne led to an increase in effectiveness of the capability and adaptability of air support within close proximity to ground forces. Unfortunately, the Air Force forgot many of these lessons after the end of the war, and the FAC(A) mission languished in the nuclear-postured Air Force.

The FAC in Vietnam: Rediscovering the Network

During the opening stages of the Vietnam War, the Air Force soon realized the importance of the FAC(A) mission. The first FACs in Vietnam, Air Force special operations forces (SOF), trained fledgling Vietnamese Air Force (VNAF) forces how to coordinate airpower into the ground war. As in Korea, the environment did not allow ground FACs to identify and track targets. Furthermore, the politically sensitive character of the conflict required great restraint when pilots conducted air strikes. The rules of engagement (ROE) required a Vietnamese Air Force FAC to approve weapons releases. Many requests for air strikes failed to occur due to lack of VNAF FACs and clearance authority. FACs soon moved

into the air for the same reasons as during the Korean conflict: to improve the effectiveness of air-strike coordination with ground fires and movement.

Forward-air-control personnel, technology, and tactics evolved to meet the operational requirements of the Vietnam War while improving the effectiveness of the FAC(A) mission. As the war expanded following the Gulf of Tonkin incident, the dearth of trained SOF FACs led the Air Force to train conventional FAC(A) forces. Simultaneously, 7th Air Force lifted the VNAF observer requirement, which freed FAC(A)s to support a larger number of friendly forces. Unlike the Korean War, the Air Force established large training programs in the United States to help create the required numbers of FACs. This helped to institutionalize the Air Force FAC(A) mission.

Throughout the conflict, FAC(A)s employed different aircraft, sensors, and communications devices to help improve their ability to direct air strikes. In the relatively safer south, FAC(A)s used slower aircraft designed to provide long loiter and maximum lookout. In the relatively more dangerous north, Fast FACs employed high-speed jet aircraft and maneuvered continuously to prevent the enemy from shooting them down. Additionally, as the war continued, enemy ground forces adapted to airborne observation. For instance, the North Vietnamese Army (NVA) stopped using established trails and stockpiles of weapons. Instead, they dispersed their operations and hid among the local population. In response, FAC(A)s armed their aircraft with bombs, rockets, and guns to strike mobile and elusive targets. FACs could then call in additional fighters if friendlies required more ordinance. In sum, each evolution of the FAC mission improved FAC's ability to control air strikes bounded only by the contextual limitations of the period.

The FAC from the Cold War through Operation Enduring Freedom: Networking the Mission

After the Vietnam War, the Air Force and Army shifted to the Soviet threat, which transformed the FAC personnel structure and laid the technological foundation for a networked FAC. To defend Western Europe from the USSR, the Army and Air Force developed the AirLand Battle concept. This entailed using a highly mobile and mechanized armored force along with aircraft to strike an enemy's lines of communication and support. The mobile character of AirLand Battle meant a greater requirement for FACs at lower echelons to prevent fratricide. The Air Force did not have enough officers qualified to integrate at the battalion echelon, only the brigade. To increase personnel, the Air Force opened FAC positions to enlisted personnel, which the service called enlisted terminal air controllers (ETACs). Whereas fighter pilots executed the FAC mission previously, now most FACs were ETACs.

While the Cold War established a diversified FAC force, the evolution to the networked FAC pivoted around the three technologies developed between Operations Desert Storm and Allied Force: remotely piloted aircraft, precision weapons, and distributed satellite communications. Remotely piloted aircraft enabled FACs to distribute the function of finding targets to a dislocated sensor. They provided an elevated viewing position, previously obtained only from airplanes, directly to ground FACs and Army units that made the final decision to strike. This reduced the potential confusion encountered when airborne FACs attempted to describe a target to supported ground personnel. Ground forces could see and validate a target with significantly less confusion.

Precision weapons, specifically the satellite-enabled Joint Direct Attack Munition (JDAM), reduced the requirement for a FAC(A). In

previous conflicts, FAC(A)s saw the target from the position of the supporting aircraft, which improved the strike aircraft's ability to find and destroy the specific target. FACs could determine the best attack angle and any environmental factors inhibiting the final attack, such as sun angle or fog. Since pilots dropped JDAMs from higher altitudes, aircraft did not necessarily see the target. Supporting aircraft merely released the weapon onto designated coordinates. Precision weapons reduced the requirement to describe a target area to supporting aircraft.

