

AIR POWER STUDIES CENTRE

PAPER 11

March 1993

KEY CONCEPTS IN AIR POWER

By

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INTRODUCTION¹

Written doctrine includes the formalised and structured expression of a number of key concepts, tempered by the lessons of experience. Those concepts may or may not be recognised explicitly within a particular manual of doctrine, but their influence on the combination of theory and practice which is presented should be evident.

This paper suggests that there are seven key concepts in air power, as follows:

- Control of the Air.
- Offensive Action.
- Unity of Air Power.
- Ubiquity of Purpose.
- Force Multiplication.
- Substitution.
- The Technological Edge.

Those terms are used here as *concepts*, not as maxims, principles, tenets or, in the case of control of the air, to identify an air power campaign. Each of the concepts rests on the inherent characteristics of the air weapon; that is, speed, range, responsiveness, flexibility, mobility, pervasiveness, high relative military effect,² and the ability quickly to concentrate massive amounts of firepower. The thinking they represent and the actions they imply thus constitute the essence of air power.

The concepts have both an historical and a general, enduring relevance. Each had been identified at the latest by the mid-1920s, and each seems likely to retain its importance for the foreseeable future.

Two points must be made before examining the concepts. First, air power does not exist in a vacuum. Like most human activities it has a political dimension. Thus, the weighting an individual places on each of the concepts is likely to depend directly on his perception of the national purpose for exercising air power.

Second, it is unlikely that the concepts could be converted into sustained action without the support of a national logistics effort. That does not make 'logistics' a key concept in air power, any more than 'aircraft' or 'pilot' or 'bomb' or 'training' is a key 'concept'. However, it does recognise that in the translation of theory into practice which takes place at another level of planning, ideas must be supported by resources.

CONTROL OF THE AIR

Control of the air is a campaign conducted for the purpose of gaining freedom of action in the air. Once control of the air has been established, other air, sea and land

¹ My thanks to Air Marshal R.G. Funnell for his thoughtful comments on the draft of this paper.

² That is, compared to the other forms of military power (land and sea power), very few friendly forces are placed at risk in relation to the amount of force applied.

operations may be conducted free from enemy air attack. This paper discusses control of the air as an *idea* in air power, rather than as a campaign.³

The first major role for air power in war was reconnaissance. Both the Union and the Confederacy used balloons for reconnaissance during the American Civil War (1861 to 1865), while Britain and Germany had both developed balloon observation units by the 1880s. When the Australian Flying Corps was established in 1915 as an army corps, its prime role was reconnaissance in support of land forces. Little, if any, official consideration was given to using aircraft in other than a supporting role, even though the Italians had given a hint of the offensive potential of air warfare during limited bombing operations against Arab forces in Libya in 1911-12; and notable air power theorists like the Italian General Giulio Douhet and the English mathematician and aeronautical engineer F. W. Lanchester were already speculating favourably on the future prospects of the air weapon.⁴

Air power in general and Australian air power in particular were, however, to find establishing a legitimate independent role very difficult in the face of army and navy opposition. Through to the end of the 1920s at least, the Australian Military Forces (AMF) and the Royal Australian Navy (RAN) continued to insist that air forces could only ever be a subordinate arm of navies and armies.⁵

Despite that opposition, sharp divisions soon emerged between theory and practice. Even though army support theoretically remained the RAAF's major task for most of the inter-war period, the evolution of air warfare during World War I and the force structure of air forces indicated otherwise. Once the crews of reconnaissance aircraft started shooting at each other to try to prevent reconnaissance from being carried out, control of the air had become a prerequisite for all air activities, regardless of whether or not it was accorded formal priority.

The first airborne exchange of shots was *the* crucial moment as far as control of the air *as a concept* was concerned. Whether that control was to be achieved by defensive means (fighter aircraft, anti-aircraft artillery [AAA] or, later, surface-to-air missiles) or offensive means (attacks on enemy aircraft on the ground, airfields, factories, and so on) was an operational rather than a conceptual issue.

In the event, specialist fighter aircraft were rapidly developed, and were supplemented by purely defensive measures such as AAA batteries and barrage balloons. When those fighters (also known initially as pursuits and scouts) started to use their enhanced attack capabilities to increasing effect against ground targets, another compelling reason to make control of the air the first priority existed.

³ For comment on the campaign of control of the air, see RAAF, *The Air Power Manual*, Canberra, 1990, pp 32-33.

