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THE IRAQI COUNTERINSURGENCY AIRCRAFT: A MODEL FOR THE FUTURE?

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JCSP 34

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PCEMI 34

Maîtrise en études de la défense

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CANADIAN FORCES COLLEGE — COLLÈGE DES FORCES CANADIENNES

JCSP 34 — PCEMI 34

2007-2008

MDS RESEARCH PROJECT — PROJET DE RECHERCHE DE LA MÉD

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By Maj Mike Barker

ABSTRACT

The United States government conducted a market survey for potential sources to supply a counterinsurgency aircraft for the Iraqi Air Force. The aircraft was to be a modified commercial-off-the-shelf purchase, configured to perform light strike and over watch counterinsurgency operations and have a secondary role as an advanced fixed wing trainer. The aircraft specifications were in some ways a departure from the characteristics of previous counterinsurgency aircraft and those suggested by doctrine.

An examination of the historical use of airpower in counterinsurgency reveals six key mission elements and enablers that contribute to success in the counterinsurgency light strike and over watch mission: reconnaissance and surveillance; convoy escort; precision strike; show of force; build supported nation capability; and the aircraft must be persistent and survivable. The specifications for the Iraqi counterinsurgency aircraft include many historically validated attributes, making an aircraft selected in accordance with them likely to be well suited for the role.

CONTENTS

LIST OF ABBREVIATIONS

CAS	close air support
CF	Canadian Forces
COIN	counterinsurgency
FAC	Forward Air Control
FAS	Fuerza Aérea Salvadoreña (El Salvador Air Force)
GPS	global positioning system
IR	infrared
MANPADS	man-portable air-defence system
NATO	North Atlantic Treaty Organization
PGM	precision-guided munitions
RAF	Royal Air Force
UAV	unmanned aerial vehicle
US	United States
USAF	United States Air Force
VNAF	Vietnamese Air Force

THE IRAQI COUNTERINSURGENCY AIRCRAFT: A MODEL FOR THE FUTURE?

In May 2007, the United States (US) government conducted a market survey for potential sources to supply a counterinsurgency (COIN) aircraft for the Iraqi Air Force. The aircraft was to be a modified commercial-off-the-shelf purchase, configured to perform "critical offensive [attack] and operational over watch" COIN operations and have a secondary role as an advanced fixed wing trainer.[1] The key requirements of the solicited aircraft were: able to loiter at least four hours with a forty-five minute fuel reserve when loaded with two, five hundred pound bombs; equipped with an integrated sensor package able to conduct surveillance and targeting in both the visual and infrared (IR) spectrums with a laser designation capability; able to transmit live, full-motion video to ground stations and other aircraft; armoured against small-arms and equipped with missile warning and countermeasures dispensing systems; and able to deliver both precision and non-precision weapons. The size and performance of the aircraft were constrained by a requirement for it to be powered by a minimum twelve hundred shaft horsepower version of the widely available PT-6 turboprop engine.

Although these key requirements and engine constraint do permit several aircraft configurations to be proposed, what is most notable about the solution space is that it does not permit any of the fixed wing aircraft currently operating in the COIN role in Iraq or Afghanistan, nor any combat aircraft in any North Atlantic Treaty Organisation (NATO) country to be considered appropriate for this role. The engine constraint is the most limiting factor. Jet powered aircraft simply do not qualify for the proposal.

Although several Central American countries are using turboprop aircraft in the COIN

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[1] United States, United States Air Force, "Iraq CounterInsurgency (COIN) Aircraft," Preaward Information Exchange System. https://pixs.wpafb.af.mil/pixs_solicitation.asp?id=5223; Internet; accessed February 21, 2008. The key elements of this document are included in appendix 1 for easy reference.

role, this will be the first time the United States Air Force (USAF) has advocated such an aircraft.[2] The requirement for a modern turboprop shows that the pendulum of thought on COIN aircraft may have swung back from the jet-powered aircraft used in the late 20th century toward the World War Two piston aircraft used in the immediate post-war era. The turboprop solution may bring the best of both technologies to the diverse mission requirements for a COIN aircraft.

Lower cost, less sophisticated aircraft are better suited to the contemporary COIN environment. Modern multi-role fighter and attack aircraft, although capable of performing most of the war fighting tasks required in a COIN campaign, are not the most effective platforms for accomplishing overall COIN mission goals. They were designed for air superiority and ground attack against a modern, industrialized enemy. Their unrivalled capability comes with a high price, but neither are required in COIN operations. The specifications for the Iraqi COIN aircraft reflect a more appropriate mix of capability and an aircraft that meets them should cost significantly less to buy and operate than a multi-role fighter.

This paper begins by exploring the evolution of doctrine and thought on the use of airpower in the COIN role. It will then suggest a list of mission elements and enablers to be considered when selecting an aircraft for the COIN attack and over watch role. This list will be used as a lens through which the employment of airpower in historical and current COIN campaigns will be discussed, validating the list and in some cases establishing criteria for success. Using the mission elements and criteria, an assessment will be made of the proposed Iraqi COIN aircraft's potential in the attack and over watch role in the context of a contemporary

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[2] "EMB-314s for Venezuela," *Flight International* 167, no. 4973 (Feb 22-Feb 28, 2005): 18; "Colombia Revives Light Strike Project," *Flight International* 166, no. 4942 (Jul 13-Jul 19, 2004): 27; "Brazil's Embraer Gets First ALX Export Contract with Dominican Republic Order," *Defense Daily International* 2, no. 32 (Aug 24, 2001): 1; "Brazil Awards $420 Million Contract to Embraer for Super Tucano Aircraft," *Defense Daily International* 2, no. 30 (Aug 10, 2001): 1.

COIN conflict.

Airpower is inherently flexible and can fill many roles when fighting an insurgency. Although medical evacuation helicopters and fixed or rotary wing transport aircraft are invaluable, they will not be considered in this paper; only aircraft and mission elements compatible with the attack and over watch role will be included. Similarly, most airpower functions, however they are defined, can contribute to a COIN mission, but only those applicable to the "critical offensive [attack] and operational over watch" mission requirements of the Iraqi COIN aircraft will be discussed in detail.

The roles of airpower in six COIN conflicts from the last century and the modern insurgencies in Iraq and Afghanistan will be analysed. The historical insurgencies are: British colonial policing between the world wars, the French Indochina War between 1945 and 1954, the Malayan Emergency, the Algerian War, Vietnam during the US advisory period before escalation in 1965 and the civil war in El Salvador.

Modern COIN Airpower Doctrine

Much of modern Western airpower doctrine evolved through the Cold War and was based on lessons learned as they were applied to state-on-state conflict. In recent years, some COIN doctrine has begun to include airpower. An examination of doctrine uncovers some ideas that contribute to an understanding of the use of airpower in COIN.

Canadian Aerospace and COIN Doctrine.

Canadian Forces (CF) Aerospace Doctrine lists five functions that the Air Force is capable of: sense, to develop an awareness or understanding of the environment; shape, to alter the engagement space in the desired manner through the use of force or threatened use of force; move, to tactically and strategically deploy or redeploy equipment or personnel through the air or

rapidly deploy air forces to provide presence or influence; sustain, to provide administrative, organizational, force protection and supporting logistic functions; and command, to lead and control the organization.[3] The Canadian Air Force functions are quite broadly defined, more so than those of the Royal Air Force (RAF), or USAF, but are comparable to the six functions described in Royal Australian Air Force doctrine.[4]

The CF has no air-specific COIN doctrine. The draft Canadian land force COIN doctrine contains a short section on the roles airpower can play in COIN. These include reconnaissance, resupply, close air support (CAS), troop movement and a discussion about the potential of precision-guided munitions (PGM) and the risks of collateral damage. The airpower section is quite short, approximately one page out of 250 in the document.[5] The aerospace and COIN doctrines overlap in their discussion of the air functions of sense, shape and sustain, and the COIN airpower roles of reconnaissance, CAS and resupply or movement.

Of the major Canadian allies, only the USAF has published COIN doctrine for its air force. USAF *Air Force Doctrine Document 2-3, "Irregular Warfare"*, discusses the capabilities that airpower can bring to a COIN conflict. It emphasizes the potential second order effects of the US conducting strikes instead of the supported nation and the importance of avoiding civilian causalities throughout. The USAF COIN doctrine is an excellent primer for air force COIN and can serve as a model for others to build on.

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[3] Department of National Defence, B-GA-400-000/FP-000 *Canadian Forces Aerospace Doctrine* (Ottawa: DND Canada, 2007), 37-47.

[4] Australia, Royal Australian Air Force, Australian Air Publication AAP 1000–D *The Air Power Manual* (Tuggeranong, Australia: Airpower Development Centre, 2007), 113; available from http://www.raaf.gov.au/airpower/html/publications/The%20Air%20Power%20Manual_small.pdf; Internet; accessed February 22, 2008.

[5] Department of National Defence, B-GL-323-004/FP-003 *Counter-insurgency Operations*, July 2007 Final Draft ed. (Ottawa: DND Canada, 2007), chap. 5, 37.

The USAF lists the following COIN airpower capabilities: building partner capacity, collecting intelligence, conducting information operations, providing air mobility, providing combat support functions, precision engagement including both attack and information operations, and providing command and control capabilities.[6]

The US Army and Marine Corps have published *Field Manual 3-24 "Counterinsurgency"* containing an appendix discussing airpower in COIN. Presumably written for non-airmen, it lists several key COIN capabilities of airpower: strike, intelligence collection, information operations, and airlift. It also devotes a section to a discussion of building supported-nation airpower capabilities.[7] The appendix additionally notes the adverse consequences of collateral damage when employing airpower. Although only five pages in a 270-page document, it does provide some insight into what capabilities a soldier expects an airman to bring to a COIN fight. It is reassuring to see that the two sets of American COIN doctrine agree on the capabilities the USAF can bring to a COIN operation.

Existing western airpower and COIN doctrine provides the role aircraft should play during COIN operations and some guidance on how that role should be constrained to avoid injury to the overall effort. As expected, the doctrine does not provide much detail on specific aircraft capabilities but instead focuses on understanding effects and some suggestions about methods. It is of limited use in determining the aircraft characteristics required for success in particular missions or roles.

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[6] United States, United States Air Force, AFDD 2-3 *Irregular Warfare*, (Washington, DC: Government Printing Office, 2007), 27-45; available from http://www.dtic.mil/doctrine/jel/service_pubs/afdd2_3.pdf; Internet; accessed October 08, 2007.

[7] United States, United States Army & United States Marine Corps, FM 3-24/MCWP 3-33.5 *Counterinsurgency* (Washington, DC: Government Printing Office, 2006), appx. E, 1-5; available from http://usacac.army.mil/cac2/Repository/Materials/COIN-FM3-24.pdf; Internet; accessed February 22, 2008.

Evolution of Thought About COIN Aircraft

Since World War Two, there has been something of a tradition of turning advanced training aircraft into COIN aircraft, beginning with the T-6 Texan and most recently with the Embrarer EMB-314 Super Tucano. If the AT-6B version of the modern T-6A Texan II is purchased as a COIN platform, the succession of American trainers to be so employed shall be unbroken. As aircraft and COIN doctrine have evolved, so has the thinking about the characteristics of aircraft selected for COIN.

The British began writing on the use of aircraft in COIN shortly after World War One. Following fighting in the mountainous regions of Iraq in 1923, British Lieutenant Colonel G.P. MacClellan stated that ground forces could be well supported by aircraft performing reconnaissance, convoy escort, supply and communications.[8] In 1928 RAF Wing Commander R.H. Peck addressed the topic of *Aircraft in Small Wars* to an audience of the Royal United Service Institute. The use of aircraft in COIN operations was still in its infancy and aircraft had not yet achieved the degree of specialization that would be seen in World War Two. He noted airpower's ability to respond quickly, to bombard with what he considered precision and their low cost when compared with land forces.[9] He did not discuss specific qualities or missions for aircraft beyond bombardment that would make them more or less suited to employment in small wars.

Written on the cusp of war, the 1940 edition of the United States Marine Corps *Small Wars Manual* differentiates between the reconnaissance, air superiority and attack roles of

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[8] G. P. MacClellan, "Air Co-Operation in Hill Fighting: Kurdistan, 1923," *The Journal of the Royal United Service Institution* LXII, no. 486 (May, 1927): 318.

[9] R. H. Peck, "Aircraft in Small Wars," *The Journal of the Royal United Service Institution* LXXIII, no. 491 (August, 1928): 542-544.

aircraft. It makes recommendations about the relative utility of lighter bombs and machine guns against insurgents compared to heavy bombing or air-to-air combat. It also stresses the value of good communications via radio or visual signals between the aircraft and ground forces. Although the Marines had experience using aircraft in small wars, there is no detailed discussion of distinct aircraft characteristics or capabilities.[10]

There was a lack of American professional thought on airpower and COIN through the post-war 1940s and 1950s. Doctrine remained focussed on conventional war and strategic bombing. The role of the newly independent USAF was one of self-directed action against strategic targets.[11] Aircraft capabilities were tailored to this role and didn't consider COIN.

The USAF began to specifically consider COIN doctrine and techniques in the early 1960s.[12] A 1962 article in *Air Force Magazine* states that COIN aircraft require accurate weapons and long loiter capabilities; they must be simple and reliable for supported nations to use them; two place aircraft will allow for more effective use of handheld cameras; two engines will provide redundancy and propellers have superior performance at low altitudes and speeds compared to jets.[13] A few months later, this was followed up by an article in *The Airman* by Brigadier General Jamie Gough in the USAF Directorate of Operations, who stated that COIN forces must be able to precisely deliver selective munitions to avoid collateral damage, fly low

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[10] United States, United States Marine Corps, *Small Wars Manual*, 1940 ed. (Washington DC: Government Printing Office, 1940), chap. 9, 15-29; available from http://www.maxwell.af.mil/au/awc/awcgate/swm/index.htm; Internet; accessed January 15, 2008.

[11] A good summary of the evolution of USAF COIN doctrine, leading to the release of Air Force Manual 2-5 *Tactical Air Operations, Special Air* Warfare in 1967 can be found in James S. Corum and Wray R. Johnston, *Airpower in Small Wars: Fighting Insurgents and Terrorists* (Lawrence, KA: University Press of Kansas, 2003), 269-271.

[12] Dennis M. Drew, "U.S. Airpower Theory and the Insurgent Challenge: A Short Journey to Confusion," *The Journal of Military History* 62, no. 4 (October, 1998): 812-814; http://www.jstor.org/; Internet; accessed February 10, 2008.

[13] Claude Witze, "USAF Polishes its New COIN." *Air Force Magazine* 45, no. 6 (June, 1962): 49-50.

and slow while circling to observe fleeting targets and be armoured for safety. He echoed a preference for twin engine, two place aircraft.[14]

Discussing COIN in 1963, General Gilbert Pritchard, Commander of the US Special Air Warfare Centre said

> "…[counterinsurgency] does not lend itself to advanced, dynamic technological weapons. So the simplest equipment, the most unsophisticated equipment, is what we are going to employ and teach these people how to use. When you relate lack of technological know-how to the language problem you really have no choice but to use the simplest equipment."[15]

British author and Jane's editor John W.R. Taylor comments in the same article that aircraft still in the design stage such as the Hawker P.1127, the predecessor of the Harrier vertical takeoff and landing jet fighter, would possess "…speed, manoeuvrability, versatility and firepower far beyond those of the present veterans of World War Two and converted trainers," implying their superiority in the COIN role.[16]

Taylor's apparent endorsement of using modern aircraft in COIN runs counter to Pritchard's stance that a simple aircraft is better suited to the mission. Taylor's belief may stem from an assessment that the capabilities of modern fighters will outweigh the disadvantages inherent in trying to have a supported nation operate a high speed, complex aircraft. If so, Taylor is one of the few who have come to that conclusion.

It is important to decide if the aircraft being considered for COIN is to be operated by the supported or supporting nation. Given the importance of building the capabilities of the supported nation, a COIN aircraft should be within their national means. Klingaman asserts that

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[14] Jamie Gough, "Airpower and Counter-Insurgency," *The Airman* VI, no. 8 (August, 1962): 5.

[15] John W. R. Taylor, "Counter-Insurgency Air Force," *The Royal Air Forces Quarterly* 3, no. 2 (Summer, 1963): 83.

[16] *Ibid.,* 88.

supported nations require a "cheap, yet effective, aerial surveillance, reconnaissance and light-strike capability."[17] He later adds forward air control (FAC), convoy escort, perimeter defence and short, primitive airfield operations to his list of required capabilities.[18] One of his key points is that any aircraft used for COIN must be specifically designed for the role, but cost and sophistication must both be minimized.

A 1970 RAND study analyzing insurgencies discusses the use of airpower in an "active defence" role and suggests some generic capabilities for the aircraft to be employed:

> …this active defensive role may be enhanced, in addition, through aerial patrols that maintain round-the-clock surveillance and can apply a heavy concentration of ready firepower in the event of a guerrilla attack. Small aircraft with long loiter times and enough weaponry to counter a light or moderately heavy guerrilla attack effectively may be an important component in this type of active defense system. The main purpose of such an aerial police would be to provide both the symbol and the reality of [the authority's] presence and protection.[19]

It is noteworthy that the study suggests that, in addition to a persistent armed reconnaissance capability, a COIN aircraft should also be able to perform what would now be called a show of force mission by being an embodiment of national power.

In his often-cited book, *The Air Force Role in Low-Intensity Conflict*, Lieutenant Colonel David Dean notes what qualities of specific aircraft made them useful in the USAF advisory role in Vietnam:

> … units used World War II vintage aircraft such as the C-47, T-28, and B-26. These aircraft had proven their ability to operate from remote, primitive bases and had capabilities in firepower, ranges, and cargo capacities useful for counterinsurgency

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[17] Jerome W. Klingaman, "Light Aircraft Technology for Small Wars," chap. 2 in *Low-Intensity Conflict and Modern Technology*, ed. David J. Dean, 123-138 (Washington, DC: Air University Press, 1986), 125.

[18] *Ibid.*, 128.

[19] Nathan Leites and Charles Wolf, *Rebellion and Authority: An Analytic Essay on Insurgent Conflicts* (Santa Monica, CA: RAND, 1970), 83; available from http://rand.org/pubs/reports/R0462/; Internet; accessed March 12, 2008.

operations .[20]

Structural strength is required to operate from remote, primitive bases; it can often be found in training aircraft designed to survive the abnormal loads imposed by student pilots. Similar to previous authors, Dean feels that adequate firepower and range are important in a COIN aircraft.

Since the conclusion of inter-state conflict and beginning of the insurgency in Iraq, the USAF has again been looking at the role of COIN aircraft. The USAF's *Air & Space Power Journal* has published numerous articles in the past several years discussing the role of airpower in COIN. Authors have suggested aircraft ranging from OV-10s to converted crop dusters and armed T-6A Texan II trainers in various forums.[21] At least two papers submitted to the USAF Air Command and Staff College in recent years have suggested armed T-6As be used for COIN warfare.[22]

Much of this recent USAF thinking has been consistent since the Vietnam era. USAF Major Arthur Davis proposed a list of criteria for COIN aircraft in 2005. Table 1, taken from his paper, delineates what he believes are the qualities to look for in a modern COIN aircraft. His list reinforces the suggestions of other authors and specifically includes survivability.

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[20] David J. Dean, *The Air Force Role in Low-Intensity Conflict* (Maxwell Air Force Base, Alabama: Air University Press, 1986), 88.

[21] William Brian Downs, "Unconventional Airpower," *Air & Space Power Journal* XIX, no. 1 (Spring, 2005): n.p. [journal on-line]; available from http://www.airpower.au.af.mil/airchronicles/apj/apj05/spr05/vorspr05.html; Internet; accessed February 25, 2008; Robyn Read, "Effects-Based Airpower for Small Wars: Iraq After Major Combat," *Air & Space Power Journal* XIX, no. 1 (March 01, 2005): n.p. [journal on-line]; available from http://www.airpower.maxwell.af.mil/airchronicles/apj/apj05/spr05/read.html; Internet; accessed October 08, 2007; Christopher Carr, "Low Tech, High Time A Political Scientist Considers COIN Aircraft," *The Wright Stuff* 1, no. 11 (November 16, 2006): n.p. [journal on-line]; available from http://www.maxwell.af.mil/au/aunews/archive/0111/Articles/BLowTechHighTimeAPoliticalScientistConsidersCOINAircraft.html; Internet; accessed February 21, 2008.

[22] Arthur D. Davis, "Back to the Basics: An Aviation Solution to Counter-Insurgent Warfare" (Maxwell Air Force Base: Air Command and Staff College Air University Paper, 2005), 25; available from https://research.maxwell.af.mil/papers/ay2005/acsc/3776%20-%20Davis.pdf; Internet; accessed February 10, 2008.

Table 1: COIN Aircraft Qualities

• Off the Shelf
• Long range and loiter capability
• Diverse weapons carrying capability
• Ability [to] absorb ground fire with a high degree of survivability
• Speed and maneuverability at low to medium altitudes
• Good pilot visibility
• Good navigation and fire control systems
• Short take-off and landing
• Ability to operate from austere airfields

Source: Davis, "Back to the Basics," 25.

Furthering the expansion of the concept of survivability, Major William Downs, a member of a unit with lineage to the Special Air Warfare Centre said

> The ideal [counter-terror]/COIN aircraft for nations with limited resources should be inexpensive as well as simple to maintain and operate yet have a robust intelligence, surveillance, and reconnaissance capability and the ability to strike targets immediately. It should also have long endurance for extended loiters, the ability to operate in rugged terrain, and low detectability.[23]

Although many of Major Downs' characteristics are the same as those suggested in previous eras, he has added the modern concept of "low detectability" to his list. Given the range of technology found in the hands of Iraqi insurgents, recognition of the importance of detectability to survivability is overdue.

COIN doctrine and the accompanying thought about tactical decisions related to the qualities of COIN aircraft have evolved since the end of World War One. Unsurprisingly, the

[23] Downs, "Unconventional Airpower," n.p.

evolution came in fits and starts as the attention of Western air forces swapped between small wars and full scale, major conflict. Despite the gaps, the vector of thought has been relatively straight from between the 1920s and today as the importance of avoiding damage to the civilian population has become more and more important and the capabilities of aircraft in general have improved. As is often the case, it has been the implementation of doctrine and theory that has proven difficult.

ATTACK AND OVER WATCH MISSION ELEMENTS AND ENABLERS

When reviewing the various lists of airpower capabilities and characteristics suggested for COIN aircraft, several emerge that may apply to the attack and over watch missions. A synthesis of the various airpower capabilities and aircraft characteristics called for in the doctrine and writing discussed above produces a set of key mission elements and enablers for a COIN attack and over watch mission: reconnaissance and surveillance, convoy escort, precision strike, show of force, build supported nation capacity, persistent and survivable.

Reconnaissance and Surveillance

The high value of intelligence to COIN operations has long been recognized. The importance of a "complete intelligence system" to the effective use of airpower in small wars was recognized at the highest levels of the RAF as early as 1928.[24] The role of aircraft in conducting intelligence gathering is discussed in the US Marines' *Small Wars Manual* and is now codified in both American and draft Canadian COIN doctrine. [25] By performing reconnaissance and surveillance activities, aircraft can play an important role in building a complete intelligence picture.

Aircrew perform the simplest form of reconnaissance using only their eyes. Current CF manuals direct that visual search and rescue missions should be performed between fifteen hundred and five hundred feet and speeds between 200 kts and 105 kts, depending on the circumstances, when looking for a victim in wooded terrain. [26] Similarly, Klingaman stated that visual reconnaissance and surveillance of insurgent activity can best be performed below fifteen

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[24] Peck, "Aircraft in Small Wars," 550.