Distributed satellite communications comprised the infrastructure for the networked FAC. Prior to OEF, FACs had to remain in contact with either higher headquarters via line-of-sight radio or through an airborne FAC to relay radio communications. Units in the field used satellite radios to ensure that ground FACs could coordinate their own support without traditional radio infrastructure.

During Operation Enduring Freedom, FACs exploited these new technologies to strike the Taliban rapidly with minimal collateral damage. President George W. Bush desired a quick response to the attack on September 11, 2001. Additionally, he wanted to ensure the widest possible support for the war in Afghanistan, so he demanded the careful application of air strikes to prevent civilian death. This led the military to adopt a new method of warfare, which coupled small groups of SOF forces to indigenous forces and coordinated firepower from aircraft. Ground FACs could more easily determine the validity of targets in Afghanistan. Unlike Vietnam, where the United States initially trained a foreign military to conduct its own war, the United States actively targeted the enemy in Afghanistan. Therefore, the best targeting intelligence came from the team on the ground that interacted directly with indigenous forces and could declare targets as hostile.

Initially, networked warfare worked well because ground FACs could call aircraft via satellite radio and then direct strikes with laser-guided marks or GPS coordinates. Additionally, ground FACs could use

RPAs to act as dislocated reconnaissance platforms, which found and tracked targets. During Operation Anaconda, the Army's plan placed too many FACs within too small of an area, which led to a loss of battlespace awareness. The volume of radio calls overwhelmed the communications network, which had operated well when one aircraft supported one ground FAC. Pilots could not talk to ground FACs, who could also not talk to each other due to mountainous terrain. The communication breakdown resulted in an unsafe situation since aircraft could potentially collide with each other or release weapons onto friendly forces.

The Combined Forces Air Component Commander (CFACC) chose to employ traditional A-10 and F-16 FAC(A)s to help organize air support. FAC(A)'s arrived over Operation Anaconda and quickly prioritized which ground units required support. They directed aircraft into safe orbits and provided immediate air strikes when required. They marked targets for other support aircraft while FACs ensured the ground forces required targets struck. Their actions prevented the unnecessary loss of life on the battlefield.

Following Anaconda, FAC(A)s did not flourish as they did in other conflicts. Instead, the Air Force developed communications technology, which continued to increase ground FAC's effectiveness. Furthermore, the Joint Staff consolidated ground-FAC training into the Joint Terminal Air Controller (JTAC) program. This helped prevent the planning problems encountered during Operation Anaconda. It also increased the number of FACs because every service could individually qualify JTACs. As the communications-network capabilities increased in Afghanistan, the capacity to manage larger numbers of ground FACs and their supporting fighters increased dramatically. RPAs provided persistent reconnaissance, which reduced the requirement for manned fighters to loiter for long periods over the battlefield. By the end of the conflict, individual units anywhere in the country could depend on a qualified JTAC to direct close air support within minutes, even if the JTAC was not

collocated with the supported ground forces. JTACs used video from strike aircraft and Predators to maintain awareness of the battlefield and provide clearance to fighters. In OEF, politics provided the desire and technology provided the infrastructure to enable significantly greater effectiveness from ground FACs than FAC(A)s.

The Characteristics of the Modern FAC

Forward air controllers adapt technology and training to the military, political, and environmental factors of conflicts to meet the ground commander's operational requirements. The FAC mission coordinates air strikes in support of ground forces. To accomplish this mission, FACs must find targets, communicate a targets location to supporting fighters, and clear those fighters to release weapons on a target. In Vietnam, the FAC mission evolved into a single airborne platform, which resulted in effective coordination of air strikes within close proximity to ground forces. In Operation Enduring Freedom, technological advances, such as satellite communications and the global positioning system (GPS) provided the architecture to distribute FAC functions to entities other than actual FACs. FACs in Afghanistan acted as an information gatekeeper who coordinated the actions of disintegrated actors that specialized in reconnaissance and communications.

While the FAC mission is highly specialized, it is also highly flexible. Air-and-ground coordination with consideration for environmental, political, and military factors requires an inherently flexible linkage. As a liaison, FACs must meet the needs of both the ground commander and supporting aircraft. To demonstrate this, FACs acclimated to the various contextual environments of WWII, Korea, Vietnam, Desert Storm, the Balkans, and the War on Terror. In each of these conflicts, FACs used available technology to improve effectiveness

and safety within the air-ground system. Moreover, nearly every adaptation improved the FAC's primary mission tasks.