⁴ Douhet's classic work, *The Command of the Air*, was published in 1921. However, it contained ideas which he had been developing for over a decade. See Colonel Phillip S. Meilinger, *Giulio Douhet and Modern War*, Unpublished Paper, School of Advanced Airpower Studies, Maxwell Air Force Base, 1992. Lanchester was presenting his vision for the employment of air power publicly by 1915: Higham, Robin, *Air Power: A Concise History*, Sunflower University Press, Manhattan, 1988. p 177.

⁵ Stephens, Alan, *Power Plus Attitude: Ideas, Strategy and Doctrine in the Royal Australian Air Force, 1921-1991*, AGPS, Canberra, 1992, pp 15-48.

While that operational imperative may not have been recognised in official doctrine, it was implicitly recognised in force structures, as fighter and attack aircraft began to enter air forces in increasing numbers. A force development program proposed by the RAAF in 1925, for example, comprised nine army and navy support squadrons and 18 air superiority and attack squadrons, even though support for the other two Services remained the RAAF's prime formal responsibility.⁶

The Battle of Britain during World War II is the best-known example of a campaign for control of the air, with the RAF's victory averting the planned invasion of the United Kingdom. That battle, incidentally, is one of the few examples of a successful *defensive* control of the air campaign. In general, airmen would prefer to wage an *offensive* counter air campaign; that is, to destroy an enemy's air force on the ground rather than fight a war of attrition in the air. It is noteworthy that the Germans had been on the verge of achieving an offensive counter air victory during the Battle of Britain when Goering made his fateful decision to shift the focus of the Luftwaffe's bombing attacks from the RAF's Fighter Command to British cities and port facilities, thus giving the RAF time to recover and regroup.

Control of the air has remained a prime concept in subsequent wars. In Korea, Malaya and Vietnam, Western forces enjoyed a degree of air supremacy which made all other air, land and sea operations far easier and far less costly than would otherwise have been the case. During the Falklands War of 1982, it was essential for the Royal Navy (RN) Fleet Air Arm and the Royal Air Force (RAF) to achieve and maintain local air superiority over the British Task Force; while in the 1991 Gulf War, control of the air was the first objective of the Coalition air campaign which preceded the ground campaign.⁷

Nevertheless, gaining control of the air need not in itself ensure victory, as the North Vietnamese demonstrated against the US and its allies in the 1962-75 Indochina war. While the allies enjoyed air supremacy (that is, complete command of the skies) over the South and air superiority (that is, sufficient command to conduct effective operations) over the North, they still lost the political war.

Perhaps the major conceptual issue for control of the air today is the weighting placed on offensive or defensive action. The inherent air power characteristics of speed, pervasiveness and mobility all work strongly in an attacker's favour in terms of achieving surprise and a favourable force-to-space ratio. Those characteristics favour the offence and make it very difficult for a defender to protect a large area, to achieve *general* air superiority. Consequently, many air forces, including the RAAF, base their air defence plans on achieving *local* air superiority; that is, control of the air over a specific location for a specific period of time.

The emergence of low observable ('stealth') technology could have a profound effect on the battle to control the air. While stealth technology may be expensive, it seems to be neither especially difficult to develop nor exclusive. During the Gulf War, some of the RAF's strike Tornados were quickly modified to achieve a reasonably effective

⁶ *ibid.*, pp 29, 49.

⁷ Middlebrook, Martin, *The Fight for the 'Malvinas'*, Viking, London, 1989; and Waters, Gary, *Gulf Lesson One*, APSC, Canberra, 1992.

degree of *ad hoc* stealth qualities.⁸ If it becomes increasingly difficult (and, therefore, expensive) to track and target stealthy aircraft, the emphasis in a control of the air campaign inevitably will have to focus even more on offensive operations, with the objective being the destruction of the enemy fighter force on the ground. Further, an air force with stealth has *de facto* control of the air (that is, it achieves control without having to fight for it), and therefore may be able to place greater emphasis on and divert resources to other campaigns. Deciding how best to deal with those issues represents a major conceptual challenge for air force strategists.

OFFENSIVE ACTION

The most widely-read and influential military strategist, Carl von Clausewitz, believed defence to be the stronger form of warfare, as it is intrinsically easier to defend than attack.⁹ Exactly a century after Clausewitz started writing his classic work *On War* in 1816, airmen turned that concept on its head.