[25] United States Marine Corps, *Small Wars Manual…*, chap. 9, 18.

[26] Department of National Defence, SMM 60-115-1003 *C-115 Buffalo Standard Manoeuvre Manual* (Ottawa: DND Canada, 2006), chap. 7, 88.

hundred feet and 125 kts.[27] Clearly, slow speeds and low altitude flight are an asset when conducting visual searches.

Electro-optical sensors can augment an aircraft's capability to perform reconnaissance and surveillance. Modern multi-spectral airborne imaging packages, nine inches in diameter and weighing less than forty pounds, can be installed on most small aircraft. [28] Options enhancing effectiveness, such as allowing the real-time transmission of imagery to a ground station, are also available.[29] Although sensors provide a significant increase in capability over visual searches, they do not necessarily allow searching at any speed. During the Falklands conflict, RAF Harrier pilots reported difficulty with target acquisition when flying low level at high speeds.[30] Klingaman asserts that few jet pilots ever saw their targets during the Vietnam War; it was the FACs in low, slow aircraft that discovered fleeting signs of the enemy and then called in strikes.[31]

High speed is not a requirement in the COIN reconnaissance and surveillance role, and it may be a disadvantage. COIN aircraft must be able to fly low and slow enough to search visually and not overspeed other sensors. Experience has shown that even electronic sensors do not necessarily allow high-speed searches.

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[27] Klingaman, "Light Aircraft Technology for Small Wars," 127.

[28] FLIR Systems Inc, "TALON Product Information Sheet," http://www.gs.flir.com/docs/gs/Documents/TALON.pdf; Internet; accessed March 15, 2008.

[29] Read, "Effects-Based Airpower for Small Wars," n.p.; L-3 Communications WESCAM, "The WESCAM WISARD Digital Microwave System," http://www.wescam.com/products/products_services_2a.asp; Internet; accessed March 15, 2008.

[30] Tim Garden, "Technology Lessons of the Falklands Conflict," chap. 2 in *Low-Intensity Conflict and Modern Technology*, ed. David J. Dean, 113-122 (Washington, DC: Air University Press, 1986), 118.

[31] Klingaman, "Light Aircraft Technology for Small Wars," 127-128.

Convoy Escort

Land convoys are an essential part of any army operation, their purpose being to move supplies, not to engage the enemy. In the late 1920s, the employment of aircraft in support of ground troops on the march was being urged with "considerable energy," although not all writers supported this enthusiasm.[32] The *Small Wars Manual* notes that "tactical reconnaissance" can augment the security measures normally taken by a convoy to avoid surprise and ambush.[33] This could include attacking any insurgents who were discovered during the reconnaissance process. CF COIN doctrine identifies the ability of aircraft to provide over watch for convoys and other operations, but stresses that appearance of the escort may serve as an indicator to insurgents.[34] US Army COIN doctrine discusses the attractiveness of logistics convoys as targets and emphasises the importance of their projecting combat power, including airborne, to appear an unattractive target.[35]

In order to perform a convoy escort mission, aircraft must be able to match the speed of the convoy, either by having a slow enough cruising speed or by manoeuvring. If the over watch is intermittent, the insurgents may simply wait until the aircraft has departed before launching their attack. Commanders must decide if they want escorting aircraft to maintain their presence or only reveal themselves when called upon, depending on the operational situation. Today, helicopter movements augment ground convoys, but cargo helicopters are at risk when arriving and departing landing zones. No matter the tactic, only the close coordination called for in the

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[32] MacClellan, "Air Co-Operation in Hill Fighting," 318-321.

[33] United States Marine Corps, *Small Wars Manual*…, chap. 9, 20.

[34] Department of National Defence, *Counter-insurgency Operations…*, 6-41.

[35] United States Army & United States Marine Corps, *Counterinsurgency…,* chap. 8, 6.

Small Wars Manual will allow efficient coordination of fires and to avoid friendly casualties.[36]

Convoys are unavoidable. Providing air escort for vulnerable ground convoys or cargo helicopters will protect these essential assets.

Precision Strike.

In 1928 RAF Wing Commander R.H. Peck stated, "the bomb today is a weapon of precision," and noted that air action did not cause animosity amongst tribesmen because it was not very destructive.[37] His comments must be considered in light of the comparable weapon of his era, artillery strikes on a village. Despite what would today be considered overconfidence in the precision of airpower, he obviously understood the link between collateral damage and winning a COIN campaign. The ability to precisely deliver ordnance is essential for a COIN aircraft.[38] This is reflected in USAF, US Army and CF COIN doctrine. As one author said, "[a] strike can be considered effective only if the delivered munitions impact upon the enemy alone."[39]

Precision strike can be divided into two main categories: unplanned and planned. Both types require geographic and temporal precision in their delivery of a variety of ordnance.[40] Although a great deal of attention is presently being focussed on the increased use of PGMs in

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[36] United States Marine Corps, *Small Wars Manual*…, 9-28.

[37] Peck, "Aircraft in Small Wars," 543.

[38] Alan J. Vick, Adam Grisson, William Rosenau, Beth Grill, and Karl P. Mueller, *Air Power in the New Counterinsurgency Era: The Strategic Importance of USAF Advisory and Assistance Missions* (Santa Monica, CA: RAND, 2006), 74; available from http://www.rand.org/pubs/monographs/MG509/; Internet; accessed September 30, 2007.

[39] John S. Pustay, *Counterinsurgency Warfare* (New York: The Free Press, 1965), 118.

[40] Corum and Johnston, *Airpower in Small Wars…*, 428.

current operations,[41] historically proven strafing attacks with aircraft mounted guns can be extremely precise and effective against insurgents.[42] Similar qualities are needed in aircraft for either mission, although the increased certainty of locating a planned target sometimes means that aircraft able to deliver a large payload will be used for those operations.

Unplanned strikes include CAS and armed reconnaissance. CAS must be timely to be effective. Aircraft can either be ready for takeoff at a nearby airfield or in an airborne alert posture to be able to respond quickly when ground forces call for assistance. Given the typically geographically widespread nature of COIN operations, there may not be an airfield close enough to the ground operations area to ensure a prompt reaction; thus, it is desirable that aircraft dedicated to CAS in a COIN environment have a long loiter time where they can remain airborne awaiting a mission. CAS also requires good communication with the ground forces to be effective. Although a capable communications suite was far from assured in the early part of the 20th century, modern avionics make communications a straightforward addition to any aircraft.

Armed reconnaissance is a dual-role mission, where aircraft first seek out and then engage the enemy. Although it has long been a part of the COIN mission, it remains challenging. When discussing air action against terrorist groups, a 2003 RAND report highlighted the ongoing difficulties:

…ferreting out individuals or small groups of terrorists, positively identifying them, and

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[41] Eric Schmitt, "Improved U.S. Accuracy Claimed in Afghan Air War," *The New York Times*, April 09, 2002; available from http://www.nytimes.com/; Internet; accessed March 13, 2008.

[42] Alan J. Vick, David T. Orletsley, Randy Boswell, and David A. Shlapak, *Enhancing Airpower's Contribution Against Light Infantry Targets* (Santa Monica, CA: RAND, 1996), 35; available from http://rand.org/pubs/monograph_reports/MR697/; Internet; accessed 08 October, 2007; Christopher Bolkcom and Kenneth Katzman, *Military Aviation: Issues and Options for Combating Terrorism and Counterinsurgency* (Washington, DC: Congressional Research Services, 2006), 34; available from http://digital.library.unt.edu/govdocs/crs/permalink/meta-crs-8470; Internet; accessed February 13, 2008; Thomas R. Searle, "Making Airpower Effective Against Guerrillas," *Air & Space Power Journal* XVIII, no. 3 (Fall, 2004): n.p. [journal on-line]; available from http://www.airpower.au.af.mil/airchronicles/apj/apj04/fal04/vorfal04.html; Internet; accessed February 13, 2008.

> engaging them without harming nearby civilians is an extremely demanding task. Substantial improvements will be needed in several areas before the Air Force can be confident of being able to provide this capability to combatant commanders.[43]

Planned strike requires aircraft able to carry an operationally suitable munitions load to and from the target area; thus payload and range become primary attributes. In an insurgency, aircrew may be required to make the final decision on the suitability of even pre-planned targets, making it important to carefully consider their sensors and training.[44]

Show of Force

Current COIN doctrine does not specifically discuss "show of force" as an element of COIN airpower or any other aspect of military COIN operations. It is not defined in the official NATO Glossary of Terms and Definitions, likely because a show of force does not have much use on a conventional battlefield.[45] It seems to have some similarities to the doctrine of "Rapid Dominance", in that it can affect the will of an adversary to fight without actually fighting.[46] The label has been applied to tactics used in the NATO-Serb standoff over Kosovo in 1998 and is frequently applied in briefings about airpower actions in Afghanistan and Iraq.[47] Wikipedia

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[43] David Ochmanek, *Military Operations Against Terrorist Groups Abroad* (Santa Monica, CA: RAND, 2003), 19; available from http://www.rand.org/publications/MR/MR1738/; Internet; accessed March 12, 2008.

[44] A. H. Peterson, George C. Reinhardt, and E. E. Conger, *Symposium on the Role of Airpower in Counterinsurgency and Unconventional Warfare: The Algerian War* (Santa Monica, CA: RAND, 1963), 58; available from http://www.rand.org/pubs/research_memoranda/RM3653/; Internet; accessed March 02, 2008.

[45] NATO Standardization Agency, AAP-6 (2007) *NATO Glossary of Terms and Definitions (English and French)*(Brussels: NATO, 2007), 2-R-4, 2-S-15; available from http://www.nato.int/docu/stanag/aap006/aap-6-2007.pdf; Internet; accessed March 01, 2008.

[46] Harlan K. Ullman and James P. Wade, *Shock and Awe: Achieving Rapid Dominance* (Washington, DC: National Defense University Press, 1996), 29-32; available from http://www.dodccrp.org/files/Ullman_Shock.pdf; Internet; accessed March 03, 2008.

[47] Jill Dougherty and Gayle Young, "NATO Demonstrates Firepower Over Balkans: Milosevic in Moscow for Talks on Kosovo," http://www.cnn.com/WORLD/europe/9806/15/nato.kosovo/; Internet; accessed March 03, 2008; United States, United States Central Command Air Forces Public Affairs, "Coalition Airpower Shows Force, Tuesday, 09 October 2007," http://www.mnf-iraq.com/index.php?option=com_content&task=view&id=14520&Itemid=21; Internet; accessed March 03, 2008.

calls it “an operation intended to warn or intimidate an opponent and to showcase one's own capability or will to act if provoked.”[48] Although not an official definition, Canadian documents have defined a show of force as a “strong military presence and heavy patrolling.”[49] During the October Crisis of 1970, the military operations order called for the CF to take part “in a symbolic show of force against the FLQ[Front de libération du Québec].”[50]

A more authoritative definition comes from the April 2007 Deputy Commander of the Combined Air Operations Center in Southwest Asia. According to Colonel Gary Crowder, a show of force “is deliberately intended as a deliberate threat to adversary forces in those types of engagements where it may be difficult or problematic to employ weapons.” This is differentiated from a show of presence, occurring at a higher altitude and “provid[ing] a broader reassurance and visible presence to the enemy and to the coalition and civilian population that we are maintaining over watch and sight of that particular problem.” [51]

Despite the lack of a doctrinal or standardised definition, show of force missions continue to be carried out and even specifically trained for.[52] Show of force missions are executed by virtually all combat aircraft in the Iraq coalition fleet and are reported to be successful.[53] In order to perform shows of force, aircraft would need to be able to present a

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[48] Wikipedia contributors, "Show of Force," *Wikipedia, The Free Encyclopedia,* http://en.wikipedia.org/w/index.php?title=Show_of_force&oldid=192775940; Internet; accessed March 03, 2008.

[49] Department of National Defence, "Facts on Exercise Resolute Guard, 5 February 2001," http://www.army.forces.gc.ca/LFWA/Documents/Facts/RG_Fact_Sheet.PDF; Internet; accessed March 02, 2008.

[50] J.O. Dendy, *Aid to the Civil Power, Directorate of History Report CFHQ 19* (Directorate of History: file 78/219, 23 February 1978), chap. 3, 73.

[51] Marcus Weisberger, "USAF using 'Show-of-Force Strategy' More in Iraq, Afghanistan," *InsideDefense NewStand,* April 30, 2007; available from www.insidedefense.com; Internet; accessed March 03, 2008.

[52] *Ibid.*

[53] United States Central Command Air Forces Public Affairs, "Coalition Airpower Shows Force".

credible threat of attack to insurgents. This would include the ability to be seen and/or heard over the target area and the ability to effectively deliver ordnance upon a desired target; thus, an unarmed unmanned aerial vehicle (UAV) at high altitude would likely be less effective as a show of force than a high speed, low-level pass by a B-1 bomber.

Show of force is a COIN tactic not typically found in conventional, attritionist war. Its absence from the NATO lexicon supports the idea that in a large-scale, state-on-state conflict, a commander would not conduct a display in order to avoid future violence when dealing with enemy troops. Although shows of force have played a role in conventional war at the strategic level, with nuclear weapons for example, they are not present in conventional doctrine.

Build Supported Nation Capacity

A significant part of any whole of government COIN effort is that of building supported nation capacity in any number of domains, including such areas as public administration, the judiciary, agriculture, infrastructure management and defence.[54] An air force is a high-visibility, prestigious symbol of national power. Simply that a nation possesses one and insurgent forces almost universally do not, makes it a differentiator in the apparent power of each group.[55] USAF COIN doctrine discusses the importance of allowing the supported-nation to build up an independent air operations capability stating "it is often better for a [supported nation] to use twelve sorties to transport supplies and troops in their aircraft with our assistance than use [US] Air Force assets to do the same mission in two sorties." [56]

States with a COIN problem are often those that can least afford a modern air force.

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[54] Department of National Defence, *Counter-insurgency Operations*…, chap. 4, 3; Vick et al., *Air Power in the New Counterinsurgency Era*…, 38.

[55] Christopher Carr, "Low Tech, High Time," n.p.

[56] United States Air Force, *Irregular Warfare…*, 30.

Although aircraft acquisition costs are almost uniformly high, the acquisition and operating costs of single-engine turboprops will typically be lower than for a similarly sized and equipped jet. This makes turboprops more affordable for troubled states, and may also make them more palatable for outside nations who wish to provide aircraft as assistance.

Assisting a supported nation to build an air force is a multi-dimensional task, but the COIN aircraft used in theatre must support it. In most cases, this would require an affordable aircraft that was relatively simple to operate and maintain. Part of its affordability could come from its ability to perform multiple roles for a fledgling air force. Small air forces have developed unique roles and capabilities for older aircraft in their own small wars. [57] One faculty member at the US Air War College has described his vision of the COIN aircraft:

> The aircraft that can be maintained by the semi-literate, that throbs along at 130 knots but which can loiter for hours, which can land on a dirt roadway and become operationally schizophrenic with the loosening of a few bolts, may not be the thing of which great airpower dreams are made but it is just the type of value-engineered airpower that could be sustained and used by most countries. Technologically, it is light years away from the F22 but in its own context this slow, bare-bones aircraft is as much a war-fighting and war-winning instrument as are the fastest and the stealthiest.[58]

Another part of building the airpower capabilities of a supported nation is training their airmen in flying skills and tactics. Two-seat aircraft make instruction much simpler, but dual-cockpit aircraft have other advantages in the COIN role. Having an onboard observer when conducting reconnaissance may relieve a less-skilled pilot of sensor operation, communication or navigation tasks, allowing him to concentrate on flying. Similar benefits are gained when performing the FAC mission, allowing each crewmember to focus on their respective duties.

The prestige associated with an air force makes it a disproportionately large symbol of

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[57] Corum and Johnston, *Airpower in Small Wars…*, 431-432.

[58] Christopher Carr, "Low Tech, High Time," n.p.

national power. To conserve ever-scarce resources, any aircraft used in the COIN role must combine with other efforts to build the capacity of the partner nation in as many ways as practical.

The following are two key capabilities for enabling the COIN attack and over watch mission. They will not bring success in the COIN campaign in and of themselves, but an aircraft that possesses these capabilities will be far more effective in the role.

Persistent

The *Small Wars Manual* notes that prompt action will often be required on the part of the air force in small wars and it suggests that marching columns will normally have two "infantry planes" with them at all times.[59] These initial doctrinal statements indicate recognition of the importance of a persistent air presence during COIN operations.

This ability to quickly respond when and where required is the essence of persistence in COIN air operations. Although persistence is not specifically identified as a capability in USAF COIN doctrine, it is noted that "[p]ersistence is key to effective operations in IW [insurgent warfare]."[60]

In order for an aircraft to respond in the time period required by ground troops, it will often need to be airborne, awaiting a mission. Without the persistence provided by endurance and/or range, neither a short response time nor wide-area surveillance will be practical. This means that a COIN attack and over watch aircraft should have a long loiter time or endurance and be part of a system that allows airpower to be where and when it is required.

Many authors stress the importance of a "long enough" loiter time, but few define what

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[59] United States Marine Corps, *Small Wars Manual*…, chap. 9, 18, 28.

[60] United States Air Force, *Irregular Warfare…*, 54.

that would be.[61] A 1962 US Department of Defense Research and Engineering report recommended that an aircraft designed for COIN would have a two-hour loiter time with a combat radius of fifty miles, but it is one of the few historical sources detailing specifications for a COIN aircraft and it seems quite low by today's technical standards. [62] For any aircraft, there is a trade-off between the operating environment, various performance requirements and aircraft cost, thus an optimization (or compromise) of desired characteristics is always required.

Aircraft able to operate from short runways are able to partially compensate for short loiter times or endurance. An aircraft that is able to operate from airfields that are closed to traditional jet powered aircraft, either because of the runway length or condition, may be positioned closer to the areas it will be employed. A network of such airfields may allow aircraft to be present on short notice, despite limited endurance.

Airpower is typically centrally controlled as a limited resource. The more limited the resource, the more efficient a system control must be to ensure effective distribution. In COIN as in other types of war, airpower will be much more effective if part of a control network that can ensure aircraft are directed where and when required. Although this added complexity may impede the participation of a less experienced supported nation, the capability is essential to maximizing the benefit of any aircraft involved.

Despite the lack of firm guidance on how long is long enough when it comes to

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[61] Although all of the following discuss the importance of loiter time, none make any specific recommendations: Klingamen, "Light Aircraft Technology for Small Wars…,"; George C. Morris, "The Other Side of the COIN: Low-Technology Aircraft and Little Wars," *Airpower Journal* V, no. 1 (Spring, 1991): n.p. [journal on-line]; http://www.airpower.maxwell.af.mil/airchronicles/apj/apj91/spr91/5spr91.htm; Internet; accessed November 7, 2007; Downs, "Unconventional Airpower…", n.p.; Christopher Carr, "Low Tech, High Time…, n.p.; Corum and Johnston, *Airpower in Small Wars…*, 432; Vick et al., *Enhancing Airpower's Contribution*…, 31.

[62] Wray R. Johnston, "Ends Versus Means: The 6th Special Operations Squadron and the Icarus Syndrome," *Chronicles Online Journal* (February 12, 2000): n.p. [journal on-line]; http://www.airpower.maxwell.af.mil/airchronicles/cc/WJohnson.html; Internet; accessed March 13, 2008.

endurance, longer is certainly better. Factors such as the number of aircraft, their range and endurance, airfield locations and the efficiency with which aircraft can be directed where they are required are all part of the equation.

Survivable

CF Aerospace Doctrine identifies "fragility" as one of the characteristics of aerospace power.[63] An aircraft's likelihood of survival can be enhanced through speed, altitude, manoeuvring, armour or threat mitigation systems. All have been used in the past with varying degrees of success.

The anti-aircraft threat in the COIN environment is typically different than the threat encountered in an interstate war scenario. It will be shown that the most prevalent threat to aircraft has been small arms and light weapons, a threat that aircraft have historically been able to survive with acceptable losses. The spread of easily operated man-portable air-defence system (MANPADS) missiles has introduced a more dangerous threat to COIN aircraft in recent decades. [64] With the cost of these systems as low as five thousand dollars, they are within the means of many insurgent groups.[65]

Modern fighter and attack aircraft are constructed with advanced techniques and materials. This is unavoidable as the aircraft perform at the practical limits of contemporary engineering. Repairing their structure requires advanced engineering knowledge, specialist technicians and tools. A COIN aircraft should have a simpler construction with standard materials and repair techniques. Their more limited performance envelope can be less taxing on

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[63] Department of National Defence, *Canadian Forces Aerospace Doctrine*…, 27.

[64] Vick et al., *Enhancing Airpower's Contribution*…, app. B.

[65] Bolkcom and Katzman, *Issues and Options for Combating Terrorism*…, 5.

the aircraft's structure, allowing a simpler repair process.

It is key that an attack and over watch COIN aircraft embody the five mission elements and two enablers discussed in this chapter. These characteristics will allow the aircraft to play an appropriate role in the overall COIN campaign, beyond that of simply destroying enemy troops and protecting convoys from attack. A shortfall in any of the elements or enablers will need to be offset by other facets of the military COIN operation. As will be shown, these elements and enablers have been present in several COIN campaigns and contributed to their success, even if the conflict as a whole was a failure.

DISCUSSION OF MISSION ELEMENTS AND ENABLERS

British Colonial Policing

The British military had long been responsible for maintaining control of the Crown's colonies around the world. Elements of the air operations used for control in Iraq, Western Africa and the Northwest Frontier in the 1920s and 1930s and Palestine in the late 1930s are instructive. The insurgents were typically local tribesmen led by warlords, unaccustomed to paying taxes or obeying a central, Western-style government. Following the First World War, the RAF was trying to prove its worth as an independent service. The niche it found was keeping order in Britain's remote colonies at a fraction of the cost of conventional army troops.[66] The period is significant because the operations involved were amongst the first that airpower had been used against insurgents following the operational experience gained during the First World War.

Reconnaissance and Surveillance

Between the wars, the British were actively using aircraft to police their territories. Building on the experience gained during World War One using aircraft for reconnaissance, they sent some of the same aircraft abroad to assist with maintaining control in troublesome areas. Aircraft such as the DH-9 were used in Somiland to act as both reconnaissance and light bombing aircraft in support of ground troops. [67] Similarly, during the 1920 Arab rebellion in

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[66] David J. Dean, *Air Power in Small Wars: The British Air Control Experience* (Maxwell Air Force Base, Alabama: Air University Press, 1985), 2-3; available from http://handle.dtic.mil/100.2/ADA215899; Internet; accessed October 08, 2007.

[67] Corum and Johnston, *Airpower in Small Wars…*, 54-55.

Iraq, the RAF had modest success in conducting reconnaissance missions.[68]

The aircraft and equipment employed at the time were primitive by most standards. Ground commanders were sceptical about the ability of aircraft to replace hilltop pickets and lookouts.[69] Despite what was likely a steep learning curve, the tactics were effective enough to allow airpower to continue to develop its capability in the reconnaissance and surveillance role.

Convoy Escort

Early experiences with convoy escort were unambiguous. When British forces had to evacuate a significant amount of stores via rail to the north from Diwaniya, Iraq in 1920, progress was slow because the rails and sleepers had been torn up. As the mile-long train slowly made its way north, two planes overhead were able to deter the six to seven thousand tribesmen surrounding the force.[70] Without the aircraft, the train and supplies may never have completed their journey.

In Palestine in 1936, slightly more modern aircraft were able to provide cover for road convoys in open country. The RAF experimented with various techniques, but experience showed that while one aircraft could monitor several routes from high altitude, the most effective deterrent to attack was flying at low altitude.[71] Unfortunately, this also exposed the aircraft to insurgent ground fire.