The increased requirement for FACs helped to distribute the FAC mission to dissimilar career fields and platforms, which created a resilient network. By the end of the Vietnam War, the FAC mission resided within a small subset of fighter pilots who primarily operated from the air. After the Vietnam War, the FAC mission started to disperse to a significantly larger personnel pool. During the Cold War, the Air Force adopted the enlisted terminal air controller. In OEF, the Department of Defense (DOD) mandated the JTAC, which created even more FACs. Finally, the Air Force created the Air Liaison Officer (ALO) career field, which opened the FAC career field to non-rated officers. The Air Force disseminated the FAC mission skillset to an ever-increasing pool of qualified personnel and could then draw upon that pool to meet the unique operational requirements of the conflict at hand.

Lastly, the modern networked FAC system is extremely adaptable. As OEF highlights, the FAC mission tasks can flow between different people and platforms due to high levels of interoperability. In OEF, the FAC mission tasks initially resided within a single SOF FAC. By Anaconda, FAC(A)s coordinated higher-than-expected volumes of air support. After Anaconda, JTACs communicated via a robust network and relied upon dispersed reconnaissance tools, such as the RPA, to control high volumes of air strikes. Each of these methods evolved during OEF to reduce fratricide and collateral damage while they increased available air support. The success of the FAC mission resides in the willingness to adapt to the existing situation rather than force existing tactics upon a new problem.

Implications of a Distributed FAC

The history of FACs illustrates that no single solution resolves the complexity faced on the battlefield. The current spectrum afforded to the CFACC ranges from single ground FACs integrated with SOF units to ground FACs connected by a technological system, to FAC(A)s. Each offer different strengths and carry associated limitations in support of different conflicts.

While extremely versatile, the SOF FAC provides a limited capability to control air strikes. Illustrated in OEF, SOF FACs are highly trained and able to coordinate air and ground forces through a wide variety of means. By their nature, SOF FACs do not have the communications resources required to execute a large number of operations within close proximity to each other. Commanders should use SOF FACs in small operations with limited air support required.

Conventional ground FACs provide most of the coordination for large force maneuvers. They bring organizational and technological systems, which can sustain large numbers of supporting aircraft for longer durations. They also integrate at multiple different echelons within the Army and help to advise and assist in providing the best application of airpower for different situations. Illustrated in WWII and Korea, ground FACs should be located with the maneuvering units at the front line to enable the best air support.

FAC(A)s provide for flexible coordination of air support during transitional periods. As illustrated in Korea and OEF, FAC(A)s can provide the required coordination before the supporting ground infrastructure is in place. Additionally, in places where conventional FACs are required but maneuvering, FAC(A)s can act as a supporting element to the ground FAC. Furthermore, in arenas where GPS or satellite communications are denied, FAC(A)s can act as a standalone coordination mechanism unlike SOF FACs or conventional ground FACs.

The distribution of FAC tasks enabled modern FACs to execute the mission from the ground in OEF. Using highly integrated communications and GPS, ground FACs coordinated air strikes within close proximity to ground forces even though many times they were not collocated. The robust system to execute the FAC's three core tasks relied upon GPS, a communications network, and freedom of maneuver or air superiority.

Global positioning satellite technology may help increase effectiveness, but it should not be the cornerstone of a mission. To remain effective in all contexts, FACs must maintain the ability to control air strikes within close proximity to ground forces even while operating in GPS-degraded environments. GPS technology improves the FAC's ability to find the target and communicate it to supporting fighters. GPS requires additional training and exercising, however. As GPS systems become more complicated, FACs must spend time to learn how to use them. This inevitably reduces the amount of time FACs train in fundamental skills. For instance, JTACs practice their skills as directed by a common syllabus, which emphasizes the technological pieces that enable a networked FAC. This includes GPS, laser rangefinders, digitally-aided close air support, datalink systems, and air-strike control from either a fixed site or moving vehicle.[1] The syllabus directs FACs to train with each of these systems along with honing their traditional FAC skills, such as target talk-ons and map interpretation. As FACs become more reliant upon technology, however, basic FAC mission skills can degrade.[2]

GPS does not reduce, but rather increases, the requirement to exercise the entire air-and-ground system. Supporting aircraft rely heavily on FAC-provided GPS coordinates to enable the networked close air-support mission. For instance, GPS weaponry allows aircraft to