‘It is the deliberate opinion of those most competent to judge’ wrote the immensely influential air power theorist, General Hugh Trenchard, in September 1916, ‘that an aeroplane is an offensive and not a defensive weapon’. At the time Trenchard was commander of the Royal Flying Corp in France. He recorded his judgment in a brief instruction to the Corps titled ‘Future Policy in the Air’, a document which has since become recognised as the classic statement on the offensive use of air power.¹⁰ Trenchard drew his conclusion partly from the conditions which prevailed in France at the time, and partly from the inherent qualities of aircraft. His judgment was correct in 1916, remained so during World War II, and holds true today.¹¹

At a risk of generalising, in most instances it is difficult to defend against an air threat. Few armed forces would confidently expect to defeat modern attack aircraft like the F-117, F-15E, F/A-18 and the F-111 armed with stand-off weapons and supported by Electronic Combat systems. Again at the risk of generalising, victory in war is likely to require offensive action at some stage; in other words, a purely defensive posture is unlikely to succeed. That imperative, in combination with the particular qualities of aircraft, has underpinned the airman’s preference to use air power offensively.

Thus, notwithstanding air power’s modest beginnings in reconnaissance, the idea of using aircraft offensively was never far beneath the surface. By the end of World War I, offensive air action was so wide-ranging it had become an integral component of warfare. Air strikes were not confined to the front-line, but already comprehended a strategic dimension. Indeed, it was only seven weeks after the declaration of hostilities that Sopwith Tabloid aircraft from the Royal Naval Air Service attacked a

⁸ Waters, *Gulf Lesson One*, p 272.

⁹ von Clausewitz, Carl, *On War* (ed. A. Rapoport), Penguin, Harmondsworth, 1986, pp 113-114.

¹⁰ Trenchard, General Hugh, ‘Future Policy in the Air’ in Stephens, Alan and O’Loghlin, Brendan (eds.), *The Decisive Factor: Air Power Doctrine by Air-Marshal H. N. Wrigley*, AGPS, Canberra, 1990, pp 131-132.

¹¹ For judgments on the essentially offensive nature of air power from the 1940s and the 1990s respectively, see Arnold, Major General H.H. and Eaker, Colonel Ira C., *Winged Warfare*, Harpers, New York, 1941, p 8; and Warden, Colonel John A., *The Air Campaign*, Pergamon-Brassey’s, Washington, 1989, pp 33-55.

Zeppelin shed at Dusseldorf. By January 1915, Zeppelins in turn were bombing English cities.

The bombing raids on London in June and July 1917 by German Gothas probably caused more panic in the United Kingdom than any other single event during the war.¹² While the material damage was slight, the psychological effect was profound, and came to be epitomised in the new concept of ‘terror’ bombing. As a direct consequence of the public and political reaction to those raids, the Royal Air Force came into being as a separate Service within nine months, while within three months a British strategic bomber force under the personal command of General Trenchard had been established in France for the express purpose of carrying out reprisal raids against the German homeland.¹³

Trenchard’s Independent Force as it was known carried out long distance night raids against strategic targets with a degree of daring that makes gripping reading and, incidentally, in the process demonstrated a level of conceptual, technical and individual professionalism not always associated with aviation in World War I.¹⁴

The commitment to the offensive was also evident in the rapid development of formation flying and its associated tactics as a method of concentrating force. Thus, huge formations of fighter aircraft massed to seek combat – to take the initiative, to act offensively – over the Western Front, the best known example being von Richthofen’s Flying Circus.

Incidentally, the symbolic effect of massed formations should not be overlooked. They were clear evidence that air warfare had become an end in itself; that air power was far more than simply an adjunct to land and sea power.

The belief in offensive action continued to dominate air force thinking during the inter-war years, especially in the context of strategic bombing. Building on the ideas of men like Trenchard and two other early theorists, Douhet and the American General Billy Mitchell, a school of thought developed which believed future wars could be won by air power alone, through the means of a quick and decisive strategic bombing offensive. Seemingly paradoxically, that notion was based in part on humanitarian logic, as it was thought that the rapid conclusion of war which was postulated would minimise human and material losses.¹⁵

The new concept of war fighting ostensibly did not rest on a planned campaign of ‘terror’ bombing, but rather on an assumed ability to attack key elements of an enemy’s war potential (especially his air forces) with precision and devastating force, which would as a secondary effect undermine public morale.¹⁶

¹² Jones, H.A., *The War in the Air*, Vol. V, Clarendon Press, Oxford, 1935, pp 26-59.