In the early days of colonial policing, airpower was able to inspire awe in the remote areas of the world it was beginning to operate in. Its ability to strike was limited and often less

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[68] Mark Jacobsen, "'Only by the Sword': British Counterinsurgency in Iraq, 1920," *Small Wars and Insurgencies* 2, no. 2 (August, 1991): 359; Corum and Johnston, *Airpower in Small Wars…*, 55.

[69] MacClellan, "Air Co-Operation in Hill Fighting," 320.

[70] Jacobsen, "Only by the Sword," 342.

[71] Philip Towle, *Pilots and Rebels* (London: Brassey's, 1989), 50.

than that of the convoy it could be escorting. However, it was beginning to show it could be most effective in the role if it was able to remain close to the escorted convoy.

Precision Strike

Attitudes toward the killing of civilians evolved through the inter-war years. In discussing insurgents while lecturing about the role of aircraft in small wars in 1928, RAF Wing Commander Peck stated "[w]e must burn his home and his goods and chattels and destroy his roof-tree in order to force him to fight; and if the lesson is to last, it must be severe, so we must kill as many as we can."[72] With what was considered precision bomb delivery and an objective of killing as many as possible, airpower would seem to leave little to be desired. Fortunately, this attitude would change.

In Kurdistan in 1931, the bombing of villages was prohibited, as it would build support for the leader of the insurrection. [73] Later during the Palestine uprising in 1936, the government put strict measures in place to avoid hurting civilians. Crews were only allowed to use twenty pound bombs and were not allowed to bomb buildings, even after being fired upon.[74] Crews had to fly below five hundred feet to comply with the level of target discrimination required of them, rendering them vulnerable to ground fire.[75]

Despite a growing unease about injury to civilians and a rising understanding of its impact in a COIN operation, the technology of the day was unable to provide anything like what would be considered a modern precision strike capability. Of 182 bombs dropped on the

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[72] Peck, "Aircraft in Small Wars," 539.

[73] A. G. R. Garrod, "Recent Operations in Kuridstan," *The Journal of the Royal United Service Institution* LXXVII, no. 510 (May, 1933): 231-251.

[74] Towle, *Pilots and Rebels*…, 50.

[75] *Ibid.,* 51.

Northwest Frontier in November 1928, 102 completely missed the villages being targeted.[76] Tactics had evolved around the precision afforded by artillery, thus anything better was an improvement to be commended.

Show of Force

By the time aircraft were in wide use, the British had long been using punitive expeditions in their colonial possessions throughout the world. The missions were intended to bring restless natives in line, but not to destroy them.[77] The mission goal for airborne punitive expeditions was identical.[78] Along with punishing restless rebels, aircraft were used to show the presence of the British state.[79]

Tactics to "provide a show of force to back up the Civil Administration and nip disturbance in the bud," were quickly developed.[80] In 1924, the Air Officer Commanding in Iraq tried to avoid the need to attack the inhabitants and show his strength by staging a public bombing demonstration in front of Iraqi officials and civilians. By dropping the first four bombs within twenty-five yards of the target from two thousand feet, he made an impression on the audience.[81] Similarly, angry mobs in Palestine could sometimes be dispersed by low

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[76] David E. Omissi, *Air Power and Colonial Control: The Royal Air Force 1919-1939* (Manchester: Manchester University Press, 1990), 166.

[77] J. M. Lonsdale, "The Politics of Conquest: The British in Western Kenya, 1894-1908," *The Historical Journal* 20, no. 4 (Dec., 1977): 852,864.

[78] Corum and Johnston, *Airpower in Small Wars…*, 52-53.

[79] Jacobsen, "Only by the Sword," 352.

[80] J.A. Chamier, "The Use of the Air Force for Replacing Military Garrisons," *The Journal of the Royal United Service Institution* LXVI (1921): 207.

[81] Towle, *Pilots and Rebels*…, 19.

overflights.[82] Both of these procedures are close analogues to current show of force tactics.

The link between force and the threat of force was captured by RAF Wing Commander J.A. Chamier in 1921:

> The attack with bombs and machine guns must be relentless and unremitting and carried out continuously by day and night, on houses, inhabitants, crops and cattle…. This sounds brutal, I know, but it must be made brutal to start with. The threat alone in the future will prove efficacious if the lesson is properly learnt.[83]

Build Supported Nation Capacity.

The purpose of colonial policing was to maintain order in the colonies, not bring about a more secure indigenous government. For example, as the independence movement in Iraq gained strength through the 1920s and 1930s, Britain did make some efforts to support the government they had set up, but they were not interested in a truly independent Iraq.[84] They did train the first crop of Iraqi pilots and crews in Britain and provided aircraft,[85] but there was little intent to allow the Royal Iraqi Air Force to become a truly independent force. Building the capacity of the supported nation was not sincerely attempted.

Persistent

The Bristol F.2 Fighter was designed for the closely-spaced trenches of World War One, and was ill-suited to operations in the Middle East; its radius was not much beyond two hundred

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[82] *Ibid.,* 49.

[83] Chamier, "The Use of the Air Force for Replacing Military Garrisons," 210.

[84] Mark Heller, "Politics and the Military in Iraq and Jordan, 1920-1958," *Armed Forces and Society* 4, no. 1 (November, 1977): 81; Federal Research Division, Library of Congress, *Iraq, A Country Study*, ed. Helen Chapin Metz (Washington, DC: The Library of Congress, 1988), 36-37.

[85] Robert Lyman, *Iraq 1941: The Battles for Basra, Habbaniya, Fallujah and Bagdhad*, Campaign 165 (Oxford, UK: Osprey Publishing, 2006), 25.

kilometres when carrying a bomb load.[86] The DH-9 used in Somaliland and Iraq was slightly better, but suffered from an unreliable engine and a limited internal load carrying capability requiring that supplies be hung outside the fuselage, greatly shortening its range and limiting its speed.[87] When discussing the use of airpower to replace army military garrisons in 1921 RAF Wing Commander Chamier said that aircraft must be able to reach the most "inaccessible village".[88] In Iraq, this would have required a three to four hundred kilometre range and endurance to match depending on the dispersion of suitable airfields.

The aircraft conducting colonial policing operations lacked the range and endurance to truly have a persistent presence over the colonies. Their numbers were low and they lacked the communications network required to ensure optimum, timely distribution. Despite these shortcomings, the RAF was able to make enough of an impact during policing operations to ensure their survival as an independent service.

Survivable

A large percentage of the rebels in 1920 Iraq were armed with modern or at least effective older rifles, but no anti-aircraft weapons.[89] The Bristol F.2 Fighter of the day was a successful product of the First World War, and was seen to be "strong, fast and manoeuvrable."[90] The DH-9, also a First World War aircraft, had built upon the success of it predecessor by improving some of the aircraft's geometry, including bettering the pilot's survivability by

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[86] Omissi, *Air Power and Colonial Control…*, 97.

[87] *Ibid.*, 138, 142-143.

[88] Chamier, "The Use of the Air Force for Replacing Military Garrisons," 210.

[89] Omissi, *Air Power and Colonial Control…*, 123.

[90] W. M. Lamberton, *Fighter Aircraft of the 1914-1918 War*, ed. E. F. Cheeseman (London: Garden City Press, 1960), 32.

moving him out from between the engine and fuel tank. Both aircraft were strong enough to survive a rifle shot in non-critical areas, but could be brought down by a single shot into almost any system.[91] With time, tribesmen developed tactics that allowed them to bring down attacking aircraft with massed rifle fire or sharpshooters on nearby mountain peaks.[92] More sophisticated techniques were also employed; guerrillas in Palestine eventually learned how to turn restrictive rules of engagement to their advantage and downed three aircraft on one day in September 1936.[93]

French Indochina

Following World War Two, France was eager to re-establish her international prestige and overseas colonies. Insurgents in Indochina had successfully fought their Japanese occupiers in a guerrilla war and believed they had won their independence. In trying to re-establish its colony, France fought a nine-year war against communist insurgents from 1945 until 1954. The French retreated and left the country after the disaster at Dien Bien Phu, where they suffered huge losses of men and material, including a large number of aircraft. This was the first time a Western nation had been defeated by an indigenous insurgent force. The vacuum created by the withdrawal of the French led to later American involvement in Vietnam.

Reconnaissance and Surveillance

The terrain in French Indochina was covered with layers of jungle canopy obscuring the

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[91] Towle, *Pilots and Rebels*…, 5; Omissi, *Air Power and Colonial Control…*, 122.

[92] Omissi, *Air Power and Colonial Control…*, 124.

[93] Towle, *Pilots and Rebels*…, 50.

ground and any insurgent activity.[94] This made General Chassin, commander of the French air forces in Indochina, want slower airplanes able to fly at a minimum of fifty mph to conduct armed reconnaissance. The general felt that only the Morane-Saulnier 500 Criquet, the French version of the German Storch light observation aircraft, was able to clearly observe any small targets.[95] Spitfires were used early in the conflict for armed reconnaissance along with Catalina flying boats, given their seven-hour endurance and amphibious abilities. A squadron of P-63 Kingcobras was converted for the photoreconnaissance role, effectively mapping the country to assist with land operations.[96]

Convoy Escort

Ambushed French columns were often saved from total destruction by air forces.[97] Strong insurgent forces would decimate convoys without airpower, such as the ground retreat from Cao Bang Ridge along road number 4 in 1950. During that operation, aircraft were assigned to escort the ground troops but bad weather and poor intelligence prevented them from making an impact.[98] Aircraft were also used in February 1952 to cover the withdrawal of troops from the French outpost in Hoa Binh toward the Red River Delta. A mix of B-26 Invader bombers, fighters and light reconnaissance aircraft were employed to support the retreat. Although it was accomplished, the mission was a mitigated success as there were substantial

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[94] Charles Christienne and Pierre Lissarague, *A History of French Military Aviation* [Histoire de l'Aviation Militaire Française], trans. Francis Kianka (Washington, DC: Smithsonian Institution Press, 1986), 462.

[95] G.J.M. Chassin, "Lessons of the War in Indochina," *Interavia* 7, no. 12 (1952): 673.

[96] Phillipe Gras, *L'armée de l'Air en Indochine (1945-1954): L'impossible mission* (Paris: L'Harmattan, 2001), 226-227.

[97] Nhu Tang Troung, *A Vietcong Memoir* (New York: Vintage Books, 1986), 29; Towle, *Pilots and Rebels*…, 115.

[98] Victor Flintham, *Air Wars and* Aircraft (New York: Facts on File, 1990), 256.

French losses and the insurgents' combat ability was not destroyed.[99]

Although the security of their convoy operations did improve, the French never adapted their tactics to account for the skill of the insurgents in mounting effective ambushes on unprotected French columns.[100]

Precision Strike

The French were not overly concerned with avoiding collateral damage through precision strike. Bernard Fall recounts the story of a village being napalmed and strafed because of some stray anti-aircraft fire coming from it. The feelings of the villagers towards the communist insurgents were unknown, although it is difficult to image how they wouldn't feel some affinity for them after a French napalm attack. Fall also recounts the story of a group of Legionnaires discussing some "sassy" villages, deciding that they'd rather have the Air Force "wipe'em off the map" than waste a good platoon on them.[101]

The French were not able to capitalize on the capabilities of aircraft in striking the enemy. They were often unable to get the intelligence needed to strike when and where required, resulting in an inability to destroy troops or cut supply lines. [102] They did use a variety of aircraft in the strike role over the nine years of war, ranging from Spitfires and P-63s to tough to

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[99] Gras, *L'armée de l'Air en Indochine…*, 375-376.

[100] Martin Windrow, *The French Indochina War 1946-1954*, Vol. 322 (Oxford: Osprey Publishing, 1998), 33.

[101] Bernard B. Fall, *Street Without Joy*, 4th ed. (Harrisburg, PA: The Telegraph Press, 1964), 111, 282.

[102] Fall, *Street Without Joy*…, 49, 265; Diego M. Wendt, "Using a Sledgehammer to Kill a Gnat," *Airpower Journal* IV, no. 2 (Summer, 1990): n.p. [journal on-line]; available from http://www.airpower.maxwell.af.mil/airchronicles/apj/apj90/sum90/4sum90.htm; Internet; accessed November 07, 2007.

maintain F-8F Bearcats.[103] B-26s equipped with sixteen nose-mounted machine guns were well employed as light-medium bombers and strafing platforms,[104] but they lacked the firepower to be systematically used to destroy the insurgents.[105] The technique of having lighter aircraft mark targets with rockets, to be used by the French with moderate success in Algeria, was not widely employed in Indochina because of a lack of rockets in the theatre.[106]

Show of Force

The writing about French airpower in Indochina does not contain a discussion of show of force tactics or examples of where they were employed. Although they may have been employed during at some point during the conflict, no record of this could be found.[107] The French did use aircraft to deploy and supply large numbers of airborne troops into fortified Bases Aéro-Terrestres; these remote forts were used to launch and support raids in isolated areas of the country. Thousands of flight hours on the entire fleet of C-47s were used to move battalions of paratroopers into and out of these remote forts. The culmination of this effort was at Dien Bien

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[103] Gras, *L'armée de l'Air en Indochine…*, 320.

[104] Christienne and Lissarague, *A History of French Military Aviation*…, 455-456.

[105] Alexander Zervoudakis, "L'emploi de l'armée de l'Air en Indochine 1951-1952," *Revue Historique De l'Armée* no. 186 (March, 1992): 84, 86; Fall, *Street Without Joy*…, 261.

[106] Gras, *L'armée de l'Air en Indochine…*, 157.

[107] In addition to the works listed in the bibliography, the following works were consulted when searching for evidence of the French use of show of force during the Indochina War: Arnaud Corvisy, "Le général Pierre Fay et le problème indochinois (1945-1954)," *Revue Historique De l'Armée* no. 204 (September, 1996): 106-117; Michel Dupouy, "Les rapports entre l'armée de Terre at l'armée de l'Air en Indochine : 1946-1954," *Revue Historique De l'Armée* no. 177 (December, 1989): 108-121; Patrick Façon, "L'armée de l'Air et la guerre d'Indochine (1945-1954)," *Revue Historique De l'Armée* no. 177 (December, 1989): 95-107; Patrick Façon, "L'armée de l'Air et Dien Bien Phu, 2e partie: La participation a la bataille," *Revue Historique De l'Armée* no. 158 (March, 1985): 79-87; Patrick Façon, "L'armée de l'Air et Dien Bien Phu, 1ère partie: La preparation de la bataille," *Revue Historique De l'Armée* no. 157 (December 1984): 58-64.

Phu, where the base was re-established and eventually supported exclusively by air.[108] Although not specifically a show of force, the demonstration of power when deploying thousands of troops with hundreds of sorties would have met some of the same operational goals.

Build Supported Nation Capacity

The French were trying to retain power over their colonies in Indochina, not simply protect them from Communism. Charles de Gaulle, quoted in Le Monde, declared in 1946 that "[u]nited with the overseas territories which she opened to civilization, France is a great power. Without these territories she would be in danger of no longer being one."[109] Although the French made a small effort to develop a Vietnamese air force, they had not equipped it with any combat aircraft. This small group became the starting point for the South Vietnamese air force to be later developed by the US.[110] Similarly, the French developed a civilian airline industry that was able to augment their airborne resupply capability.[111]

The French were already stretched thin in Indochina. Had they been able to build a local air force, they may have been able to dedicate some of their own resources to other areas and build the perceived power and goodwill of their government at the same time.

Persistent

The initial strike and armed reconnaissance aircraft were Spitfires, able to operate from short airfields but with only a ninety-minute endurance and two hundred kilometre combat

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[108] Flintham, *Air Wars and Aircraft*…, 258-259.

[109] Michael Maclear, *Vietnam: The Ten Thousand Day War* (London: Thames Meuthen, 1981), 30.

[110] Flintham, *Air Wars and Aircraft*…, 262.

[111] Christienne and Lissarague, *A History of French Military Aviation*…, 462.

radius.[112] Mosquitoes offered much longer endurance, but were unable to survive in the local climate and required longer runways.[113] The P-63, introduced in late 1949, was well suited to operations in Indochina. It had a seven hundred kilometre combat radius and was competent in ground attack.[114] The B-26 had had a combat radius of 1100 kilometres and had the flexibility to operate in a number of roles, making it a mainstay of COIN air forces until the US became fully involved in Vietnam.[115]

Their small number of aircraft required wide dispersal to allow a continuous presence over the countryside. The lack of runways and radio navigation infrastructure in the country prevented this.[116] These limitations provided opportunities for unhindered insurgent activity.

Survivable

Unlike in many other insurgencies, the insurgents in Indochina possessed a credible anti-aircraft capability and with it destroyed a considerable number of French aircraft.[117] The Chinese began providing anti-aircraft assistance to the insurgents in 1950, greatly increasing their capability.[118] The toll of insurgent anti-aircraft fire against aircraft flying in and out of the camp at Dien Bien Phu was high, with forty-eight aircraft lost and 167 damaged by enemy

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[112] Christienne and Lissarague, *A History of French Military Aviation*…, 451; Ian Gooderson, *Air Power at the Battlefront: Allied Close Air Support in Europe 1943-45* (London: Frank Cass, 1998), 64.

[113] Corum and Johnston, *Airpower in Small Wars…*, 147; Christienne and Lissarague, *A History of French Military Aviation*…, 452.

[114] National Museum of the United States Air Force, "Bell P-63 Kingcobra," http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=2217; Internet; accessed April 08, 2008.

[115] Leonard Bridgman, ed., *Jane's All the World's Aircraft, 1947* (London: Sampson Low, Marston & Company, 1947), 225c.

[116] Zervoudakis, "L'emploi de l'Armée de l'Air en Indochine…," 80.

[117] Fall, *Street Without Joy*…, 260.

[118] Flintham, *Air Wars and Aircraft*…, 256.

fire.[119] Many of the aircraft were subjected to a concentrated, proficient anti-aircraft artillery barrage on takeoff or landing, something very few aircraft are able to survive.

The wooden and canvas components in the Spitfires that began the war did not stand up well to the environment in Indochina.[120] The aircraft were not terribly resilient; a single bullet could put their liquid cooled engine out of commission.[121] The plywood Mosquito suffered from an environmental unsuitability similar to the Spitfire and was withdrawn from service after only six months.[122] Although both aircraft were able to operate in Europe's climate without difficulty, the different conditions in Indochina were destructive.

The Malayan Emergency

In 1948, the Malayan people voted against independence and to become a federation protected by the British. Chinese communist insurgents who had been forced underground at the end of the war revolted, attempted to take control and topple British rule. The government enacted the "Briggs Plan" to isolate the insurgents from their popular support through community relocation and having the civilian government manage the military counterinsurgency effort. The plan was successful; in 1958 the country became independent and the emergency was over by 1960.

Reconnaissance and Surveillance

Although most of the activity performed by aircraft during the Malayan Emergency was

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[119] Fall, *Street Without Joy*…, 263.

[120] *Ibid.*, 261.

[121] Corum and Johnston, *Airpower in Small Wars…*, 147.

[122] Flintham, *Air Wars and Aircraft*…, 257; Christienne and Lissarague, *A History of French Military Aviation*…, 452.

transport, there was "much work devoted to reconnaissance."[123] Over the twelve years of the Emergency, photo reconnaissance and surveillance work was largely carried out by a mixture of post-war Spitfires and Mosquitoes, later augmented by jets such as the Meteor and Canberra. This effort was essential to completing maps of the undocumented jungle and rural areas of the country that were critical to planning operations later in the campaign.[124] Conditions were such that determining the aircraft's position over areas of uniform jungle was difficult, complicating the mapping effort.[125] A parallel effort to provide tactical reconnaissance to aid ground troops in locating insurgent activity and specific ground features became more important through 1951.[126] Using the highly detailed images, ground commanders were able to order individual troops to investigate specific items of interest. [127]

Visual reconnaissance was conducted primarily by piston engine Austers operating at altitudes between one thousand and three thousand feet. Observers were equipped with binoculars to allow them to spot signs of insurgent camps or agriculture areas.[128] The aircraft cruised at a relatively slow 80 kts, but even this was fast for conducting visual reconnaissance

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[123] Henry Probert, "Malaya: The Start of the Emergency," *Royal Air Force Historical Society Journal* 21, (2000): 11; available from http://www.rafmuseum.org.uk/london/research/journals.cfm; Internet; accessed March 09, 2008.

[124] Malcolm Postgate, *Operation Firedog: Air Support in the Malayan Emergency 1948-1960* (London: HMSO, 1992), 125.

[125] *Ibid.,* 126.

[126] *Ibid.,* 127.

[127] P.E. Warcup in A. H. Peterson, George C. Reinhardt, and E. E. Conger, *Symposium on the Role of Airpower in Counterinsurgency and Unconventional Warfare: The Malayan Emergency* (Santa Monica, CA: RAND, 1963), 68; available from http://www.rand.org/pubs/research_memoranda/RM3651/; Internet; accessed March 02, 2008.

[128] Postgate, *Operation Firedog*…, 130.

over the jungle canopy.[129] With time, pilots would come to know their assigned surveillance areas quite well, such that they would be able to note subtle changes in the jungle that could indicate insurgent activity.[130]

Although aircraft conducting photo or visual searches were not successful at locating insurgents for immediate attack, low, slow visual surveillance by pilots familiar with the areas was critical to locating insurgent activity in the thick jungle.

Convoy Escort

The terrain in Malaya was well suited to insurgent operations. Four-fifths of the country was covered in dense jungle, cutting horizontal visibility on the surface to twenty-five yards or less. Much of the population lived in a strip along the country's western coast. The few roads that cut through the jungle were typically obscured from airborne observation. As a result, there were not many convoys that could be escorted by aircraft. [131]

Precision Strike

A wide variety of post-war propeller and early jet aircraft were used in the strike role. There was poor information on specific targets, frequent bad weather, heavy tree cover over the ground and some of the aircraft lacked bombsights; thus precision strike was virtually impossible. [132] Even contemporary jet aircraft such as the Venoms were only capable of a dive-

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[129] M.W Sutcliffe in Peterson, et al., *The Malayan Emergency*…, 48.

[130] Richard L. Clutterbuck, *The Long Long War: Counterinsurgency in Malaya and Vietnam* (New York: Praeger, 1966), 160.

[131] "The RAF Task Force Malaya: The First Two Months," *The Royal Air Forces Quarterly* XX, no. 2 (April, 1949): 87-88.

[132] Michael Robinson, "Offensive Air Operations: Beaufighter/Brigand," *Royal Air Force Historical Society Journal* 21, (2000): 21-22; available from http://www.rafmuseum.org.uk/london/research/journals.cfm; Internet; accessed March 09, 2008.

bombing accuracy of thirty-five yards, seventy yards if conducting a level delivery.[133]

Two main types of offensive strike, pinpoint and harassing, were used during the Emergency with the emphasis switching back and forth between them as the situation evolved.[134] CAS as employed during World War Two was not a useful tactic in Malaya, as the exact location of the enemy was often unknown, the enemy was not committed to holding ground and radio communication with friendly ground troops was typically not available.[135]

Pinpoint attacks were attempted when there was good intelligence pointing to a worthwhile enemy target. The insurgents soon realized that they were vulnerable to air attack and thus quickly began to disperse and camouflage their activity.[136] Spitfires pressed into the ground attack role in 1948-49 would "cruise round for more than half an hour looking for something resembling [the] briefed objective… Then the first pilot who reckoned he had found it would bomb, and the rest of us would follow and aim at his bursts…"[137] Pilots would do this knowing that they had to avoid civilian structures, as damaging them would "prejudice local goodwill" and potentially cost the pilots £10 for each damaged rubber tree.[138] Given that the hardest part of a bombing operation was finding the target, light aircraft were employed to mark pinpoint targets with flares or smoke for the large bombers to attack. [139]

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[133] G.S. Cooper, "Venoms and Canberras," *Royal Air Force Historical Society Journal* 21, (2000): 31; available from http://www.rafmuseum.org.uk/london/research/journals.cfm; Internet; accessed March 09, 2008.