[1] "DRAFT: 93 AGOW Operations Training: Joint Terminal Attack Controller Mission Qualification Training (MQT)" (Moody AFB, January 2015).
[2] Capt. John (3 Air Support Operations Group Flight Commander) Meyers, in discussion with author, March 18, 2015.

deliver weapons without ever seeing the target. FACs can describe a target's location with just twelve letters and numbers rather than a verbal talk-on or visual mark. Aircraft must also continue to train in GPS-denied environments. The ability to find a target from a verbal talk-on is a learned skill that pilots and ground controllers must practice. Both FACs and supporting aircraft should exercise with and without GPS capability because they act as nodes in the information network.

Networked FACs rely upon a robust communications infrastructure to effectively coordinate air and ground forces. This infrastructure can take the form of satellite communications, ground station relays, or aerial-communication-relay platforms. Each of these advancements allows more air support to respond faster when needed. Furthermore, datalink relays provide nearly instantaneous situational awareness to both ground and air personnel, which reduces the workload on JTACs. Each additional improvement in communication improves a JTAC's ability to coordinate between air support and a ground commander. It pushes situational awareness out rather than centralizing it with one person, but both air and ground forces must exercise together with and without supporting communications infrastructures.

If the strength of the networked FAC is distributed operations enabled by communications, then the enemy will likely move to deny the use of enhanced communications platforms. Near-peer threats, such as China and Russia, each retain the capability to deny satellite communications through either kinetic means or jamming.[3] Systems like BACN can help augment satellite communications, but they require some access, which enemy states can deny with long-range surface to air missiles. The Air Force should continue to develop methods of distributing the communications network in hostile airspace.

[3] James Clay Moltz, *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests* (Stanford, Calif: Stanford Security Studies, 2008), 53, 179.

Modern networked JTAC's rely upon a system of support to execute the FAC mission. For instance, JTACs relied upon RPAs and shared targeting-pod video to locate and track targets in OEF. To use airborne platforms to support the ground commander assumes some degree of United States air superiority. Stealthy aircraft can deliver JDAMs in hostile airspace, but this method assumes viable GPS and non-maneuvering friendly and enemy forces. Korea, North Vietnam, and Desert Storm demonstrated that lack of air superiority reduces the ability for supporting aircraft to loiter for long periods over enemy locations.

In higher-threat environments, JTACs must use different methods to find and track targets. During the opening days of OEF, SOF JTACs relied primarily upon indigenous forces to provide real-time intelligence. Traditional FAC tactics, such as binoculars, voice descriptions, and laser range finders provided the supporting aircraft with enough detail to find and strike targets. JTACs must continue to train towards GPS- and communications-denied situations rather than fully integrated environments.

Policy Recommendations

Forward air controllers in OEF adapted to the character of warfare as they had during the preceding one-hundred years of close-air-support. Even though many see OEF as a new warfighting paradigm, it is only a variation of warfare, which political, environmental, and military characteristics shape. The Air Force should not eschew traditional methods of coordination to train networked FACs, as a robust GPS and communications system may not always be available.

Rather than view FACs as a person or a platform, policy makers should considered FAC an integrated mission. The most effective FAC capability comes from the inherent flexibility of the parts that make up

the whole. Every conflict since WWI demonstrated that FACs adapt to the operational requirements of war. A FAC's adaptability should not be an excuse to ignore the mission, however. In Vietnam, FACs adapted to the conditions of jungle and counterinsurgent warfare, but it took time – over four years. The geopolitical situation provided the United States enough time to relearn the mission and train the people. The Desert Storm and OEF conflicts did not provide the military time to prepare, however. In both of those wars, policy directed the CFACC to use what was available to execute the mission. As Michael Howard explained of military execution, "What does matter is their capacity to get it right quickly when the moment arrives."[4] In these cases, robust FAC training, which occurred in the interwar years, enabled the force to adapt to the character of conflict easily.