¹³ See ‘Examples of Effect of Air Bombardment’, in Stephens and O’Loughlin, *The Decisive Factor: Air Power Doctrine* by Air-Marshal H. N. Wrigley, pp 158-162.

¹⁴ Kingsford, A.R., *Night Raiders of the Air*, Greenhill Books, London, 1988, pp 89-110.

¹⁵ Mitchell, William, in *Winged Defense*, Dover Publications, New York, 1988, p xvi, wrote that air power’s unique ability to ‘strike immediately at the enemy’s ... centres’ would result in a ‘tremendous’ saving of lives and expenditure.

¹⁶ Perhaps the most intellectually lively debate on the notion of ‘precision’ bombing was conducted at the US Army Air Corps Tactical School during the 1920s and 1930s: see Futrell, Robert Frank, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force*, Vol I, Air University Press,

That was the theory and the official position. In practice, the threat of indiscriminate terror attacks on civilian populations loomed darkly over international relations throughout the 1930s.¹⁷ That threat was given substance during the Spanish Civil War by the horror bombing of Guernica by the German Condor Legion on 29 April 1937. The perceived menace of the Luftwaffe played a significant part in the appeasement of Hitler during the Munich crisis of 1938, during which air raid trenches were dug in London parks and nearly one third of the population of Paris evacuated the city.

In the event, the Strategic Bombing Offensive waged by the RAF and the United States Army Air Force against Germany and Japan during the Second World War remains probably the most contentious issue of the war. The offensive encountered considerable operational and technical problems and did not meet the exaggerated expectations of its most enthusiastic advocates. It did not achieve a quick and decisive victory, and, in the case of the RAF's Bomber Command at least, was based essentially on a campaign of terror. By the same token, there is no doubt that the overall bombing campaign made a major contribution to the eventual allied victory. The official United States Strategic Bombing Survey concluded in September 1945 that allied air power had been 'decisive in the war in Western Europe ... It brought the [German] economy ... to virtual collapse'.¹⁸ Indeed, according to the Nazi's Minister of War Production, Albert Speer, if attacks of the scale of those made against Hamburg in the week of 25 July to 2 August 1943 had been repeated against six more major cities, Germany's armaments production would have been brought to a 'total halt'.¹⁹

It is significant that, unlike the allies, neither the Germans nor the Japanese ever developed a genuine strategic air offensive capability. The Luftwaffe was structured essentially to support the Army, and Japanese air power the navy. That deficiency was a major factor in the eventual inability of the Axis powers to prosecute the war to maximum effect.²⁰

The idea of 'terror bombing' mentioned above clearly had a psychological foundation. All warfare, of course, rests on a psychological base to some extent, but none more so than offensive air action. Following the two atomic attacks on Japan – the ultimate example of offensive air action – the concept of 'deterrence' dominated global strategic thinking. Although deterrence was defined primarily in terms of a nuclear capability, it was extended by some planners to include conventionally armed air forces. Thus, the RAAF, for example, has persistently referred to its bomber fleet as a 'deterrent' force. Both the Canberra and the F-111 were acquired for the perceived 'deterrent effect' they would create through their explicit threat of offensive action.²¹

Maxwell Air Force Base, 1989, passim, but esp. pp 64-5, 68-70, 77-8. For a British perspective, see Frankland, Noble, *The Bombing Offensive Against Germany*, Faber and Faber, London, 1965, pp 38-46.

¹⁷ Quester, George H., *Deterrence Before Hiroshima*, John Wiley, New York, 1966, pp 77-8, 123.

¹⁸ MacIsaac, David, *The United States Strategic Bombing Survey*, Vol I, Garland Publishing, New York, 1976, pp 15-16.

¹⁹ Speer, Albert, *Inside the Third Reich*, Weidenfeld and Nicolson, London, 1970, p 284.

²⁰ Murray, Williamson, *Strategy for Defeat: The Luftwaffe 1933-1945*, Chartwell Books, New Jersey, 1986, pp 16-29, for background on the development of the Luftwaffe and its doctrine.

²¹ See Stephens, Alan, *Power Plus Attitude: Ideas, Strategy and Doctrine in the Royal Australian Air Force*, pp 147-54. The Canberra entered RAAF service in 1953 and the F-111 in 1973.