[134] Postgate, *Operation Firedog*…, 40-41.

[135] *Ibid.*, 41.

[136] *Ibid.*

[137] John Nicholls, "Spitfires and Guerillas," in *Spitfire at War*, ed. Alan Price, 144-147 (London: Ian Allan, 1974), 146.

[138] Probert, "Malaya: The Start of the Emergency," 11.

[139] A.D.J. Garrison in Peterson, et al., *The Malayan Emergency*…, 60.

Large aircraft carried out harassing attacks to disrupt the insurgents' activities and support areas or to force them into closing ground troops.[140] Canberras and Venom jets were used in these missions with some success, but larger, propeller powered medium bombers such as the Lincoln, a derivative of the Lancaster, and the Sunderland flying boats were able to bring a more substantial bomb load to the target area. [141] Sunderlands pressed into bomber service were able to expend 240 twenty pound bombs and thousands of rounds of ammunition on a single mission, [142] while the Lincoln could carry up to fourteen one thousand pound bombs. This bombing effort was effective, [143] but it had the follow-on effect of driving up the cost of munitions to £2 million per year, the cost of one hundred fully equipped Vampire fighters.[144]

The direct contribution of airborne attack to the success of the Malayan COIN effort was limited,[145] but the pressure that aircraft strikes were able to put on the insurgents did erode their morale and was able to increase the effectiveness of ground troops.[146]

Show of Force

The Malayan insurgents learned that aircraft were the instrument of the state, either in the

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[140] Postgate, *Operation Firedog*…, 40.

[141] Cooper, "Venoms and Canberras," 31.

[142] G.H. Gilbert, "Sunderlands – Far East Flying Boat Wing," *Royal Air Force Historical Society Journal* 21, (2000): 34; available from http://www.rafmuseum.org.uk/london/research/journals.cfm; Internet; accessed March 09, 2008.

[143] Sir Michael Knight in "Malaya Discussion." *Royal Air Force Historical Society Journal* 21, (2000): 52; available from http://www.rafmuseum.org.uk/london/research/journals.cfm; Internet; accessed March 09, 2008.

[144] Postgate, *Operation Firedog*…, 45.

[145] Clutterbuck, *The Long Long War*…, 156.

[146] Postgate, *Operation Firedog*…, 73.

form of reconnaissance, troop transport or an impending attack.[147] The Lincoln bomber could be forced to loiter over an area for hours awaiting good weather, but in doing so it had almost the same effect on insurgents as conducting its bombing mission.[148] The deterrent effect of aircraft was also used to dissuade attacks on trains. By having a series of aircraft accompany the train, dropping flares each few minutes, attacks seemed to be prevented.[149] Simply by flying over remote communities, the authorities could show presence and the ability to reach those areas, strengthening the resolve of the inhabitants to resist exploitation by the insurgents.[150]

Build Supported Nation Capacity

In 1949, the RAF planned for the formation of auxiliary fighter squadrons in Malaya, Singapore and Hong Kong to augment the regular squadrons in the Far East and to provide a core for new air forces when the colonies gained independence.[151] They were to be equipped with aircraft similar to the RAF and be trained to fly and perform basic maintenance tasks. Progress on preparing the pilots to transition from training aircraft to combat aircraft such as the Spitfire or eventually jets was extremely slow, and by mid-1958, the three squadrons were only able to perform one percent of the reconnaissance sorties.[152]

The Royal Malayan Air Force was stood up in May 1958, with the remnants of the Malayan auxiliary as its core. Although the Royal Malayan Air Force was given control of all

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[147] Postgate, *Operation Firedog*…, 60.

[148] A.D.J. Garrison in Peterson, et al., *The Malayan Emergency*…, 61.

[149] J.R. Burgess, "Lincolns - 100 Squadron Malaya 1950," *Royal Air Force Historical Society Journal* 21, (2000): 27; available from http://www.rafmuseum.org.uk/london/research/journals.cfm; Internet; accessed March 09, 2008; Postgate, *Operation Firedog*…, 63.

[150] "The R.A.F. Task Force Malaya," 89; Postgate, *Operation Firedog*…, 73.

[151] Postgate, *Operation Firedog*…, 135.

[152] *Ibid.,* 137.

air operations in supporting the COIN effort, its fledgling transport force was only able to deliver a little over one percent of the supplies dropped to support remote jungle camps. The organization remained short of pilots, restricted in flying hours and unprepared to handle its own maintenance. [153]

Persistent

In 1948, the RAF in the Far East was equipped with what were rapidly becoming out of date World War Two aircraft. In some cases, these slower, piston driven aircraft were found to be more suitable for the role than their more modern counterparts. [154] The operational range of the jet powered Venom light bombers was only 370 kilometres, [155] compared to over 1100 kilometres for a Mosquito.[156] The Canberras and Venoms were said to have "too much speed to cruise around looking for [their] targets in hills covered by patchy clouds."[157]

The somewhat out of place Sunderland flying boat was able to fly over virtually the entire country given enough time and stay on station for three hours once there.[158] Similarly, the Lincoln had up to eleven hours of endurance, with three-hour missions being more typical. [159] Australian officers who flew in Malaya expressed a strong preference for the slower, piston powered aircraft that were employed, noting their ability to delay actions once they were

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[153] *Ibid.,* 138.

[154] Probert, "Malaya: The Start of the Emergency," 11.

[155] Cooper, "Venoms and Canberras," 29.

[156] Leonard Bridgman, ed., *Jane's All the World's Aircraft, 1945-46* (New York: The Macmillan Company, 1946), 31c.

[157] Cooper, "Venoms and Canberras," 30.

[158] Gilbert, "Sunderlands," 35.

[159] A.D.J. Garrison in Peterson, et al., *The Malayan Emergency*…, 59; Postgate, *Operation Firedog*…, 48.

airborne and loiter for long periods awaiting weather or specific mission assignments. [160]

Survivable

During the twelve years of the Emergency, there was no ground or air based opposition to aircraft operations. The age of the Spitfire and Mosquito reduced their operational availability rates, but the newer, more complex jet aircraft that replaced them often had worse rates.[161] Some of the problems with jet aircraft were caused by the overheating of their electronics or metal fatigue caused by low, fast flight through the turbulent Malayan air.[162]

The aircraft originally in Malaya had proven their hardiness in the skies of World War Two; despite their age they continued to perform relatively well until they were replaced. The more modern jet aircraft, although well suited to a battle in Europe, were not robust enough to operate as reliably as desired in the conditions on the Malayan Peninsula. [163]

The Algerian War

In 1954, after years of repressive rule and broken promises of reform, Algerian nationalists started a popular insurgency against French immigrants and colonial rule. The Arab nationalists received material support and refuge at bases in neighbouring Tunisia. The French erected a security barrier along the border and successfully cut off the support. Airpower combined with ground forces quickly established control over the border and the country, preventing the insurgents from gathering into large groups. By 1962, when the war was over, close to one million people had died in the fighting. Although a military success, France

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[160] J.C. Hartley in Peterson, et al., *The Malayan Emergency*…, 80-81.

[161] Postgate, *Operation Firedog*…, 31.

[162] A.J. Fookes in Peterson, et al., *The Malayan Emergency*…, 81.

[163] Corum and Johnston, *Airpower in Small Wars…*, 198.

ultimately lost to Algerian independence.

Reconnaissance and Surveillance

The primary role of aircraft in the Algerian War was one of reconnaissance.[164] The effects of the reconnaissance missions were greatest when the flights were quickly followed up with ground troops. Any concentration of insurgents could be surrounded by airmobile or airborne troops and then attacked with bombs, rockets or napalm. [165] A joint, multipurpose radio relay network was created to assist both the air and ground elements to quickly and easily communicate across the country. This relay network made reconnaissance flights more effective by eliminating the requirement for pilots to climb above nearby geography to relay their reports or to receive direction. [166] As with the RAF in Malaya, pilots were assigned specific regions to patrol, thus gaining familiarity with the local pattern of life and flora.[167]

World War Two era T-6 Texan trainers were used with Algerian observers, thus capitalizing on their local knowledge of "normal."[168] This simple procedure allowed the detection of small changes in routine or environment without expensive, modern sensors. MD315 Flamant jets were also used along the flat coast because of their ability to fly low and fast, preventing insurgents from detecting their approach and hiding before being spotted. [169]

The French made excellent use of the resources they had on hand by maximizing the

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[164] J. Mitterand in Peterson, et al., *The Algerian War…*, 22.

[165] Flintham, *Air Wars and Aircraft*…, 81.

[166] Y.P. Ezanno in Peterson et al., *The Algerian War*…, 27.

[167] Y.P. Ezanno in Peterson et al., *The Algerian War*…, 32.

[168] R. Laure in Peterson et al., *The Algerian War*…, 62.

[169] Y.P. Ezanno in Peterson et al., *The Algerian War*…, 33.

local knowledge of their observers and creating an efficient communications network to relay the information they gathered with various aircraft.

Convoy Escort

Aircraft virtually always escorted ground convoys in Algeria and had great success at reducing attacks. In the western part of Algeria, there were only two attacks on convoys that had air support.[170] Similarly, T-6s were used to patrol the railway lines, looking for signs of sabotage. They were able to spot details as small as the condition of individual railway ties.[171]

Algeria was one of the first theatres where a successful, widespread use was made of helicopters in COIN operations. Tactics for this new tool were under development as the war unfolded. It was quickly learned that during their period of vulnerability, when in the landing zone, fixed wing aircraft had to provide escort.[172]

Precision Strike

The French Air Force in Algeria made excellent use of a number of World War Two fighters and bombers in the strike role. These included the sturdy P-47 Thunderbolt, the B-26, the T-28 Trojan and A-1 Skyraider, but the T-6, equipped with machine gun pods, napalm, bombs and rockets was the main air weapon in Algeria.[173]

T-6s or slow moving observation aircraft would often mark targets with rockets. Although this would allow heavier aircraft to see the marked area, any target so marked would

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[170] Y.P. Ezanno in Peterson et al., *The Algerian War*…, 42; R. Laure in Peterson et al., *The Algerian War*…, 61.

[171] J. Mitterand in Peterson et al., *The Algerian War*…, 68.

[172] Y.P. Ezanno in Peterson et al., *The Algerian War*…, 38.

[173] J. Mitterand in Peterson et al., *The Algerian War*…, 21.

quickly attempt to disappear before the real attack came.[174] This lead to the development of armed reconnaissance missions, where aircraft would fill the roles of both searching for and then attacking targets.

Although jet powered fighter-bombers such as the Mistral (the French version of the de Havilland Vampire/Venom) were employed over Algeria with some success, they were too fast to conduct precision bombing. The insurgents knew that if one flew overhead and didn't hit them, it wouldn't be able to turn and attack again with any real chance of success. French pilots, who noted that any insurgents in the area had taken cover by the time the aircraft turned around for a second pass, acknowledged this limitation.[175] One pilot admitted that in 324 Mistral missions, he had only actually seen insurgents on a few occasions.[176]

The French had some success in attacking insurgents directly with aircraft. The importance of armed reconnaissance aircraft to ensure that fleeting targets could be attacked immediately was clear, as was the limited capability of fast jets in a COIN fight.

Show of Force

The constant presence of armed T-6s over the country had a strong deterrent effect on the insurgents, keeping them from assembling in large groups.[177] One commander related the story of a T-6 diving at a group of four armed men. One of them threw away his rifle in surrender,

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[174] François Pernot, "La rébellion et le fait Aérien," *Revue Historique De l'Armée* no. 187 (June, 1992): 88.

[175] Pernot, "La rébellion et le fait Aérien," 89.

[176] Lucien Robineau, "Chasse Lourde Sur Les Djebels," *Revue Historique De l'Armée* no. 187 (June, 1992): 64.

[177] Corum and Johnston, *Airpower in Small Wars…*, 169-170.

anticipating the attack to come.[178] After the war, Algerian insurgents admitted that they would become nervous whenever they heard an aircraft below two thousand feet, anticipating some sort of attack. Aircraft overhead would force them to stop whatever they were doing and hide.[179] Friendly aircraft flying overhead also had a morale boosting effect for French soldiers who were reassured that striking power was nearby when needed.[180]

Build Supported Nation Capacity

Until its independence in 1962, Algeria was considered a part of France. As such, the French had no interest in establishing any independent capability in the nation. There were no efforts made to build an independent Algerian Air Force.

Persistent

The efficient manner in which the French organized their air forces into decentralized sectors achieved a remarkable degree of persistence using T-6s.[181] The T-6 had a moderate combat radius of approximately five hundred kilometres, but the flexible, reliable communications system the French had in place, combined with a huge airfield construction effort,[182] allowed simple aircraft like the T-6 to perform constant surveillance over an area by an on-station relief system.[183]

Other aircraft such as the P-47 were able to spend more than two hours in the air with a

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[178] R. Laure in Peterson et al., *The Algerian War*…, 61.

[179] Pernot, "La rébellion et le fait Aérien," 88.

[180] *Ibid.,* 89.

[181] Corum and Johnston, *Airpower in Small Wars…*, 168-169.

[182] *Ibid., 166.*

[183] Y.P. Ezanno in Peterson et al., *The Algerian War*…, 25.

heavy bomb load.[184] The A-1 was even more capable, regularly spending more than three hours in the air with a bomb and fuel load equal to its empty weight.[185] In comparison, the Mistral was only able to spend approximately fifty minutes away on a mission with a two hundred kilometre combat radius.[186]

France was fortunate to have a relatively large number of T-6s and other aircraft with long combat endurance times and radii. Combining these characteristics with a capable radio network allowed French airpower to be "omniprésente" in Algreia.[187]

Survivable

T-6s were "robust", easy to maintain and cheap.[188] The Algerian insurgents had no effective anti-aircraft weapons, only small arms and a few heavier weapons for which they lacked ammunition. [189] Aircraft losses in general were quite light, but the insurgents did learn how to take down T-6s and helicopters with massed small arms. [190]

The war vintage P-47 was armoured and tough, being equipped with features such as self-sealing fuel tanks and a bullet-proof windscreen. It had the reputation of being resilient and always bringing the pilot back intact,[191] whereas the Mistral was relatively delicate.[192]

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[184] Robineau, "Chasse lourde sur 1es Djebels," 64.

[185] *Ibid.,* 65.

[186] *Ibid.,* 64.

[187] Pernot, "La rébellion et le fait Aérien," 86.

[188] Flintham, *Air Wars and Aircraft*…, 80; Corum and Johnston, *Airpower in Small Wars…*, 167.

[189] Y.P. Ezanno in Peterson et al., *The Algerian War*…, 7; A. Giroult in Peterson et al., *The Algerian War*…, 10.

[190] Flintham, *Air Wars and Aircraft*…, 80-81.

[191] Robineau, "Chasse Lourde Sur Les Djebels," 65.

The insurgents initially seemed to be incapable of mounting a significant anti-aircraft defence with the small arms, but they developed practical tactics that made them into a threat for some aircraft. Simple modifications such as limited armour and fuel tank hardening, coupled with proper tactics, allowed pilots to continue to operate without prohibitive losses.

Vietnam During the US Advisory Period until 1965

Following the defeat of the French at Dien Bien Phu and the Geneva agreements splitting French Indochina into North and South Vietnam, the US began to support the government in the south against communists in the north. In 1961, President Kennedy began to increase US military support for the South Vietnamese government through the deployment of military advisors and Special Forces. This included elements of the 4400th Combat Crew Training Squadron to help the South Vietnamese rapidly improve the combat capability of their air force in a mission code named Farm Gate. The number of American military advisors and trainers in the country continued to grow until the Gulf of Tonkin incident when the US fully committed its forces to war in Vietnam.

Reconnaissance and Surveillance

Slow flying aircraft such as the O-1 Bird Dog, OV-1 Mohawk and various A-1 models were used by US forces in Vietnam to conduct reconnaissance for fleeting targets or searching for the "road with a roof" of insurgent supply lines. [193] The OV-1 was specifically designed for the COIN reconnaissance role with a side-by-side cockpit and bubble canopy to allow a pilot to concentrate on flying at low altitude with an observer to operate sensors and conduct visual

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[192] Flintham, *Air Wars and Aircraft*…, 80.

[193] Edmund B. Edwards, "Air Operations in Vietnam: II," *The Journal of the Royal United Service Institution* CXII, no. 645 (February, 1967): 27.

reconnaissance.[194]

High-speed strategic reconnaissance was carried out by specially configured jet aircraft such as the RF-101, RB-57 and U-2.[195] The USAF also provided three RC-47 Skytrains and eighteen RT-28s to the Vietnamese Air Force (VNAF) in an effort to develop a Vietnamese capability and increase the number of reconnaissance aircraft in the country.[196]

Vietnam saw the first widespread use of modern sensors in a COIN campaign. OV-1s and RB-57s were equipped with IR sensors allowing real-time viewing to locate insurgent cooking fires at night. The information was used in support of artillery and air strike targeting.[197] Low technology sensors were used as well. Photographs taken by observers with handheld cameras were as useful as those taken by more sophisticated machines. Local photo interpreters were used to provide a cultural context to the images and point out significant but minute details that might be missed by an American photo interpreter.[198]

The combination of strategic and tactical, high and low technology reconnaissance and surveillance allowed the USAF and VNAF to conduct the full range of intelligence gathering operations. They were able to maximize their capability by partnering to build on one another's strengths.

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[194] Terry Love, *OV-1 Mohawk in Action* (Carrollton, Tx: Squadron/Signal Publications, 1989), 4.

[195] Flintham, *Air Wars and Aircraft*…, 266-267.

[196] Robert F. Futrell, *The United States Air Force in Southeast Asia: The Advisory Years to 1965* (Washington DC: Office of Air Force History, 1981), 147.

[197] Futrell, *The Advisory Years to 1965*…, 244-245.

[198] W. C. Porter, and W. G. von Platen, "Reconnaissance in COIN," *Air University Review* XV, no. 3 (March-April, 1964): 65-66.

Convoy Escort

The roads in Vietnam were narrow, limited by low capacity bridges and continually sabotaged. The single railway line was also under a continuous threat of sabotage.[199] In 1962, after suffering regular losses to insurgent attacks on virtually every unprotected road and rail convoy, air escort was ordered for all such movements.[200] The new procedure was successful; in the first eight months of 1962, 462 convoys had been ambushed but no air-escorted convoys were attacked for more than a year following the change in procedure.[201] The insurgents were however quick to attack surface movement without air cover.[202] Fixed wing air escort was also provided for helicopters, especially vulnerable when landing or taking off in the jungle,[203] and for marine traffic on Vietnamese rivers, canals and coastal waterways.[204] Convoy escort was typically conducted with one FAC aircraft such as an O-1 and two strike aircraft such as T-28s or occasionally a single B-26.[205] This combination was obviously effective in the convoy escort role.

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[199] P. W. Helmore, "Air Operations in Vietnam: I," *The Journal of the Royal United Service Institution* CXII, no. 645 (February, 1967): 18.

[200] James F. Sunderman, "Air Escort - A COIN Technique," *Air University Review* XV, no. 1 (November-December, 1963): 72.

[201] Jack S. Ballard, Ray L. Bowers, Rowland W. Doty, Robert F. Futrell, William Greenhalgh, Robert R. Kritt, Doris A. Krudner, et al., *The United States Air Force in Southeast Asia 1961-1973: An Illustrated Account*, ed. Carl Berger (Washington, DC: Government Printing Office, 1977), 17.

[202] Futrell, *The Advisory Years to 1965*…, 174.

[203] Mark D. Secord, "The Viet Nam Air Force," *Air University Review* XV, no. 1 (November-December, 1963): 66.

[204] Sunderman, "Air Escort," 68.

[205] *Ibid.,* 72.

Precision Strike

The former British Air Attaché to South Vietnam said in 1966 "I personally have never seen air power so discriminately applied, or so much care taken to avoid errors, often at great tactical disadvantage."[206] The importance of discrimination in ground attack was well understood by the USAF and by extension the VNAF. After a Cambodian village was accidentally bombed in 1962, the Pacific Air Forces issued a message:

> We must exercise the greatest possible control and discretion to assure that we achieve our objectives without undue or unnecessary alienation of the civilian populace. If we are to avoid the imposition of highly limiting controls on the application of Farm Gate, we must make every effort to avoid another incident and, in addition, demonstrate the effectiveness of our control and ability to discriminate in the selection and designation of targets as well as in the conduct of air strikes.[207]

Much of the strike effort was conducted by A-1s and T-28s.[208] The B-26 continued in service because of its short takeoff and landing capability, armour, and nine hundred kilometre range while carrying eight thousand pounds of bombs at speeds slow enough to allow precision bombing.[209] The importance of precision bombing had been grasped by both air forces in Vietnam, and they had the capability to limit collateral damage while attacking the enemy.

Show of Force

In 1962 the VNAF had only a limited capability to operate at night. Flare missions were flown because the insurgents frequently operated after dark. "Flare and strike" missions were often conducted where AC-47 gunships would drop flares to illuminate targets for VNAF strike

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[206] Helmore, "Air Operations in Vietnam: I," 21.

[207] Futrell, *The Advisory Years to 1965*…, 120.

[208] Dean, *The Air Force Role in Low-Intensity Conflict*, 88.

[209] Robert D. Johnston, "The Invader Returns," *Air University Review* XV, no. 1 (November-December, 1963): 10,13,14.

pilots. This tactic worked well; eventually the insurgents would scatter as soon as flares were dropped over them.[210] The inevitability of air attack after being spotted led to a situation where insurgent attacks would be called off after spotting an O-1 light observation plane over a convoy.[211]

Shows of force proved to be very effective in Vietnam. Small aircraft were able to achieve the desired effect without needing to actually attack a target; harmless flares were able to dissuade attacks. Given the potential adverse consequences of bombing during an insurgency, using effective shows of force becomes an attractive option.

Build Supported Nation Capacity

Before fully engaging in the Vietnam War, the US expended considerable effort to build the capacity of the Vietnamese to defend themselves against the insurgents. The details of how the Farm Gate operation was run, its successes and faults are outside the scope of this paper. What is relevant is that the combat modified T-28 was selected to be the primary attack aircraft that the USAF would use to train the fledgling VNAF. The two-seat aircraft was manoeuvrable, with an easy to handle tricycle landing gear and was able to carry a significant bomb load over a useful range. The qualities of forgiveness, simplicity and sturdiness, essential in a trainer, were an asset for an aircraft to be employed by non-US personnel in training and combat from jungle landing strips. The same aircraft was used to support clandestine air operations and the training of the Royal Laotian Air Force in Laos in 1964.[212] It was hoped that the simplicity of the T-28

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[210] Ballard et al., *An Illustrated Account*, 15; Secord, "The Viet Nam Air Force," 66.

[211] Sunderman, "Air Escort," 73.