The Air Force is the only service with the capacity to maintain sustained aerial operations to support the Army, and FACs provide the coordination for that support. Therefore, this paper makes two recommendations. First, create a FAC 'center of excellence,' which consolidates and organizes the knowledge and training of air-and-ground coordination mechanisms. A FAC center unifies all Air Force FAC processes, to include platform-specific FAC(A)s, SOF, and conventional FAC forces.[5] Air-to-ground support requires the same specialized training that other missions require. A center of excellence enables the FAC force to continually collect, refine, and distribute FAC best practices to the wider force. A core of air-to-ground specialists could ensure future expansion of capabilities if required. Furthermore, no longer will individual units develop and maintain their own training regimes. A FAC center will help to ensure that the FAC mission at the unit level remains

[4] Howard, "Military Science in the Age of Peace."
[5] At the publication of this paper, the Air Force Weapons School formed the JTAC squadron which currently resides within the A-10C weapons school squadron.

linked to strategy. Lastly, it will help to provide an organizational means of leading dislocated FAC units who live and work with Army forces.

Second, the Air Force should retain the FAC(A) mission as a primary mission for at least one aircraft. The FAC(A) mission requires an aircraft that balances speed, survivability, and armament with a low cost of operations. In future conflicts, sophisticated aircraft, such as the F-35, may be capable of executing the FAC(A) mission, but the cost to sustain high-volume missions in austere locations may prove prohibitive. To remain effective and reduce costs, the Air Force can either create a squadron of ground-support-specific attack aircraft, such as the AT-6 light-attack aircraft, or re-designate multi-role F-16 aircraft as a ground-support specific asset. These two options may be less expensive to operate in lower-intensity conflicts that require a high-volume of coordination and act as a bridge to a future A-X platform. Additionally, this option retains the specialized air-ground coordination knowledge and expertise currently held in the A-10C and F-16 FAC(A) communities. If different capabilities are needed in future conflicts, having the knowledge pool available will enable rapid expansion into other platforms as required. With the reduction in aircraft in the service, it may be easy to assume away the difficulties inherent in the FAC(A) mission. The ability to adapt quickly to new situations comes from the expertise acquired over 100 years. Diffusion of the FAC(A) mission will most likely degrade the United States' ability to operate on the battlefield because close air support pivots on rapid coordination of air-and-ground forces.

Future Study

This paper encountered four additional areas for future study. First, the RPA remains an intriguing FAC platform. The long loiter time coupled with a robust sensor package and organic armament meets many of the requirements for a FAC(A) platform. Furthermore, the RPA extends the networked-FAC concept by enabling a central authority to consolidate a wide range of information from internet, satellite radio, and real-time video to help make informed decisions.

To evaluate a proposal for RPA integration into the FAC mission requires the examination of the three requirements for a FAC, finding the target, communicating the target location to supporting fighters, and clearing fighters to release weapons on the target. Few will argue the effectiveness of the RPA sensor suite. The limitations of a Predator FAC remain within communications and awareness. Currently RPAs carried only one radio. To enable an RPA FAC, the Air Force should add an additional multi-frequency radio for communication with supporting fighters and ground forces simultaneously. RPAs must also track airborne support aircraft through either electronic or visual means. This allows for the appropriate separation between aircraft and ensures they are within weapons release parameters before they drop near friendlies. Another area to explore is the resilience of the RPA-satellite control linkage. RPA operators should continue to practice line-of-sight operations to replace FAC(A)s who can operate in some GPS- and satellite-communication degraded areas. The RPA community must free an appropriate number of people and sorties to train to the FAC mission. This may continue to cause problems, since the RPA career field is already stressed with limited numbers of pilots and aircraft.

Second, this thesis covered only Air Force and Army coordination. Further study is required to see if the same distribution of tasks occurred in the Navy and Marine Corps. Third, the FAC function is moving further from its pilot-centric origin with the creation of JTACs and a professional Air Liaison Officer. Does the elimination of the pilot

affect the airmindedness of the FAC career field? Fourth, how resilient is the communications-and-targeting network created to support ground FACs? Under what communication-degraded conditions will ground FACs no longer be able to identify, track, and coordinate for air support? Examination of these areas of further study will provide a better understanding of methods, strengths, and weaknesses in building coordination networks between air and ground forces.

The Future of the FAC

The movement towards a coordinated FAC-net improves the effectiveness of the close air support mission. In each conflict from WWI through OEF, ground forces enthusiastically championed the efforts of the Air Force to deliver weapons onto fielded enemy forces. Dedicated professionals sought to improve the people, processes, and technologies that enable the FAC mission. In transitioning to a leaner Air Force, policy must embrace the FAC mission as *the* critical link that enables all capable aircraft to support ground forces effectively.

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