[212] Michael E. Haas, *Apollo's Warriors: USAF Special Operations during the Cold War* (Maxwell Air Force Base, Alabama: Air University Press, 2000), 177; available from http://aupress.maxwell.af.mil/Books/Haas/Haas.pdf; Internet; accessed 30 September 2007.

would allow the VNAF ground crews to quickly gain proficiency; but in 1962 they would take between two and three hours to turnaround an aircraft between missions, rather than the US average of less than an hour. Similar performance was noted in other maintenance tasks.[213]

As the wartime demands for airpower increased however, insufficient VNAF pilots were available to fly the increasing number of T-28s. To remain compliant with the December 1961 Joint Chiefs of Staff order that all Farm Gate aircraft would fly with at least one South Vietnamese national on each flight for training purposes, American pilots ended up flying with unqualified Vietnamese air force cadets or non-commissioned officers in their back seats.[214] The focus on training VNAF personnel to fight their own war had obviously been lost, despite Secretary McNamara's direction that Farm Gate aircraft were "to be used for training and operational missions in South Vietnam with Vietnamese riding rear seats."[215]

The B-26 and C-47 were the other aircraft used to develop the VNAF combat capability. Both World War Two designs were modified for the COIN role. The B-26 was employed primarily in bombing & reconnaissance missions, while the C-47 was used as a flareship, gunship, tactical transport, air ambulance and reconnaissance platform.[216] The Vietnamese C-47 units were frequently stripped of their most experienced pilots to build the strength of the T-28 strike units.[217] They suffered from a similar dilution of their training mission; one American pilot recalled that the Vietnamese were "never allowed anywhere near the controls of the

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[213] Futrell, *The Advisory Years to 1965*…, 132.

[214] Darrel Whitcomb, "Farm Gate," *Air Force Magazine,* December, 2005, 85, 87; available from http://www.afa.org/magazine/dec2005/; Internet; accessed March 21, 2008.

[215] Futrell, *The Advisory Years to 1965*…, 83.

[216] *Ibid.,* 325, 328, 334, 340.

[217] *Ibid.,* 110.

aircraft."[218]

The aircraft the USAF used were appropriate for the role and exhibited most of the qualities desired in a COIN aircraft used to develop the capacity of a supported nation. The USAF made a legitimate effort to build a VNAF, but in their efforts to accomplish the combat mission they lost focus on the importance of having the VNAF defend their own country. This led to an over-reliance on USAF personnel in all aspects of the development process.

Persistent

A number of techniques were used to ensure aircraft were available when and where required. C-47s would perform "Night Angel" operations, where they would loiter all night over insurgent areas, ready to begin dropping flares should there be an attack.[219] Holding aircraft on "ramp alert" for convoy escort operations did not provide a quick enough response to requests for assistance. An airborne over watch system was used instead with good results.[220] The specific technique employed depended on the specifics of the mission and the aircraft available.

The USAF set up a tactical air control system to provide centralized planning, direction and control of air operations in an attempt to improve the overall coordination and allocation of airpower in the country. Communications are key to any such system, but it took nine months for the proper equipment to be brought into the country and installed.[221]

The aircraft being employed had the endurance required to allow the system to work.

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[218] Whitcomb, "Farm Gate," 85.

[219] Secord, "The Viet Nam Air Force," 66.

[220] Sunderman, "Air Escort," 72.

[221] Futrell, *The Advisory Years to 1965*…, 107.

The T-28 had a 320 kilometre combat radius when carrying a full bomb load.[222] The A-1, brought into service to replace the T-28s, was even more capable; able to take off fully loaded from short airstrips with a combat radius of 2400 kilometres.[223] The OV-1 had an operating radius of approximately one thousand kilometres and 4.5-hour endurance when carrying external tanks and sensors for an IR reconnaissance mission.[224]

Survivable

Despite contemporary claims by some that "jungle rebels are not equipped with ack-ack",[225] the Vietnamese insurgents possessed a credible anti-aircraft capability. The insurgency was described by RAF Group Captain Helmore, the British Air Attaché to South Vietnam as "…so well armed and trained with modern automatic light weapons that it has developed a formidable low level anti-air capability."[226] In 1963 the insurgents were given better anti-aircraft weapons from Russia and China, plus they established anti-aircraft training cadres and improved their tactics. These changes led to at least a fourfold increase in anti-aircraft incidents and a tenfold increase in the aircraft loss rate suffered by the Americans and their allies. [227]

FACs were equipped with light O-1s, but they were vulnerable to enemy fire in these

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[222] *Ibid.,* 79.

[223] Futrell, *The Advisory Years to 1965*…, 221; Leonard Bridgman, ed., *Jane's All the World's Aircraft, 1957-58* (Toronto: The McGraw-Hill Company of Canada, 1957), 289.

[224] John W. R Taylor, ed., *Jane's All the World's Aircraft 1972-73* (New York: McGraw-Hill Book Co., 1972), 327.

[225] Witze, "USAF Polishes its New COIN," 49.

[226] Helmore, "Air Operations in Vietnam: I," 17.

[227] Futrell, *The Advisory Years to 1965*…, 285; Helmore, "Air Operations in Vietnam: I," 25.

fragile planes. [228] The O-1s were augmented by the more capable, twin turboprop OV-1 in 1962. It was equipped with machine guns and could be configured with various sensors including IR, day/night photography and side-looking radar.[229] Two engines were specified during its acquisition process to enhance survivability.[230] The aircraft had an armoured cockpit, a bullet resistant windscreen and was inherently quiet in flight. Its robustness led the insurgents to offer a reward to anyone who shot one down.[231]

The A-1 had begun its career during World War II and then served in Korea. Battle damage data gathered during its service life was incorporated into the design of armour panels in the early 1950s. The six hundred pound set of plates, designed to withstand .50 cal and 20 mm cannon fire, covered the bottom and back of the cockpit, key areas around the engine and fuel cells and part of the fuselage. The installation was successful, as when the modification went into combat in 1952, the loss rate decreased significantly.[232]

The aircraft used in Vietnam were susceptible to a trained insurgent anti-aircraft capability. The survivability of the aircraft was improved by hardening the aircraft against the sorts of weapons they were expected to encounter in theatre. The lesson of the A-1 is particularly relevant; by adding only six hundred pounds of armour to an aircraft, its survivability against a robust anti-aircraft defence was greatly improved.

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[228] Helmore, "Air Operations in Vietnam: I," 22.

[229] Taylor, *Jane's All the World's Aircraft 1972-73*…, 326.

[230] Love, *OV-1 Mohawk in Action*, 4.

[231] Carolinas Aviation Museum, "Grumman OV-1D Mohawk Serial 62-5890 / N1209P," http://www.carolinasaviation.org/collections/aircraft/ov1d-62-5890.html; Internet; accessed March 21 2008; Love, *OV-1 Mohawk in Action*, 5, 34, 36.

[232] Rosario Rausa, *Skyraider: The Douglas A-1 "Flying Dumptruck"* (Annapolis, MD: Nautical & Aviation Publishing Co., 1982), 91-93.

Civil War in El Salvador

In the 1970s, El Salvador was a poor country run by an oppressive government. The success of rebels in Nicaragua encouraged leftist insurgents in El Salvador to launch their own war in 1980. Although the crackdown was repressive and violent, the Carter administration stepped in to avoid an insurgent victory. The Reagan administration continued the support, providing billions of dollars of aid, military equipment and government training. This COIN campaign used relatively modern equipment on both sides including jet aircraft and surface to air missiles. The bloody civil war ended with a peace settlement between the insurgents and government in 1992.

Reconnaissance and Surveillance

The El Salvador air force, the Fuerza Aérea Salvadoreña (FAS), was equipped with the Cessna O-2A Skymaster for reconnaissance and surveillance. The O-2A was the USAF's replacement for the O-1. With twin engines in a novel front/back arrangement, the aircraft had the performance and range to visually survey much of the country. This limited capability was augmented during the civil war by American aircraft operating out of nearby countries, including AC-130s searching for insurgent supply routes at night using sophisticated IR and visual sensors and US Army OV-1s conducting electronic reconnaissance.[233] This augmentation was part of an effort to unequivocally prove the origin of foreign support for the insurgents, but it was ultimately unsuccessful.[234]

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[233] Norman J. Brozenick, "Small Wars, Big Stakes: Coercion, Persuasion, and Airpower in Counterrevolutionary War," (School of Advanced Airpower Studies, Air University, 1998), 165; available from http://www.maxwell.af.mil/au/awc/awcgate/saas/brozenick_nj.pdf; Internet; accessed October 08, 2007.

[234] Max G. Manwaring and Court Prisk, *A Strategic View of Insurgencies: Insights from El Salvador* (Washington, DC: Institute for National Strategic Studies, 1990), 10; available from http://handle.dtic.mil/100.2/ADA271343; Internet; accessed February 06, 2008.

A mix of simple visual searches and sophisticated sensors can be employed together to provide a comprehensive intelligence picture, but insurgents have repeatedly proven themselves able to hide from or camouflage themselves virtually any sensor. Advanced sensors, while an asset, are no guarantee of mission success.

Convoy Escort

El Salvador is a mountainous country with bad roads. The government was able to move many of its troops with helicopters, thus avoiding the danger of ambushes.[235] The insurgents did attempt to disrupt the national road network in an effort to decrease the perceived power of the government. They would announce blockades in specific areas and then burn or confiscate all the vehicles they stopped. The government successfully countered this tactic through the use of armoured columns and patrols of helicopter gunships.[236]

Precision Strike

The FAS was given combat-converted jet trainer A-37B Dragonflies and AC-47 gunships by the US to use in the precision strike role, but the government of El Salvador was not averse to civilian casualties. In 1989, when the insurgents gained control of parts of the capital city, Air Force generals ordered planes to drop their bomb loads on civilian neighbourhoods and targets.[237] Avoiding civilian injuries because of imprecise bombing was obviously not a concern. In any case, the FAS was not proficient enough with the A-37, a plane that is difficult

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[235] Corum and Johnston, *Airpower in Small Wars…*, 336.

[236] Moroni Bracamonte and José Angel, *Strategy and Tactics of the Salvadoran FMLN Guerrillas:Last Battle of the Cold War, Blueprint for Future Conflicts* (Wesport, Conn.: Praeger, 1995), 29.

[237] Saul Landau, *The Guerrilla Wars of Central America: Nicaragua, El Salvador and Guatemala* (London: Weidendeld and Nicholson, 1993), 140.

to bomb accurately with, to achieve a real degree of precision in their bombings.[238] Simpler weapons, such as the machine guns on AC-47s, were more effective with the limited proficiency of the FAS than more complex and demanding weapons systems such as the A-37, despite the jet's greater potential.

Show of Force

The government of El Salvador failed to adapt its conventional tactics to the COIN conflict it was fighting. This failure led to a fixation on not losing battles against the insurgents, rather than winning the COIN war.[239] The conventional war mindset prevented the FAS from employing shows of force, a tactic largely intended to dissuade insurgents, rather than actually defeat them. If the insurgent didn't attack, the FAS was unable to find and kill them. Having failed to understand the techniques required to win a COIN war, this shortcoming was unavoidable.

Build Supported Nation Capacity

El Salvador was the recipient of over $6 billion in aid from the United States.[240] Approximately $250 million of that went to the FAS.[241] The Americans had to balance the importance of stemming the tide of Marxist insurgent support in Central America with the

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[238] Corum and Johnston, *Airpower in Small Wars…*, 348.

[239] Hugh Byrne, *El Salvador's Civil War: A Study of Revolution* (Boulder, CO: Lynne Rienner Publishers, 1996), 157-158.

[240] Benjamin C. Schwarz, *American Counterinsurgency Doctrine and El Salvador: The Frustrations of Reform and the Illusions of Nation Building* (Santa Monica, CA: RAND, 1991), v; available from http://www.rand.org/pubs/reports/R4042/; Internet; accessed March 12, 2008.

[241] Charles Lane, "The Pilot Shark of El Salvador," *The New Republic* 203, no. 13 (Sep 24, 1990): 27.

realisation that the solution to the war in El Salvador was a political one.[242] The Report of the National Bipartisan Committee on Central America recommended that the military aid be tied to progress toward democratic goals designed to reduce the support of the insurgents and increase that of the government, so the military portions of the aid were tied to political and human rights reforms in the country.[243] The link between reforms and aid made it difficult for the government of El Salvador to rely upon American support. The government became hesitant to commit the expensive FAS to battle, lest it use all its ammunition or lose aircraft that would not be replaced. For a time, the FAS was an insurance policy, guaranteeing that the government would not lose, but it was not being used to win.[244]

Having taken lessons from their experience in Vietnam, the US had firm limits on the number of USAF personnel who could be in the country. No more than fifty-five USAF members could be assigned to the military advisory group. This forced the FAS to conduct operations on its own rather than being able to rely upon Americans. Pilots and technicians were trained either in the US or in Panama at the Inter-American Air Force Academy.[245] The training program had trouble keeping pace as the aircraft inventory of the FAS was quickly built up.[246]

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[242] Schwarz, *American Counterinsurgency Doctrine and El Salvador*…, 10.

[243] Henry A. Kissinger, *Report of the National Bipartisan Commission on Central America* (Darby, PA: Diane, 1998), 104.

[244] Colonel John Ellerson in Max Manwaring and Courtney Prisk, eds., *El Salvador at War: An Oral History* (Washington, D.C.: National Defense University Press, 1988), 306.

[245] James S. Corum, "The Air War in El Salvador," *Airpower Journal* XII, no. 2 (Summer, 1998) [journal on-line], 31-32; available from http://www.airpower.maxwell.af.mil/airchronicles/apj/apj98/sum98/corum.pdf; Internet; accessed February 06, 2008.

[246] A. J. Bacevich, James D. Hallums, Richard H. White and Thomas F. Young, *American Military Policy in Small Wars: The Case of El Salvador* (Washington, DC: Pergamom-Brassey's International, 1998), 32.

By the last years of the 1980s, the size of the FAS fleet had more than doubled.[247] A large training cadre was required to accommodate such enormous growth, but the ceiling on the number of USAF personnel in the country prevented any such cadre from being established.[248] Even when FAS crews returned home from their foreign training, they were unable to maintain proficiency in the multiple types of aircraft they needed to fly.[249]

The AC-47 was very effective during the civil war in El Salvador, primarily because the FAS had experience with the type before the beginning of the conflict.[250] Its three .50 cal machine guns were simple to operate and the 40 year-old design was easy to maintain. The FAS had difficulty operating the more modern aircraft in their inventory, partially because of the lack of competent mechanics, the disdain shown toward maintenance by the officer corps and the tendency for skilled mechanics to leave the military for higher paying civilian jobs.[251] There was limited training available to replace FAS personnel because of the US requirement for English language skills when training in America. There were also significant delays before Spanish advanced aircraft courses were provided in Panama.[252]

The lesson that can be drawn from this conflict is that without an indigenous training capability and the ability to sustain aircrew and technician proficiency, building up the air force of a supported nation is extremely difficult. Either a dedicated training and support corps needs to be assigned until the supported nation capability is firmly established, or aircraft already

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[247] *Ibid.,* 5.

[248] Corum and Johnston, *Airpower in Small Wars…*, 347.

[249] *Ibid.*

[250] Corum, "The Air War in El Salvador,"33-34.

[251] *Ibid.,* 36.

[252] *Ibid.,* 38.

familiar to the supported nation should be used in the augmentation effort. This problem is further complicated when aircraft are more sophisticated than those that the supported nation's personnel are already familiar with.

Persistent

The O-2, with a two thousand kilometre range, was able to patrol the entire country without needing a large number of airbases.[253] The long endurance of the AC-47 provided it with a similar capability. The A-37, designed as a training aircraft, had a much more limited combat radius of approximately 350 kilometres,[254] but even this was useful in a country as small as El Salvador.

A larger problem related to providing a persistent umbrella of air cover was the poor operational availability of the FAS fleet, because of problems discussed above. Although equipped with over one hundred aircraft in 1985, only fifty percent or fewer were ever ready to be flown at any time.[255] Without trained crews and ready aircraft, a persistent presence can never be maintained.

Survivable

The Cessna Company originally conceived the O-2 as a civilian airplane. It was adapted to military use by the addition of armour plates to the cockpit, anti-explosion foam to the wing fuel tanks and a fire detection system. This combined with the addition of wing pylons for stores and associated modifications converted a civilian aircraft into a capable military observation and

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[253] John W. R. Taylor, ed., *Jane's All the World's Aircraft 1977-78* (New York: Jane's Yearbooks, 1977), 278.

[254] Taylor, *Jane's All the World's Aircraft 1977-78*…, 277.

[255] Corum, "The Air War in El Salvador," 34.

light strike platform that was used for over twenty years.[256]

At the beginning of the conflict, the insurgents were only equipped with .50 cal machine guns and small arms for anti-aircraft defences.[257] The A-37s and AC-47s had been largely immune to small arms until the insurgents obtained SA-7 and SA-14 missiles in 1990.[258] Despite the missiles and their lack of any countermeasures equipment, the A-37s were able to continue to operate successfully in the newly threatening environment.[259]

El Salvador proved that small, manoeuvrable aircraft could be operated against an insurgent adversary equipped with surface to air missiles, despite not being equipped with modern countermeasures systems. Although faster aircraft, operating at higher altitudes will have a greater chance of defeating missiles, a nation at war for its survival may be willing to accept a greater risk to its pilots.

Modern Insurgencies – Iraq and Afghanistan

The forces fighting the current COIN campaigns being waged in Iraq and Afghanistan are equipped with some of the most capable contemporary aircraft. As is typical in a COIN campaign, the insurgents are completely unable to match the technology of the pro-government forces. Despite being outclassed, the insurgency has been able to carry on for more than five years. Most modern airpower capabilities are being employed to some degree in both theatres;

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[256] "History of the Skymaster," http://www.skymaster.org.uk/history.asp; Internet; accessed March 22, 2008.

[257] Corum, "The Air War in El Salvador," 30.

[258] Lindsey Gruson, "Missiles Give Salvador Rebels a New Advantage," *The New York Times*, December 10, 1990. Available from http://www.nytimes.com/; Internet; accessed March 23, 2008.

[259] Vance C. Bateman, "The Role of Tactical Air Power in Low-Intensity Conflict," *Airpower Journal* 5, no. 1 (Spring, 1991): n.p. [journal on-line]; available from http://www.airpower.maxwell.af.mil/airchronicles/apj/apj91/spr91/6spr91.htm; Internet; accessed November 7, 2007.

the mission elements and enablers discussed in a historical context above will be analysed further.

Reconnaissance and Surveillance

This element is being performed by a wide variety of aircraft with an equally wide range of capabilities. UAVs such as Predator and Global Hawk, U-2, P-3 and a variety of Boeing 707-based platforms are all performing the roles that they were designed to fill in a major conflict. Aircraft acting in a non-traditional surveillance and reconnaissance role are augmenting this dedicated reconnaissance and surveillance capability. A wide variety of fighters, many with two seats, are employing their targeting pods to gather intelligence.[260] The flexibility inherent in some aircraft has allowed new sensor technologies to be employed, such as those capable of detecting metal stored underground or those sensitive to the gravity effects of caves in mountainsides.[261] These leaps in sensitivity and detecting power provide new tools in battle against insurgents.

Satellite imagery has largely replaced high altitude, fast aircraft in the strategic reconnaissance and map-making roles. Commercially available satellite photos and data are ideal for surveying large areas and making maps of the remote parts of a country. Strategic reconnaissance was once supplied by supporting nations, such as the US in Vietnam and El Salvador, but now virtually any country can purchase the capability on the open market.

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[260] Tim Ripley, "UK Tornado Force Pushes NTISR," *Jane's Defence Weekly*, January 10, 2007. Available from http://www.janes.com/; Internet; accessed March 08, 2008; Benjamin S. Lambeth, *Air Power Against Terror: America's Conduct of Operation Enduring Freedom* (Santa Monica, CA: RAND, 2005), 289-290; available from http://rand.org/pubs/monographs/MG166/; Internet; accessed February 22, 2008; M. Exterkate, "NATOs ISR Challenge During ISAF VII," *Journal of the Joint Air Power Competence Centre* 6, no. 3: 1-2 [journal on-line]; available from http://www.japcc.de/journal.html; Internet; accessed March 01, 2008.

[261] Andrew C. Revkin, "New Sensors Report, 'I Know They're in There, I Can See Them Breathing'," *The New York Times*, November 22, 2001; available from http://www.nytimes.com/; Internet; accessed March 01, 2008.

Non-traditional surveillance and reconnaissance being performed by fighter aircraft with targeting pods most closely resembles the armed reconnaissance capability often found in historical COIN operations. Flexible, two seat aircraft with modern sensors creatively employed are bringing new capabilities to an old role. This is especially powerful when coupled with modern satellite sensors.

Convoy Escort

Apache and Cobra gunships are being extensively used to successfully provide convoy escort throughout Iraq and Afghanistan.[262] Helicopters have some inherent limitations that constrain their performance in high, hot locations, and continue to be vulnerable to ground fire in key phases of flight, making fixed wing aircraft a better choice for some tasks. Modern helicopter gunships are also extremely expensive, making them likely beyond the means of a troubled country.

A-10 Thunderbolt IIs, the spiritual successor to the P-47s used in World War Two and Algeria, are being used in the convoy escort role in the Middle East.[263] These slow, heavily armoured aircraft were designed to destroy Soviet tanks on a European battlefield, not shoot insurgents in pickup trucks. At least they were designed to attack slow moving ground targets and work closely with ground force units. Fighter aircraft are also being used in the escort role, but their higher speeds and shorter endurance make them less well suited.

The majority of air support missions in Iraq are convoy protection and supply-

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[262] Wes Allison, "Quick, new Apaches can shoot, hunt and escort," *The St. Petersburg Times*, March 23, 2003; available from http://www.sptimes.com/; Internet; accessed March 03, 2008; Paul Leicht, "Airborne Guardians: HMLA-169 Escort Missions Support Convoy Operations," http://www.usmc.mil/units/marforpac/imef/3rdairwing/Pages/2004/Airborne%20guardians%20%20HMLA-169%20escort%20missions%20support%20convoy%20operations.aspx; Internet; accessed April 05, 2008.

[263] United States, United States Air Force, "June 21 airpower summary: Keeping fighters in the fight," http://www.af.mil/news/story.asp?id=123058282; Internet; accessed March 03, 2008.

route/pipeline combat reconnaissance.[264] Given the increasing amount of logistics support required by a modern army, it is no surprise that Iraq "…is a war of convoy ambushes and car bombs."[265] The importance of a strong convoy escort capability cannot be overstated. Although helicopters are able to provide an effective escort capability in some environments at a high cost, most fixed wing fighters are too fast to stay overhead any convoy they escort.

Precision Strike

During the initial combat in both Iraq and Afghanistan, many of the strikes were pre-planned. Now that an insurgency is underway, most of the missions in Afghanistan are unplanned, short notice strikes.[266] Strategic bombers such as the B-1 and B-52 as well as fighters from all allied nations are performing precision strike. The bombers have an unrivalled ability to loiter for hours, waiting to respond to urgent calls for assistance or to strike pop-up targets.[267] Added to the mix are long-loitering Reapers, essentially missile-armed Predator UAVs. A-10s and Harriers, both aircraft designed for CAS, are being employed as well, augmented by AC-130 gunships at night.[268] Aircraft such as the F-15E, F/A-18 and F-14 perform strike coordination attack and reconnaissance missions, where they fill a role similar to FACs. [269] Two seat aircraft are particularly well suited to this role because of the ability to divide responsibilities between

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[264] Davis,"Back to the Basics," 1.

[265] Robert Bryce, "Gas Pains," *The Atlantic Monthly* 295, no. 4 (May, 2005): 34.

[266] David A. Fulghum and Robert Wall, "Heavy Bomber Attacks Dominate Afghan War," *Aviation Week & Space Technology* 155, no. 23; (December 03, 2001): 22.

[267] Lambeth, *Air Power Against Terror*…, 250.

[268] Christopher F. Bentley, "Afghanistan: Joint and Coalition Fire Support in Operation Anaconda," *Field Artillery*, September-October, 2002, 13; available from http://sill-www.army.mil/FAMAG/2002.asp#sep-oct; Internet; accessed March 01, 2008.

[269] Steve Davies, *F-15C/E Eagle Units of Operation Iraqi Freedom* (London: Osprey, 2004), 29-30.

the two crewmembers. Long endurance, multi-crew aircraft continue to be the preferred platform for conducting unplanned strikes on fleeting targets.

Many of the weapons being employed in Iraq and Afghanistan are GPS-guided Joint Direct Attack Munitions. These weapons have an unclassified precision of ten to twelve feet, roughly the length of the weapon.[270] This degree of repeatable, all-weather precision may allow less powerful weapons to be employed specific targets, reducing the likelihood of collateral damage. It will also reduce the damage caused by near misses and pilot technique.

Show of Force

Daily airpower updates from Iraq and Afghanistan show that a large percentage of the fighter and bomber missions performed by coalition aircraft are "show of force." Some of these missions merely involve the presence of the aircraft, during others self-defence flares are jettisoned over the target.[271] In some other cases, weapons may be expended in an uninhabited area near the target audience.[272] Low altitude passes will commonly be used; an aircraft such as a B-1 making a fast, low, visible pass can make a strong impression on potential insurgents. [273]

Ground troops frequently call for show of force missions to help reduce the level of violence in an encounter and to help minimize the collateral damage caused by fighting in urban areas. [274] They will also call for pre-emptive shows of force, designed to frighten any nearby

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[270] Robert Hewson, ed., *Jane's Air-Launched Weapons Issue 44 – September 2004* (Surrey, UK: Jane's Information Group, 2004), 517.

[271] Emmett R. Titshaw, *Statement of Opinion: F-16 Mishap at Warren Grove Range, S/N 83-1148, 15 May 2007* (Washington, DC: United States Air Force, 2007), 31; available from http://www.acc.af.mil/shared/media/document/AFD-070726-069.pdf; Internet; accessed March 15, 2008.

[272] Lambeth, *Air Power Against Terror*…, 202.

[273] Weisberger, "USAF using 'Show-of-Force Strategy'," n.p.

[274] *Ibid.*

insurgents into reconsidering their attack plans.[275] It is recognized however that overuse of show of force missions makes the tactic less useful. Repeated threats not backed by action reduce the effectiveness of future threats, but the overall COIN mission may be better supported by reducing the level of violence in operations.

Build Supported Nation Capacity

The US and its allies are devoting considerable resources to helping rebuild the Iraqi Air Force. The long-term goal is an air force capable of guarding the sovereignty of Iraqi airspace, defending Iraq against external aggressors and re-establishing Iraq as a military power within the region.[276] The country's immediate need however, is to contribute to the fight against the insurgency. The US has provided C-130 transport aircraft, but the remainder of the fleet is unarmed, typically civilian pattern aircraft. The US is now attempting to purchase armed COIN aircraft for the Iraqis, but jet fighters are not being considered at this time as coalition allies are filling the role.[277]

A similar air force building effort is underway in Afghanistan.[278] Akin to Iraq, the focus

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[275] David S. Cloud, "US Airstrikes Climb Sharply in Afghanistan," *The New York Times*, November 17, 2006; available from http://www.nytimes.com/; Internet; accessed March 02, 2008.

[276] Michael Leaming, "Building an Iraqi Air Force," *Journal of the Joint Air Power Competence Centre* 7, no. 6: 14 [journal on-line]; available from http://www.japcc.de/journal.html; Internet; accessed March 01, 2008.

[277] Grzegorz Holdanowicz, "US Review Counter-Insurgency Capabilities for Iraqi Air Force," *Jane's Defence Weekly*, February 01, 2006; available from http://www.janes.com/; Internet; accessed March 08, 2008.

[278] Associated Press, "In need of aircraft, Afghan air force struggles to get off the ground," http://edition.cnn.com/2007/WORLD/asiapcf/10/09/afghanistan.airforce.ap/index.html; Internet; accessed 01 March, 2008; Al-Jazeera, "Rebuilding an air force," http://english.aljazeera.net/NR/exeres/33D362F8-6467-4C58-A1E8-AEE4E1FAC968.htm; Internet; accessed March 01, 2008.

is on transport aircraft and helicopters to support counterinsurgency efforts.[279] The Afghans do have several Russian-built aircraft that will form the core of their renewed fleet. Concurrently, the USAF is developing the capability to train Afghans in the skills required to run an independent air force.[280]

In both countries, the goal of providing an offensive air capability is to allow them to fight against their insurgencies and defend their country, without changing the local balance of power. By providing relatively low-tech aircraft solutions, this can be accomplished without any of the regional political problems that come from providing highly capable, modern fighter aircraft to one side in a regional rivalry. [281] A small national fleet, augmented by coalition aircraft can allow a strong foundation to be laid for a national air force. Care must be exercised to ensure the local forces continue to strengthen with a firm commitment to taking over from their supporting allies.

Increasingly, medium- and high-altitude UAVs are able to perform many airpower roles in COIN. Their utility in reconnaissance and surveillance is well known and they are coming to be used more frequently as long endurance strike platforms.[282] Although in many ways they are well-suited to use in COIN operations by a supporting nation, their rising cost, fragility and high technology components and design make them incompatible with the goal of building supported

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[279] Kenneth Katzman, *Afghanistan: Post-War Governance, Security, and U.S. Policy* (Washington, DC: Congressional Research Service, 2007), 26; available from http://fpc.state.gov/documents/organization/79284.pdf; Internet; accessed March 25, 2008.

[280] Ken Hall, "Afghan air commander seeks USAF help reconstituting air corps," http://www.aetc.af.mil/news/story.asp?id=123060628; Internet; accessed March 25, 2008; Julie Weckerlein, "U.S. Airmen Mentor Afghan Air Corps Counterparts," http://www.defenselink.mil/news/newsarticle.aspx?id=46940; Internet; accessed 25 March 2008.

[281] Christopher Carr, "Low Tech, High Time," n.p.

[282] Armed Forces International, "US Military's UAV Missions Increasing," http://www.armedforces-int.com/news/2008/01/02/us-militarys-uav-missions-increasing.asp; Internet; accessed April 19, 2008.

nation capacity. The requirement for satellite control when operating over long ranges, their limited ability to perform show of force missions and immature doctrine and tactics make them more appropriate to augment conventional aircraft than to replace them. Low cost, tactical UAVs may allow a supported nation to build its experience with the vehicles as a potential lead-in to more expensive and complex platforms.

Persistent

Partially because of their long loiter times, bombers such as the B-1 and B-52 dropped seventy percent of the bombs during Operation Enduring Freedom, but only carried out ten percent of the sorties.[283] Average mission lengths were between twelve and fifteen hours.[284] Similarly, the endurance and weapons load of F-15Es made them useful in the battle to defeat the Taliban.[285] Combined with air-to-air refuelling, the persistence of modern airpower can be virtually assured, but that persistence comes at a great cost. Modern fighters burn thousands of pounds of fuel per hour, even when trying to minimize consumption. Although air-to-air refuelling extends the fighters' time aloft, the considerable costs of operating the tanker aircraft must be considered. When the price of the modern fighter is included, the cost of patrolling a sector of potentially empty space becomes extremely high. The cost, not technology, could become the limiting issue.

Survivable

The survivability of current armed helicopters on the modern COIN battlefield continues

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[283] Fulghum and Wall, "Heavy Bomber Attacks Dominate Afghan War," 23.

[284] Lambeth, *Air Power Against Terror*…, 250.

[285] Lambeth, *Air Power Against Terror*…, 92.

to be debated.[286] Despite their advantages in some areas, they have suffered the preponderance of the losses in Iraq and Afghanistan. Fixed wing aircraft equipped with countermeasures have suffered far fewer losses. The RAF lost only one fixed wing aircraft in Iraq between 2003 and 2005.[287] The US has lost only two to enemy fire in Iraq.[288] Current fixed wing aircraft are able to operate effectively in the modern COIN environment.

Seventeen American aircraft were destroyed in combat between 1990 and 2002.[289] The SA-7 missile, the most common shoulder fired MANPADS in the hands of insurgents, destroyed none of them. [290] No civilian fixed wing aircraft have been lost to enemy fire in Iraq or Afghanistan since 2003,[291] however a civilian A300 was severely damaged in Baghdad by an SA-14 missile and did not return to flying status. The low number of fixed wing aircraft lost to MANPADS indicates that many fixed wing aircraft can be successfully operated in a COIN environment that includes such a threat.

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[286] Sandra I. Erwin, "Army Rushes to Deploy Defensive Gear on Aircraft," *National Defense* 88, no. 604 (March, 2004): 24; Carlo Kopp, "Are Helicopters Vulnerable?" *Australian Aviation*, March 2005.

[287] United Kingdom, Defence Analytical Services Agency, "Table 4.7 Aircraft losses and aircrew casualties during military operations," http://www.dasa.mod.uk/natstats/ukds/2006/c4/table47.html; Internet; accessed March 01, 2008.

[288] Wikipedia contributors, "List of aviation accidents and incidents during the Iraq War," *Wikipedia, The Free Encyclopedia,* http://en.wikipedia.org/w/index.php?title=List_of_aviation_accidents_and_incidents_during_the_Iraq_War&oldid=203656838; Internet; accessed March 01, 2008.

[289] Daniel L. Haulman, "USAF Manned Aircraft Combat Losses 1990-2002," (Maxwell Air Force Base, Alabama: Air Force Historical Research Agency, 2002), 2; available from http://www.afhra.af.mil/shared/media/document/AFD-070912-043.pdf; Internet; accessed March 03, 2008.

[290] Thomas B. Hunter, "The Proliferation of MANPADS," *Jane's Intelligence Review*, September 01, 2001; available from http://www.janes.com/; Internet; accessed February 28, 2008; Michael Puttré, "Facing the Shoulder-Fired Threat," *The Journal of Electronic Defense* 24, no. 4 (April, 2001): 41.

[291] Wikipedia contributors, "List of aviation accidents and incidents during the Iraq War;" Wikipedia contributors, "List of Coalition aircraft losses in Afghanistan," *Wikipedia, The Free Encyclopedia,* http://en.wikipedia.org/w/index.php?title=List_of_Coalition_aircraft_losses_in_Afghanistan&oldid=202043463; Internet; accessed April 7, 2008.

The Change in Insurgent Weapons

During the various COIN campaigns of the 20th century, the weapons available to the government forces changed and improved significantly as technology advanced. Effective wheeled vehicles, radios, more capable airplanes, helicopters, and a wide variety of sensors all came to be used against insurgents. The armoury of the insurgent had largely remained the same until the 1980s. Until then, insurgents had small arms and possibly light anti-aircraft weapons such as heavy machine guns. Some had larger calibre weapons with higher rates of fire, but all were optically tracked and unguided. When MANPADS were introduced to insurgents, the mastery of the air, so long enjoyed by governments, became contested.

Today, "[s]houlder-fired, IR guided missiles currently represent the most potent practical threat to modern aircraft."[292] Half of all combat losses worldwide since 1973 have been attributed to IR guided surface to air missiles; many of these missiles were MANPADS.[293] In Iraq, there are approximately twenty attacks or attempted attacks each month by MANPADS.[294] These portable, easily operated systems have proliferated widely throughout the world, with twenty-eight non-state groups reported, but not confirmed, to have MANPADS in their arsenals.[295] The threat posed by these systems is widespread and potentially deadly.

Great strides have been made in IR missile countermeasures since the loss of A-37s and C-47s to insurgent missiles in El Salvador in 1990. These missiles home in on the heat signature

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[292] Puttré, "Facing the Shoulder-Fired Threat," 40.

[293] Christopher Bolkcom, *Military Suppression of Enemy Air Defenses: Assessing Future Needs* (Washington, DC: Congressional Research Service, 2005), 3; available from http://digital.library.unt.edu/govdocs/crs/permalink/meta-crs-6201; Internet; accessed February 13, 2008.

[294] Mark Schroeder, "Rogue Missiles - Tracking MANPADS Proliferation Trends," *Jane's Intelligence Review*, November 01, 2007; available from http://www.janes.com/; Internet; accessed February 28, 2008.

[295] Hunter, "The Proliferation of MANPADS," n.p.

of an aircraft. As such, a small turboprop aircraft is less susceptible to this threat than a jet powered aircraft.[296] The modern Large Aircraft IR Countermeasures system is judged to be eighty percent effective at defeating IR missile threats, considered a reasonable success rate.[297] An aircraft equipped with a modern countermeasures system is considered well protected against the SA-7, one of the most widely deployed MANPADS.[298]

The FAS continued to be able to operate small jets against a SA-7 and SA-14 armed foe without a countermeasures system or a high degree of pilot skill. Although pilot tactics can reduce the likelihood of a successful IR missile attack, a modern countermeasures system, combined with a less detectable aircraft will further increase the survivability in the COIN environment.

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[296] Davis, "Back to the Basics," 27.

[297] Puttré, "Facing the Shoulder-Fired Threat," 40.

[298] *Ibid.,* 41.

THE IRAQI COIN AIRCRAFT

If the Iraqi COIN aircraft is able to satisfy the established key mission elements and enablers, it will support the government of Iraq and the supporting nations in their COIN goals. The capabilities and characteristics called for in the Iraqi COIN aircraft solicitation will be measured against the yardsticks previously discussed.

Reconnaissance and Surveillance.

The Iraqi COIN aircraft must be capable of "locating, tracking, identifying, and engaging a variety of targets with a suite of EO[electro-optic]/IR sensors" and be able to link this information to other aircraft or ground stations.[299] By definition, such a sensor will be capable of day and night operations, but it will likely be limited by smoke, thick cloud or fog.

The ability to link the information to other aircraft and the ground will allow immediate processing of imagery for intelligence or targeting purposes. It will also help to eliminate possible confusion between ground and air assets when conducting FAC operations. This data-linking capability is not currently present in all western air forces. This leading edge capability will increase the complexity and cost of any solution; both are undesirable second-order effects.

The Iraqi COIN aircraft is required to have two seats. This will allow pilot and observer to concentrate on their respective missions. As sensor packages become more and more complex, the ability to have a dedicated operator has become more important. Aircraft such as the F-14, F-15E, and F/A-18 D and F models have all adopted this team approach when complex sensors are involved. The Iraqi COIN aircraft only requires that the front seat be able to operate the sensors via efficient control stick and throttle buttons. This may force unusual techniques

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[299] United States Air Force, "Iraq CounterInsurgency (COIN) Aircraft," n.p.

such as having a rear seat pilot and front seat observer, or it may limit the contribution that a rear seat observer is able to make to the mission. It will also constrain the training techniques available to instructors teaching observers.

The avionics on the aircraft will further contribute to its utility as a reconnaissance and surveillance platform. Workload reduction technology such as an autopilot will enable the crew to concentrate on the observation elements of the mission instead of basic flying skills. It will also provide some relief for the crew during long surveillance missions. The navigation capability of the aircraft will surpass anything previously fielded with an inertial navigation system and a global positioning system (GPS). Simple features, such as the ability to enter data in various map grid systems allow both air charts and ground maps to be used for coordination and navigation with less potential for error. The crew will not suffer from the problems of Malaya where aircrew were occasionally uncertain about their position. The night vision compatible cockpit will allow simple visual reconnaissance and navigation at night. An observer with very limited training could carry this out early in the supported nation training process.

The reconnaissance and surveillance capability of the Iraqi COIN aircraft will be well beyond that of any supported nation previously engaged in an internal COIN campaign. The specifications are appropriate to ensure that modern equipment is incorporated, making the reconnaissance and surveillance capability of the Iraqi COIN aircraft equal to or better than many modern fighter aircraft.

Convoy Escort

To be effective, COIN escort aircraft need to be able to stay above and ahead of the force they are escorting, be it on land or sea. Historically, aircraft have been effective at dissuading attacks either by their own strike capability or that of the aircraft that accompanies them.

The maximum endurance speed of a modern T-6A Texan II, an aircraft that meets many of the performance requirements of the Iraqi COIN aircraft, is approximately 115 kts.[300] By employing a series of S-turns, the aircraft will be able to remain in contact with a ground convoy moving at 50 km/h. Similarly, the Iraqi COIN aircraft will be able to drop up to two bombs on attacking forces. In the event that two bombs are not enough, it will be able to partner with other aircraft to ensure that it complements their possibly greater striking power.

The aircraft will be equipped with two or three secure radios that will be compatible with other Iraqi aircraft and Iraqi ground forces. This will enable close coordination between ground forces and their air cover. As the insurgents have become more technically capable, encrypted communications will be an asset.

The capabilities of the Iraqi COIN aircraft will allow it to fill the escort role at a level comparable to the converted trainers of the past like the T-6 and T-28. Some aspects of its ability to perform escort missions will exceed those of modern jet fighters, in that it will fly at a speed closer to that of the convoy it is escorting. It will not carry the same weapons load as the B-26, A-1 or most modern fighters, and so will have less of an ability to deal with large attacks unless operating with other aircraft.

Precision Strike

The Iraqi COIN aircraft must "provide the capability to carry and employ both non-precision and precision weapons."[301] It must meet its 4.5-hour loiter requirement carrying two, five hundred pound bombs, thus laser, GPS and unguided weapons are all potential stores. With

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[300] Raytheon Aircraft Company, *Canadian Forces Approved Flight Manual T-6-A1 Aircraft*, rev. 5 (NATO Flight Training Canada: Bushel Park, SK, 2006), chap. 4, 93 – Maximum Endurance Time and Fuel. A relatively high drag configuration was selected to account for external stores.

[301] United States Air Force, "Iraq CounterInsurgency (COIN) Aircraft," n.p.

proficient operators, the reliability and precision of PGMs is well beyond the capability of older aircraft, potentially reducing collateral damage.

One element of precision strike that may be missing in a future Iraqi COIN aircraft is a gun. An aircraft gun has proven to be very effective against infantry, and it has the advantage of a very limited lethal radius. Aircraft such as the T-6 and T-28 had guns retrofitted with great effect. A gun would enhance the aircraft's versatility and provide it with a low-cost option for engaging targets or conducting shows of force.

Airborne radar is useful for air to ground gunnery, unguided weapons delivery and reconnaissance. Although modern inertial sensors may be coupled with terrain databases and other sensors, a real-time measurement and computation of ranges, bearing and elevations would provide a more accurate delivery of unguided weapons. Without this capability, the aircraft may be required to employ more expensive PGMs in situations where an accurately targeted unguided weapon might have been adequate. Radar can also be used to quickly locate moving vehicles or those that have been camouflaged against visual detection. Airborne radar would add significantly to the overall cost of the aircraft, and increase its complexity. An analysis should be performed to determine if the advantages of a specific radar system would outweigh the disadvantages.

The Iraqi COIN aircraft will be able to perform precision strike tasks. With proper training, the crews should be able to exceed the precision historically achieved during most COIN operations. If it is only able to carry two, five hundred pound bombs, its effectiveness against large formations will be limited unless it is operating as part of a formation. The ability to deploy a variety of weapons, including rockets, cluster bombs and a greater number of PGMs would be an asset. Its ability to conduct precision strike with PGMs will be equal to that of a

modern jet fighter, provided the skill of the pilot is comparable. When operating with unguided weapons, the Iraqi COIN aircraft will have abilities exceeding those of historical COIN aircraft, including relatively modern aircraft such as the A-37, but it will be inferior to those of radar equipped fighters. Pilot skill will be extremely important to achieve the most precise results.

Show of Force

One of the advantages of a turboprop is that it is generally quieter than a similarly sized jet. When trying to make a show of force, this advantage becomes a disadvantage. A PT-6 powered aircraft will have great difficulty impressing insurgents or citizens by itself. The Iraqi COIN aircraft is required to have a countermeasures dispensing system, so it will be able to employ the tactic of dropping flares over a target. Similarly, it could expend weapons on a site but may be unable to strafe.

The Iraqi COIN aircraft will have a limited ability to perform show of force missions. Historical aircraft such as the B-26 and A-1 would be more effective. Modern jet fighters are also able to provide a more impressive presence than a two seat, PT-6 powered turboprop. In the past, simple aircraft were able to affect insurgent activity because of their association with more threatening aircraft. The Iraqi COIN aircraft may be able to do the same by partnering closely with jets from supporting nations.

Build Partner Nation Capacity

The Iraqi COIN aircraft has several elements that will contribute to the building of the air capability of the Iraqi nation. By being equipped with a two-place cockpit, flight instruction ranging from intermediate to advanced weapons employment can be performed. The aircraft is explicitly required to be configured as a day/night visual and instrument flight trainer, further enhancing its capability in the training role. As it will be similar to the aircraft used for flight

training in several western countries, foreign flight instructors should be able to maintain a high degree of proficiency without relying on Iraqi aircraft to do so.

The comprehensive avionics suite specified for the aircraft will expose Iraqi technicians to virtually the entire span of modern aircraft avionics, with the exception of airborne fire control radar. The PT-6 is one of the most widely used turbine engines today, and any maintenance skills developed can be readily applied to other PT-6 powered aircraft such as helicopters and light passenger aircraft. Unfortunately, all technical manuals and documentation are to be provided in English but the English language abilities of many Iraqis may not be sufficient for them to be able to make use of complex technical documentation.[302]

There is a danger of the aircraft being too large a technological step for the new Iraqi Air Force. Although the lack of sophistication of supported nation troops may have been overstated in the past, the specified systems are generations more advanced than those of the T-28 or even the A-37. Civilian contractors providing technical services, motivated by profit, may not have the same incentive to build the independence of the Iraqis as a supporting military force. Foreign military troops often have a "mission first" attitude, where they will go to great lengths to ensure an aircraft is able to fly. When supporting the Iraqis, they may need to back down and recognize that the mission of building Iraqi capacity is more important than any particular sortie. Strong leadership will be needed to meet this aim.

Security classification remains an area of concern with respect to building the supported nation's airpower capacity. Some of the systems called for in the specification contain export-controlled technology. Although the administrative hurdles can likely be overcome, concerns about the security of the technology or software may prevent the full capabilities being provided

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[302] Leaming, "Building an Iraqi Air Force," 16-17.

to the Iraqis, or it may mean that they are not allowed to truly own some aspects of their operation. If this situation is encountered, the value of that additional technology to the COIN fight must be carefully considered in the light of the potential adverse effects on the supported nation's motivation and ownership of their aircraft and forces.

The specifications for the Iraqi COIN aircraft will ensure that the platform is suitable for building the airpower capacity of the supported nation, whether it is Iraq or any other. As the aircraft will be up to date, it should serve better in that role than COIN aircraft have historically done. This is contingent upon the fledgling air force receiving adequate technical, pilot and English training to maintain and operate the aircraft independently.

Persistent

Requiring the ability to loiter four hours with a fuel reserve while carrying two, five hundred pound bombs will ensure that the endurance of Iraqi COIN aircraft is long enough to enable a persistent air presence. Although shorter than aircraft such as the B-26 and Sunderlands, it is roughly equal to aircraft such as the A-1 and OV-10 and superior to the A-37, T-28, T-6 and Spitfire.

Persistence requires more than a single aircraft with a long endurance. Multiple aircraft are required to allow continuous coverage, but only eight aircraft will be initially purchased. With an eighty percent mission readiness rate specified, there should be six or seven aircraft available most of the time.[303] Although this may allow close to continuous coverage over a small area, more aircraft will be required to patrol a country as large as Iraq. The aircraft's excellent communications abilities will allow an efficient handover when relieved, especially if radio relays are employed as the French did in Algeria.

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[303] United States Air Force, "Iraq CounterInsurgency (COIN) Aircraft," n.p.

Until more aircraft can be purchased, holding a high-readiness ground alert posture may help to improve the response time of the Iraqi COIN aircraft. Its navigation system is required to ready to fly after a five-minute start-up period. This capability will help to ensure an aircraft can be quickly started and en route to its target in a short period of time.

It will be difficult for Iraq to have a persistent, national air presence over its territory without a large number of aircraft. Provided that the coalition presence is reduced at the same pace as the Iraqi Air Force grows, the overall coverage should remain roughly stable.

Survivable

To cope with the threat of insurgent MANPADS, the Iraqi COIN aircraft is required to have both a missile warning system and countermeasures dispensing system. The specified AN/AAR-47 missile warning system and the AN/ALE-47 countermeasures dispenser system are both modern, capable systems that provide good protection for an aircraft when integrated. As a turboprop is quieter and has a lower IR signature than a similar-sized jet, it should be able to survive at least as well as that jet with the same pilot operating in the same environment. The systems can typically be operated either manually or automatically. In many cases pilots prefer manual operation, but this increases workload while potentially decreasing pilot performance in other areas. The skill of the pilot must be considered when deciding on the operational techniques to be employed in the threat area. Provided the systems are fully enabled with complete software packages, the Iraqi COIN aircraft will have a countermeasures system equal to that of any modern fighter and far superior to that available to the FAS during the civil war in El Salvador.

The cockpit of the aircraft shall be lightly armoured to protect the engine and crew against small arms fire. There is no specification for anti-explosion foam in the fuel tanks,

self-sealing tanks or fire protection systems. All of these could be easily fit on any potential aircraft and would further enhance its survivability. Should the armour prove insufficient, the crew will be able to bail out with a modern ejection system, ensuring their survival to fly another easily replaced aircraft. A simple structure built with easily purchased materials will improve the ability of the Iraqi Air Force to repair damaged aircraft should they be able to return to base.

The environment in the Iraqi desert can be quite harsh, with extreme heat during the daytime. The aircraft's environmental control system is specified to provide a comfortable cabin temperature when the outside temperature is as high as 50˚C. Implicit in the eighty percent mission readiness rate specification and operating environment is the ability of the aircraft to operate its avionics systems at those temperatures without overheating.

Because the aircraft is required to be widely commercially available, powered by a PT-6 and its equipment must meet Department of Defense and NATO standards for growth, spare parts should be readily available for a reasonable price. Parts production and overhaul lines will likely be up and running and able to support the aircraft for years to come. Similarly, allies should be able to provide technical and operational expertise to assist as required, ensuring the aircraft will continue to be operationally available and relevant.

Historically, COIN aircraft advocates have expressed a preference for twin-engine aircraft. These opinions were based on the reciprocating engine technology of their day. Modern turboprop aircraft engines are extremely reliable. A recent study comparing the reliability of a single turboprop engine to that of twin reciprocating engines showed that a reciprocating aircraft engine was five times more likely to need to be shut down in flight than a

turboprop engine.[304] Although two engines may be better than one if the single engine is damaged by enemy fire, statistics show that a single modern turboprop is a reliable powerplant for a COIN aircraft.

[304] Robert E. Breiling Associates, *Single Turboprop Powerplant Aircraft Reliability for Pilatus Business Aircraft Ltd*, (Boca Raton, FL: Robert E Breiling Associates, 2000), n.p.; available from http://www.westbranchair.com/files/SINGLE%20TURBOPROP.doc; Internet; accessed April 2003, 2008.

CONCLUSIONS

Reconnaissance and Surveillance

The importance of reconnaissance and surveillance to building a complete intelligence picture in a COIN operation is undisputed. Although satellite imagery has surpassed the use of aircraft in the strategic reconnaissance and mapmaking roles, tactical intelligence gathering continues to be provided by aircraft. Slow aircraft, flying at low level remain the best method for surveying thickly covered regions. Their effectiveness can be greatly augmented by using local observers who are able to discern changes to the regular patterns of life in an area, or by assigning crews to become familiar with specific regions. Although not high-technology solutions, both methods have proven themselves in previous battles.

Armed reconnaissance remains an effective method of finding and attacking the fleeting targets so common in COIN operations. Without the ability to engage any target almost immediately after it is discovered, airpower planners will find that their targets disappear as soon as they are no longer being watched. This makes armed reconnaissance an essential capability for any COIN aircraft.

Convoy Escort

Ground convoy operations will remain important to providing stores to soldiers stationed throughout a country. Experience has shown that the most effective way to escort a convoy is with constant air presence. This will deter insurgent attacks rather than simply respond to them. As the purpose of a convoy is to move troops and supplies and not engage the enemy, deterrence is the most effective tactic. In the event that there is an attack, a swift intervention by aircraft remains an effective way of ensuring the convoy gets through with a minimum delay.

Precision Strike

The technical tools are now available to make precision strike a reality for any air force, under most conditions. The equipment is now small and light enough that it can be installed on virtually any aircraft, often without specialist engineering support. The equipment does not, however, account for a lack of discrimination during targeting. Without a focus on delivering ordnance only onto insurgent targets rather than innocents, a precision strike capability will be of little use. This was seen in El Salvador where the indiscriminate bombing of civilian areas interfered with the government's ability to establish its credibility in the minds of the country's people. Although it will be difficult to succeed in a COIN operation without precision strike, a precision capability alone is inadequate.

Show of Force

The show of force tactic at the tactical level is unique to COIN operations. It cannot be used in isolation however; the aircraft must have established credibility with the target audience before the threat of force will be effective. Once the conditions have been established, shows of force can be extremely successful at preventing insurgent violence. History has shown that light aircraft are capable of dissuading insurgent activity through a show of force technique, provided the audience has been conditioned to expect an attack following the appearance of the light aircraft. Although the label applied to the tactic is relatively new, shows of force have been taking place throughout the use of aviation in COIN operations.

Build Supported Nation Capacity

Building the capacity of the supported nation is essential in all aspects of COIN operations. Although it may not be efficient to allow the supported nation to accomplish a task with its own resources, it is a more effective way to accomplish the larger mission. Multi-role

aircraft that can be operated within the resources and skills of the supported nation can be a key element of a nation-building effort. Supporting nations must be careful to use the aircraft and its support systems as a tool to build capacity, rather than a weapon with which to win a COIN war.

Persistent

From a military point of view, a persistent air presence is an enormous advantage. A constant air presence will keep insurgents off balance, limiting their ability to form large groups for operations, mass supplies or move. A steady air presence will also build the morale of the supported nation's troops, as they gain confidence that they will be supported during an attack.

As insurgents have historically not possessed an air force, the constant presence of government aircraft overhead will also contribute to establishing the power and presence of the government in the eyes of the people. It can also build the confidence of the people in the ability of the government to defend them against the insurgents, further strengthening the government's reputation.

The aircraft capabilities and resources required to establish a persistent presence depend greatly on the nature of the situation. A large country with a dispersed population will require a different solution than a country with only a few concentrated population centres. In either case, a nation-wide communications network will enable the efficient allocation of scarce airpower resources in a timely manner. A network of suitable airfields will also enhance the persistence of an air force. If there are a large number of airfields in the country, aircraft can be dispersed closer to the required areas. Fewer airfields will increase the importance of an aircraft being able to operate from short, austere strips.

Survivable

An air force is expensive for any country, more so for a small country struggling with an internal conflict. Pilots can become a critical commodity in a nation without the ability to train its own personnel. Both personnel and equipment resources can be preserved with an appropriately protected, survivable aircraft. The level of protection should be commensurate with the COIN threat to avoid excessively expensive or restrictive solutions.

Non-combat aircraft can be converted to a combat role with the addition of the correct equipment. Care must be taken to ensure the added weight does not have an adverse effect on the aircraft's performance in other domains. Although technology can greatly enhance survivability, tactics and operational techniques must also be employed to maximum effect.

The configuration specified for the Iraqi COIN aircraft provides an excellent guide when selecting an aircraft for the COIN attack and over watch role. A compliant aircraft will provide many of the key capabilities required to support a nation in its fight against an internal insurgency. It may also provide a more coast effective method of performing some of the COIN missions currently performed by expensive, high technology jet fighter and strike aircraft.

Although the use of airpower when fighting against insurgents is only one small element in a COIN campaign, it can have a disproportionately large effect on the outcome. An air force is a prestigious symbol of statehood, but if it is responsible for indiscriminate damage to civilian property or the taking of innocent lives, this prestige can quickly change into notoriety.

APPENDIX 1 – IRAQI COIN AIRCRAFT REQUIREMENTS

The information below is taken from :

United States, United States Air Force, "Iraq CounterInsurgency (COIN) Aircraft," Preaward Information Exchange System. https://pixs.wpafb.af.mil/pixs_solicitation.asp?id=5223; Internet; accessed February 21, 2008.

TITLE: Iraq CounterInsurgency (COIN) Aircraft

FIRST SUBMITTED ON: 05/03/2007. **LAST UPDATED ON:** 05/17/2007.

DESCRIPTION:

1. **Synopsis.** The 337 Aeronautical Systems Group (AESG), Wright-Patterson AFB, OH, is conducting a market survey of potential sources to provide both a Counter Insurgency (COIN) Aircraft and Contractor Logistics Support (CLS) for the Government of Iraq and Iraqi Security Forces (ISF). Based upon the results of this market survey, the 337 AESG may award a single contract for the aircraft and CLS support.

2. **Background.** The first fully COIN mission capable aircraft must be delivered in country (Iraq) no later than 30 November 08. CLS support shall be in place 30 days in advance to support operational requirements for the aircraft as they arrive. This project will be considered a Foreign Military Sale; however, it will be required to comply with all applicable USG Federal Acquisition Regulations. The selected source must meet all requirements listed in paragraph 3.

3. **Contract Requirements.**

a. Eight (8) COIN Aircraft fully weapons tested and certified meeting requirements as specified in paragraph 3.g. below

b. Delivery schedule:

i. Nov 08 1 Aircraft

ii. Jan 09 3 Aircraft

iii. Apr 09 4 Aircraft

c. 12 month in-country CLS beginning 30 days prior to delivery of first aircraft.

d. All aircraft Supportability and Logistics Requirements as listed in paragraph 3.h. below.

e. Options for additional aircraft in Lots of 6.

f. All Technical Manuals (in English) to support maintenance, training, and flight operations.

g. Aircraft Requirements:

i. Mission Capability: The USAF plans to acquire a Commercial-Off-The Shelf (COTS) aircraft modified to perform COIN operations. The COIN aircraft

must be a lightly armored, 2-seat, turbo-prop aircraft capable of locating, tracking, identifying, and engaging a variety of targets with a suite of Electro-Optical/Infrared (EO/IR) sensors and laser-guided/unguided air-to-ground weapons/missiles. Further, it must be able to share data and imagery with other COIN aircraft and current IqAF Intelligence Surveillance and Reconnaissance (ISR) and Counter Terrorism (CT) aircraft. Finally, it must incorporate an IR threat detection and countermeasure system and be capable of performing a dual role as an advanced fixed-wing flight trainer aircraft.

ii. Operating Environment: The COIN aircraft will operate within harsh desert conditions at all times of the day or night. It must be capable of operating routinely under the following conditions:

1. Ground temperatures as high as 53 degrees Celsius and field density altitude of 5000 feet.

2. Day and night, in both Visual Meteorological and Instrument Meteorological Conditions (VMC/IMC)

iii. Interoperability: COIN aircraft data, imagery, and voice capabilities should be compatible with equipment used by Iraqi ground forces, special operations forces, and current/planned ISR and CT aircraft. Section vi.,4, below will identify specific communications and data specifications required. The USAF desires the capability for air-to-air transmission and reception of imagery and data between similarly equipped COIN aircraft to facilitate sensor cueing.

iv. Mission Concept: The COIN aircraft will provide the IqAF with a critical offensive and operational over watch capability in the COIN fight. It will also have a dual role as an intermediate/advanced single-engine fixed-wing trainer aircraft.

1. The COIN aircraft, capable of being manned by either a crew of one pilot, or a pilot and a sensor operator, will arrive in an area of interest with the ability to receive data and imagery from other IqAF surveillance, CT, and COIN platforms. Whether cued by an external sensor or its own sensor suite, the COIN aircraft will be able to find, fix, identify, track, target, and engage emerging and time-sensitive targets. It may have a variety of laser guided precision weapons and non-precision weapons at its disposal in order to create effects tailored specifically to the unique situations it will encounter in the COIN environment.

v. Strategy for Future Growth and Capability:

1. DoD and NATO standards to enable future expansion and interoperability with other platforms.

2. The USAF or the Government of Iraq (GOI) must have the option to purchase additional COIN aircraft in lots of 6 aircraft.

vi. Aircraft Performance Requirement:

1. General Airframes and Avionics Requirements. The COIN aircraft shall:

a. Use a PT-6-based turboprop engine fueled by JP-8 or similar fuel to maintain commonality with other Iraqi aircraft. It is desired that the engine provide as a minimum 1200 Shaft Horse Power (SHP).

b. Be in current/wide production and in wide use or be a variant of turboprop aircraft currently being used widely such that a high degree of commonality is maintained.

c. Possess crew stations for a two-man crew with dual sets of flight, navigation, communication, and weapons controls.

d. Be capable of full employment (aviation, navigation, communication, sensor use, and weapons delivery) with only one pilot and an empty back seat. However, the aircraft must have the ability to inhibit weapons release from either seat.

e. Be suitable as an intermediate/advanced single-engine fixed-wing flight trainer with systems which allow the aircraft to be easily reconfigured for COIN operations.

f. Possess light armor to protect the occupants of both seats and engine compartment from small arms fire.

g. Be suitably equipped and approved for operation during day or night.

h. Be suitable equipped and approved for operation and navigation in both Visual and Instrument Meteorological Conditions (VMC/IMC).

i. Possess a night vision goggle (NVG)-compatible cockpit and external aircraft lighting.

j. Be capable of loitering in excess of 4 hours while maintaining a 45 minute fuel reserve while loaded with two GBU-12 or Mk-82 type weapons.

k. Be capable of carrying external fuel tanks.

l. Possess an environmental control system that provides cabin air conditioning capable of cooling the aircraft to a minimum temperature of no greater than (required) 27 degrees Celsius or (desired) 22 degrees Celsius with ambient outside air temperature (OAT) of 53 degrees Celsius.

m. Possess a heads-up display (HUD) and other avionics which conform to applicable DoD standards.

n. Be equipped with ejection seats that provide safe ejection parameters at ground level with zero airspeed.

2. Aircraft Sensor Suite Requirements: The COIN aircraft shall possess an integrated sensor suite and be capable of being modified to:

a. Include a space-stabilized electro-optical (EO) and infrared (IR) sensor mounted in a way that minimizes vibration and obstruction to the sensor's field of view.

b. Include a laser range finder, laser illuminator, and laser designator. The laser designator may either be separate from or integrated with the EO and IR sensor.

c. Be capable of enabling a pilot or sensor operator in either seat to view real-time, full-motion video, and capture still image. The sensor operator display should show target coordinates in either Universal Transverse Mercator (UTM) or latitude/longitude format. When selected, the data shall be automatically transferred into the aircraft fire control system.

d. Be capable of transmitting real-time, full-motion video and still imagery to ground stations (required), other COIN aircraft (required), the IqAF CT-equipped aircraft (desired), and the IqAF ISR-equipped aircraft(required). See table below.

e. Be capable of receiving and recording real-time, full-motion video and still-photography to imagery from other COIN aircraft (required), the IqAF CT- and ISR-equipped aircraft (desired), and the ISR-equipped aircraft (required).

[Table deleted for clarity]

f. Be capable of digitally recording all sensor information, with automated time and position (coordinates) data.

g. Provide references/scales to image displays for determining cardinal directions and horizontal ranges (Desired). It is also desired that the display indicate modes of operation, relative pointing position, and area and point track modes.

h. Enable sensor operation from, as a minimum, the front seat via Hands-On-Throttle-And-Stick (HOTAS) controls.

3. Aircraft Defensive Avionics Suite Requirements: The aircraft shall be capable of being equipped with a defensive avionic suite that consists of the AN/AAR-47 Missile Warning system and the AN/ALE-47 Countermeasures Dispenser system.

4. Aircraft Communications/Data Link Requirements: The COIN aircraft shall possess an integrated communications and data link suite which will:

a. Provide internal crew intercom capability.

b. Provide at least 2 radios (3 are desired). For commonality with Iraqi Ground Forces and other IqAF aircraft, or provide encryption capability that is compatible with the current Iraqi aircraft.

c. Be able to communicate with Air Traffic Control (ATC) and operational agencies within the designated frequency ranges.

d. Be capable of receiving data from the video downlink system carried on the ISR-equipped aircraft. (Desired)

e. Be capable of sharing data (to and from) other COIN aircraft, the CT-equipped aircraft, and the ISR aircraft.

5. Aircraft Navigation Requirements: The COIN aircraft shall:

a. Be suitably equipped and approved for operation under Instrument Flight Rules (IFR) as defined by International Civil Aviation Organization (ICAO) or equivalent Federal Aviation Administration (FAA) Regulation (FAR).

b. Be equipped with an integrated Inertial Navigation System (INS) capable of cold-start alignment in less than five minutes.

c. Be equipped with a civil-code (SPS) Global Positioning System (GPS) capable of providing position and altitude updates to the aircraft INS. If possible, an Embedded GPS/INS (EGI) solution is preferred.

d. Be equipped with an encoding transponder for ATC identification for operations within civil and military airspace.

e. Be equipped with an autopilot.

f. Be capable of navigating and performing instrument approaches using GPS, ILS, and VOR/DME navigational aids (NAVAIDs).

g. Provide a data transfer cassette or similar data transfer device capable of transferring data from mission planning computers to aircraft navigation and mission management systems.

h. Enable entry of coordinates into aircraft systems/sensors to be in either UTM or latitude/longitude format.

6. Aircraft Weapons Employment Requirements: The COIN aircraft shall provide the capability to carry and employ both non-precision and precision weapons. If a RFP is released for this effort specific weapon requirements will be contained therein.

vii. If technology export is slow for certain technologies the following options should be followed in preference order:

1. Option 1: Integrate the Group A wiring and Group B equipment and use hardware or software to inhibit use of these technologies until technology is released. Engineer an inhibit function via hardware or software to disable the designator functionality until technology is released.

2. Option 2: Integrate the Group A wiring and leave Group B equipment off for delivery. Integrate/test the designator, but do not deliver the

designator. Integrate Group A/Group B, flight test and deliver without weapons.

h. CLS Requirements:

i. The COIN aircraft must be capable of sustaining fully mission capable (FMC) operations availability rates of eighty percent (80%).

ii. The Contractor for the COIN platform shall be required to assist in the design of an Integrated Logistics Support program including (all logistics, operations and technical literature to be provided in English):

1. A technical maintenance program based on OEM Commercial and Non-Developmental Item documentation. The program shall conform to requirements set forth by the aircraft's Airworthiness Authority (AA). The maintenance program shall use an organizational level maintenance concept with major repair or overhaul accomplished at AA approved overhaul facilities.

2. A recommended spare parts package to support the desired operations tempo (OPTEMPO) of 100 hours per month per aircraft for a 1-year period.

3. Technical maintenance manuals, parts manuals, and inventory documentation to support the recommended parts, tools and test equipment upon first delivery.

iii. All manuals and software products (to include avionics software) required for life-cycle support (LCS) of the fielded systems upon first delivery.

iv. The maintenance concept to take maximum advantage of parts standardization, interchangeability, and commonality; to minimize the number and types of required spares.

v. Intermediate and depot level maintenance and supply support services will be provided through Contractor Logistics Support (CLS) for a period of 12 months.

4. **Technical Considerations.** In addition to the information requested above, interested firms should also submit sufficient information to permit evaluation and qualification of their technical capabilities. The 337 AESG will be assessing the level of market interest and competitiveness for this acquisition based on responses to the following:

a. Does your firm have the resources to dedicate to this schedule driven requirement? If affirmative, please provide specific examples.

b. What strengths does your firm have that enhance your ability to meet and/or exceed the Nov 2008 delivery requirement for a fully operational aircraft?

c. Do you have a current aircraft in production to satisfy all operational requirements? If not, what capabilities will need to be developed and integrated into your aircraft? What impacts to the delivery schedule are expected if development is required?

d. Does your firm have qualified personnel available to support on-site/in country maintenance activities? Is your firm committed to the initial and potential long-term in-country CLS requirement?

All firms are asked to provide a telephone number, an e-mail address, and a facsimile number in their response. Information marked "Proprietary" will be protected, and will not be divulged unless mandated by existing laws. THIS INFORMATION SHOULD BE SUBMITTED IN WRITING TO 664AESS/PK, BLDG 11A, ROOM 201-I, 1970 MONAHAN WAY, WPAFB OH 45433-7211, NOT LATER THAN CLOSE OF BUSINESS 18 May 2007. The point of contact is Christopher Kirbabas at (937) 904-4314. Any non-technical and/or contractual questions should be referred to this individual. Program/technical questions should be directed to Mr. Forest Oberschlake at (937) 904-4275. In accordance with recent changes to the Air Force Materiel Command Federal Acquisition Regulation Supplement, the position of the ASC Ombudsman has been terminated. If any potential source has questions or concerns about this particular acquisition, please direct all comments to the Contracting Officer Christopher Kirbabas at (937) 904-4314. INFORMATION CONTAINED IN THIS SYNOPSIS IS FOR MARKET RESEARCH PURPOSES ONLY. IT DOES NOT CONSTITUTE A REQUEST FOR PROPOSAL AND IT MUST NOT BE CONSTRUED AS A COMMITMENT BY THE US GOVERNMENT. Firms responding to this announcement should indicate whether they are a large or small business, small disadvantaged business, woman-owned small business, HUBZone small business, and/or service-disabled veteran-owned small business. The North American Industrial Classification System Code 336411, Aircraft Manufacturing, applies to this acquisition with a size standard of 1,500 employees. All potential sources must be registered in the Central Contractor Registration database to be awarded a DoD contract. Interested firms are encouraged to first register as a potential source on the PIXS Web Site (http://www.pixs.wpafb.af.mil). PLEASE INFORM US IF YOUR FIRM INTENDS TO PERFORM THE WORK SOLELY OR IF YOU DESIRE TO SUBCONTRACT WITH THE PRIME CONTRACTOR.

Iraq CounterInsurgency (COIN) Aircraft is an Aeronautical Systems Center (ASC) program.

The current status is Sources Sought and it is a Category 15 - Aircraft and airframe structural components program.

SOLICITATION NUMBER: FA8617-07-R-0001
RESPONSE DATE: 05/25/2007
NAIC CODE: 336411
DOLLAR AMOUNT: N/A

APPENDIX 2 – PHOTOS OF SELECTED COIN AIRCRAFT

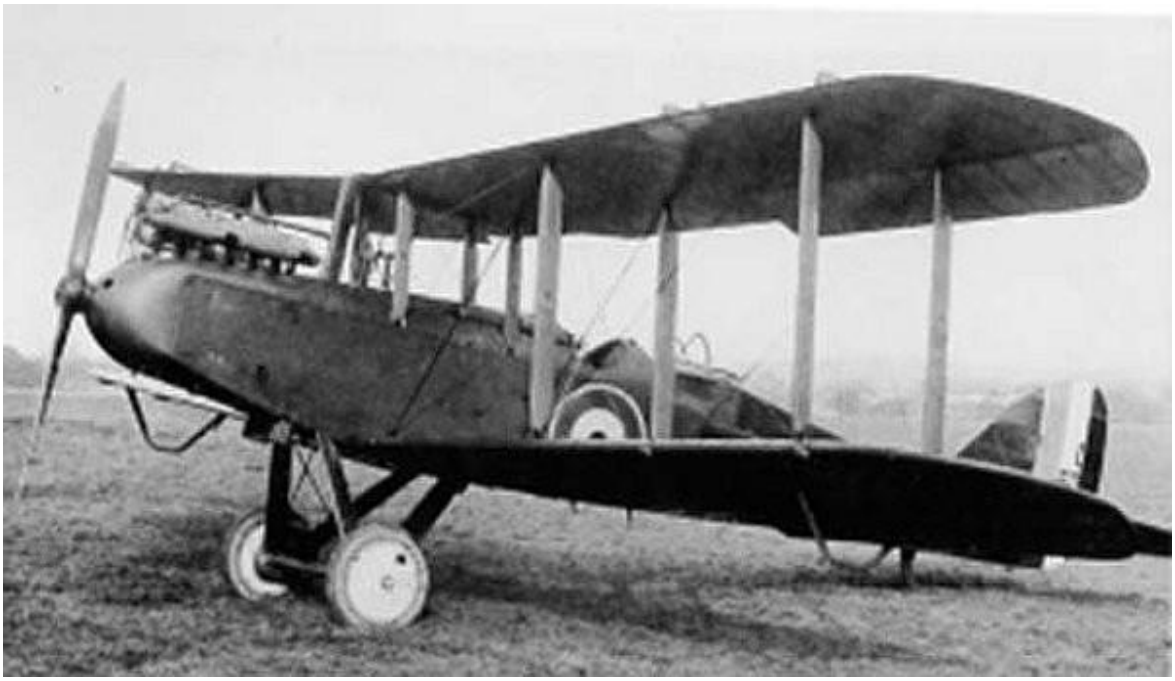

Figure 2.1 –DH-9.
Source: Wikipedia contributors, " Image:Airco D.H.9.jpg," *Wikipedia, The Free Encyclopedia*, http://commons.wikimedia.org/w/index.php?title=Image:Airco_D.H.9.jpg&oldid=8665988; Internet; accessed April 15, 2008.

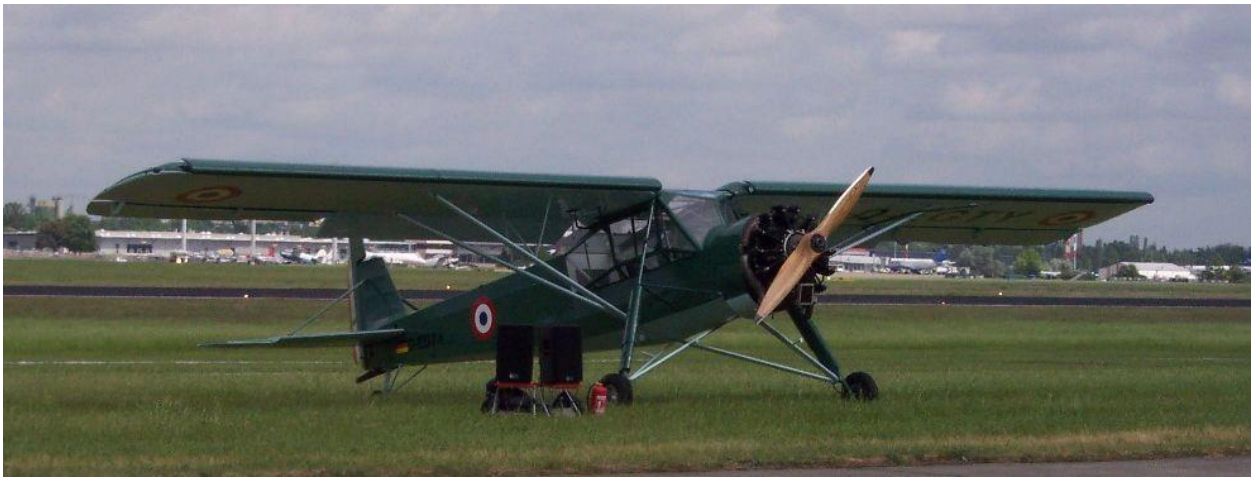

Figure 2.2 –MS 500 series Criquet.
Source: Wikipedia contributors, "Image:MORANE-SAULNIER MS.505 CRIQUET D-EGTY.jpg," *Wikipedia, The Free Encyclopedia*, http://commons.wikimedia.org/w/index.php?title=Image:MORANE-SAULNIER_MS.505_CRIQUET_D-EGTY.jpg&oldid=10365196; Internet; accessed April 15, 2008.

Figure 2.3 – North American B-26 Invader.
Source: Wikipedia contributors, "Image:B-26.jpg," *Wikipedia, The Free Encyclopedia,* http://commons.wikimedia.org/w/index.php?title=Image:B-26.jpg&oldid=4990202; Internet; accessed April 15, 2008.

Figure 2.4 – Bell P-63 Kingcobra.
Wikipedia contributors, "Image:Bell P-63 Kingcobra in flight.jpg," *Wikipedia, The Free Encyclopedia,* http://commons.wikimedia.org/w/index.php?title=Image:Bell_P-63_Kingcobra_in_flight.jpg&oldid=4992973; Internet; accessed April 15, 2008.

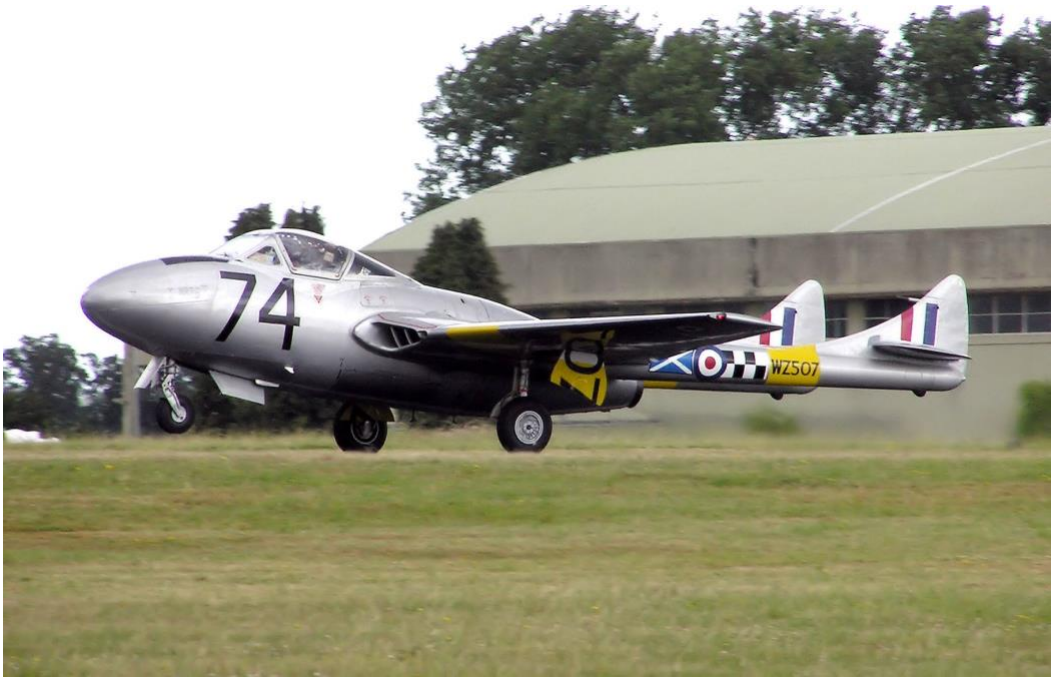

Figure 2.5 – De Havilland Vampire. The aircraft is similar to the Venom and Mistrale.
Wikipedia contributors, "Image:Dh115.vampire.t11.june2004.arp.jpg," *Wikipedia, The Free Encyclopedia*, http://commons.wikimedia.org/w/index.php?title=Image:Dh115.vampire.t11.june2004.arp.jpg&oldid=9653072; Internet; accessed April 15, 2008.

Figure 2.6 – North American T-6 Texan.
Source: Wikipedia contributors, "Image:T-6 Texan.jpg," *Wikipedia, The Free Encyclopedia*, http://commons.wikimedia.org/w/index.php?title=Image:T-6_Texan.jpg&oldid=9371006; Internet; accessed April 15, 2008.

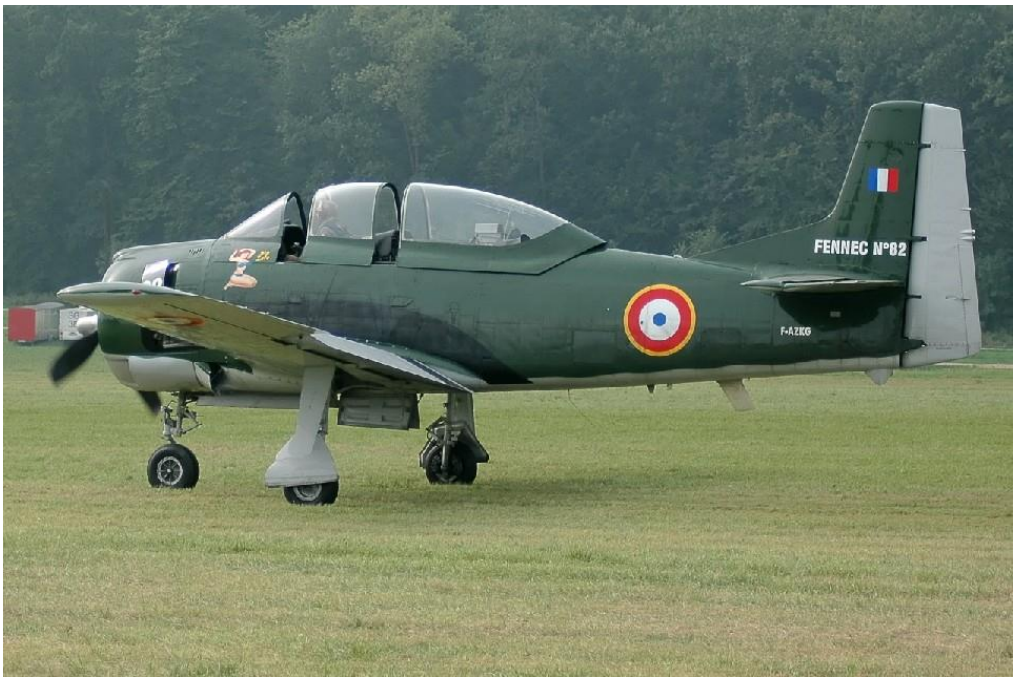

Figure 2.7 – North American T-28 Trojan.
Wikipedia contributors, "Image:NA T28 Fennec.jpg," *Wikipedia, The Free Encyclopedia,* http://commons.wikimedia.org/w/index.php?title=Image:NA_T28_Fennec.jpg&oldid=8376692; Internet; accessed April 15, 2008.

Figure 2.8 – Douglas A-1 Skyraider.
Wikipedia contributors, "Image:Skyraider A-1H-J 1969 - 00000033 - USAF.jpg," *Wikipedia, The Free Encyclopedia,* http://commons.wikimedia.org/w/index.php?title=Image:Skyraider_A-1H-J_1969_-_00000033_-_USAF.jpg&oldid=8711520; Internet; accessed April 15, 2008.

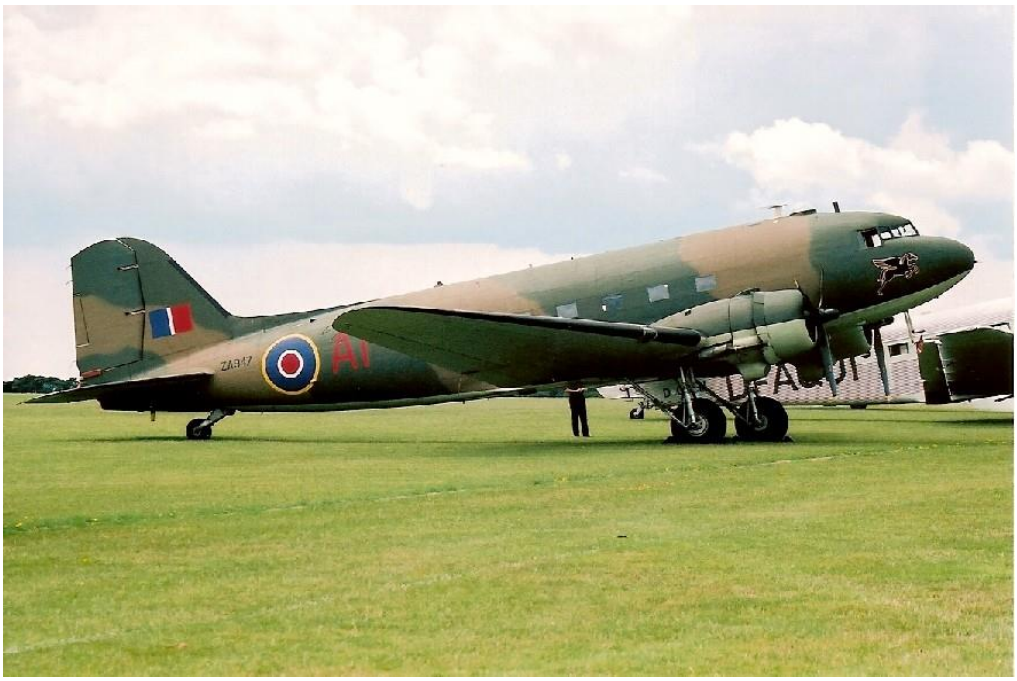

Figure 2.9 – Douglas C-47 Skytrain.
Source: Wikipedia contributors, "Image:C-47 exhibition in 2004.jpg," *Wikipedia, The Free Encyclopedia*, http://commons.wikimedia.org/w/index.php?title=Image:C-47_exhibition_in_2004.jpg&oldid=7122301; Internet; accessed April 15, 2008.

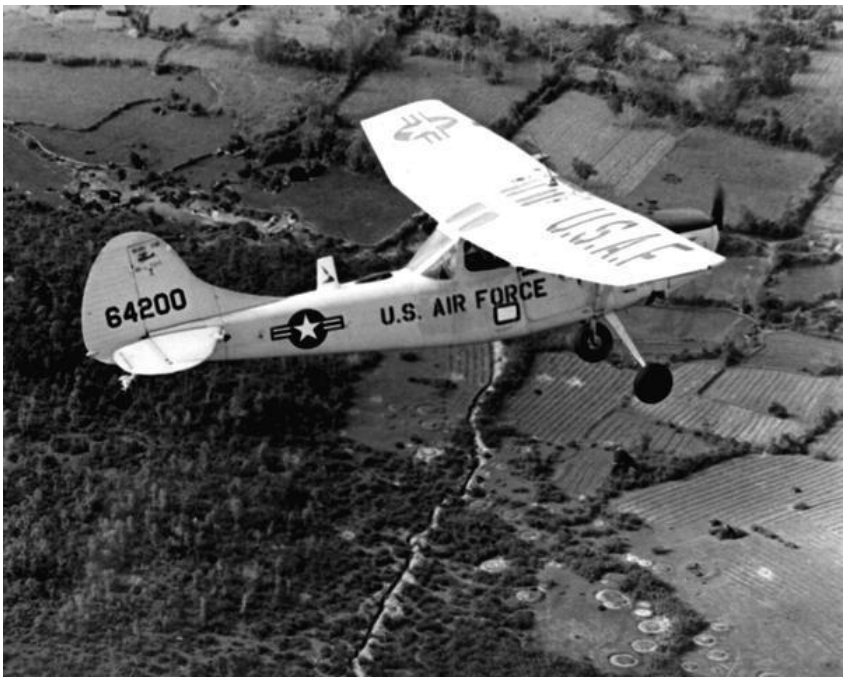

Figure 2.10 – Cessna O-1 Bird Dog.
Source: Wikipedia contributors, "Image:BirdDog.jpg," *Wikipedia, The Free Encyclopedia*, http://commons.wikimedia.org/w/index.php?title=Image:BirdDog.jpg&oldid=9280135; Internet; accessed April 15, 2008.

Figure 2.11 – Grumman OV-1 Mohawk.
Source: Wikipedia contributors, "Image:OV-1 Mohawk.jpg," *Wikipedia, The Free Encyclopedia*, http://commons.wikimedia.org/w/index.php?title=Image:OV-1_Mohawk.jpg&oldid=10368443; Internet; accessed April 15, 2008.

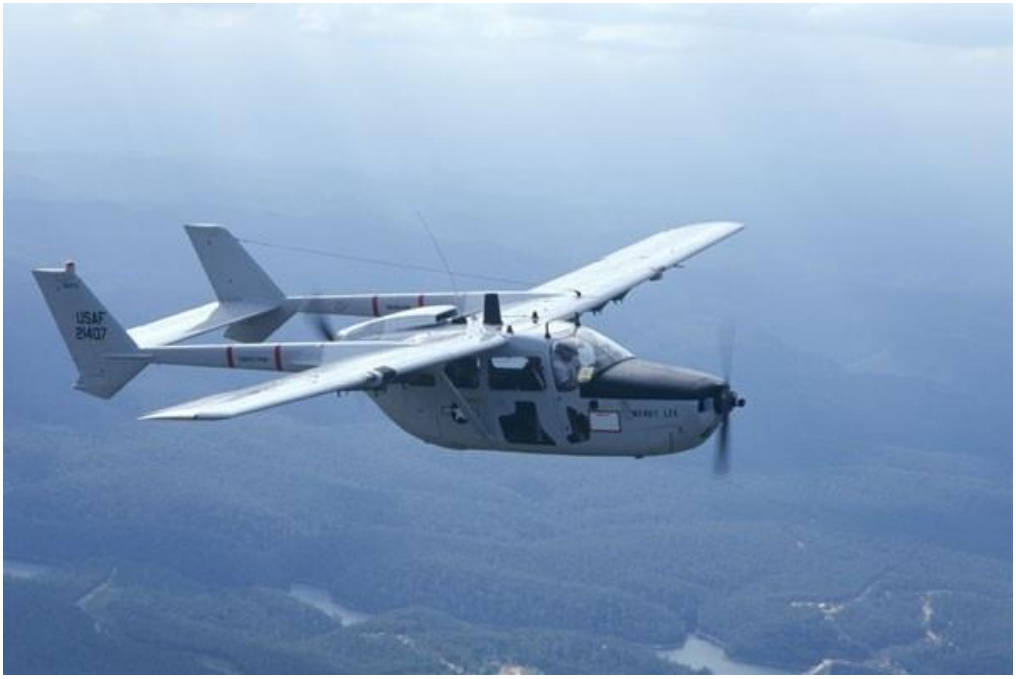

Figure 2.12 – Cessna O-2 Skymaster.
Source: Wikipedia contributors, "Image:O-2 Skymaster-1.jpg," *Wikipedia, The Free Encyclopedia*, http://commons.wikimedia.org/w/index.php?title=Image:O-2_Skymaster-1.jpg&oldid=6088247; Internet; accessed April 15, 2008.

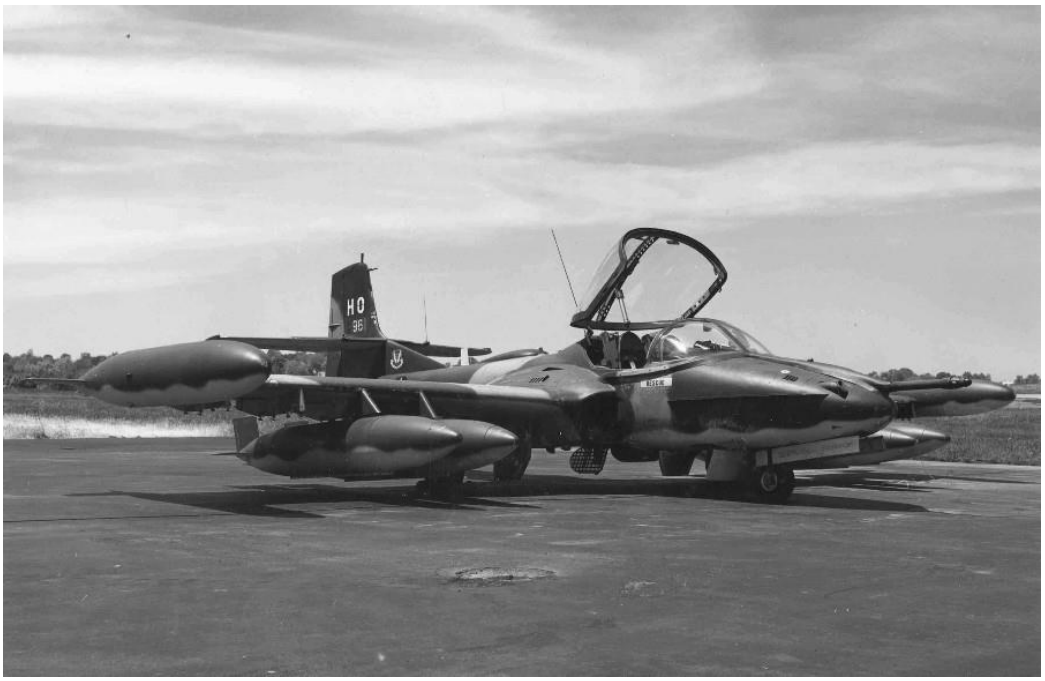

Figure 2.13 – Cessna A-37B Dragonfly.
Source: Wikipedia contributors, "Image:A-37B Dragonfly.jpg," *Wikipedia, The Free Encyclopedia,* http://commons.wikimedia.org/w/index.php?title=Image:A-37B_Dragonfly.jpg&oldid=9280104; Internet; accessed April 15, 2008.

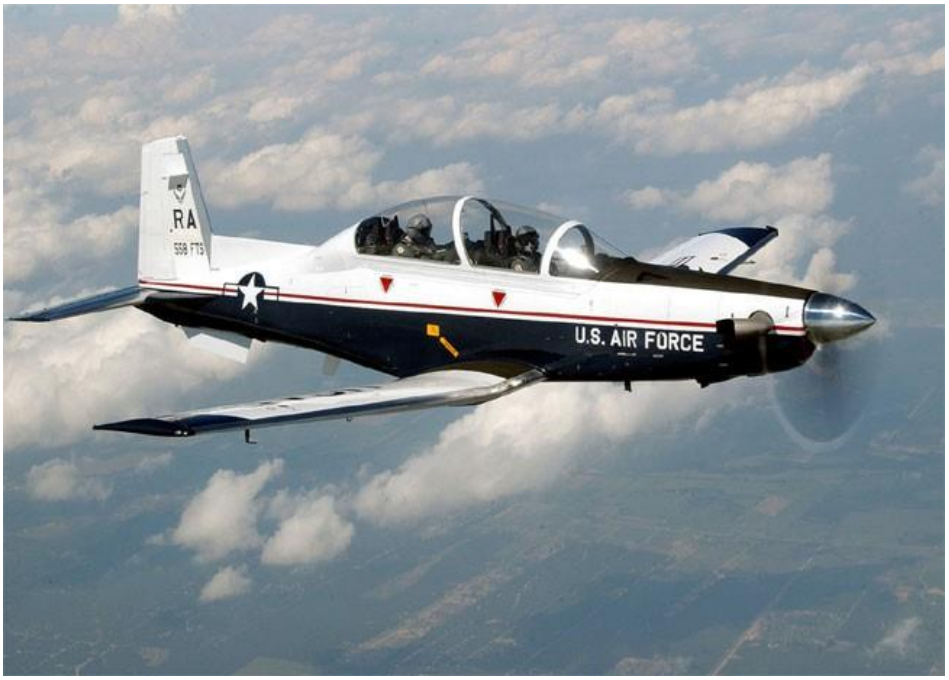

Figure 2.14 – Hawker-Beechcraft T-6A Texan II.
Source: Wikipedia contributors, "Image:T-6A Texan II.jpg," *Wikipedia, The Free Encyclopedia,* http://commons.wikimedia.org/w/index.php?title=Image:T-6A_Texan_II.jpg&oldid=8353991; Internet; accessed April 15, 2008.

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