In the section of this paper on the concept of control of the air, the difficulty of establishing a general level of air superiority was noted. That difficulty arises largely from the inherently excellent offensive capabilities of strike aircraft, and the consequent difficulty in mounting a reliable defence. That observation is also relevant here, as it illustrates why, in many circumstances, offensive action will be the most cost-effective way of fighting a war, as well as being the best way of taking the initiative. Notable examples include the highly successful pre-emptive strikes by the Israeli Air Force in the 1967 Six-Day War and against the Osirak nuclear reactor in Iraq in 1981.

The point can be taken further. While control of the air is properly recognised as the prime air campaign, it is questionable whether it is the most deeply held belief of airmen. There is strong evidence that the first conviction of airmen has always been, and remains, one of offensive action. The RAAF provides a good case study.

From the earliest days of World War I, the RAAF has appreciated the tactical and operational necessity to gain the command of the air. However, at the final, emotional level (which does not necessarily exclude rationality and military logic), it has been offensive action, expressed through strike/bomber aircraft, which has been considered the heart of air power. It was, after all, the belief of the classical theorists that wars could rapidly be won by air power alone which was the main justification for the establishment of independent air forces, and on which the alleged/perceived/actual dominance of the air weapon continues to rest. In the RAAF, former chiefs of the air staff Air Marshal Sir George Jones, Air Marshal Sir Donald Hardman, Air Chief Marshal Sir Frederick Scherger, Air Marshal Sir Valston Hancock, Air Marshal Sir Charles Read and Air Marshal Sir James Rowland have all argued the pre-eminent place of the bomber in air power.²²

Recent strategic and force structure thinking in Australia suggests that the concept of offensive action retains its pre-eminent place in air power doctrine. One of the most influential defence planning papers in recent years, the 1986 *Review of Australia's Defence Capabilities* by ministerial consultant Paul Dibb, proposed an essentially defensive strategy for Australia, which Dibb called 'denial'. Primarily because of his preference for a defensive strategy, Dibb questioned the place in the ADF's force structure of the RAAF's prime strategic strike assets, the F-111 bombers.²³ One positive consequence of Dibb's outlook – which flew in the face of 70 years of air power thinking – was the pressure it placed on the RAAF to re-examine the importance of, and its commitment to, offensive action. That the RAAF (and other like-minded Defence strategists) was able successfully to meet what was a considerable intellectual challenge became apparent in two subsequent major government policy documents.

The first was the 1987 Policy Information Paper *The Defence of Australia*, which was based on the Dibb review, but which rejected 'denial' in favour of a strategy of 'defence in depth', in which the place of offensive action by the F-111s was explicitly recognised.²⁴ The second document was a major policy statement made in 1989 by the

²² *ibid.*, pp 78-9, esp fn 147. Jones was CAS from 1942-52, Hardman 1952-54, Scherger 1957-61, Hancock 1961-65, Read 1972-75 and Rowland 1975-79.

²³ Dibb, Paul, *Review of Australia's Defence Capabilities*, AGPS, Canberra, 1986, pp 120-122

²⁴ Department of Defence, *The Defence of Australia* 1987, AGPS, Canberra, 1987, pp 31-33, 41.

Minister for Foreign Affairs and Trade, Senator Gareth Evans, titled *Australia's Regional Security*. In that statement, Senator Evans acknowledged the need to retain in the ADF a mix of offensive and defensive capabilities, with the former constituting 'a strong message of deterrence against any attack on Australian territory'.²⁵

The stunning application of offensive air power during the 1991 Gulf War indicates that the dominance of the offence over the defence in warfare in general and air warfare in particular is likely to continue,²⁶ and that the concept of offensive action will remain pre-eminent in air power strategy.

UNITY OF AIR POWER

The concept of unity (of command) is probably the most politically sensitive of those under discussion in this paper, as it is sometimes perceived as nothing more than a self-serving attempt by airmen either to retain or gain control of all air assets. The occasional use of terms such as 'indivisibility' or 'independence' as synonyms for 'unity' by advocates of the concept has perhaps contributed to the problem, which often is manifested as inter-Service rivalry.²⁷

The medium in which air power is applied – space – 'is an indivisible field of activity'.²⁸ However, some airmen seem to confuse that physical fact with the *application* of air power. Air power itself manifestly is *not* 'indivisible' – the United States, for example, maintains four separate, very powerful air forces, while even Australia has three.²⁹ Nor is 'independence' an exclusive characteristic of air power. Clearly, any of the three forms of military power can be applied independently if necessary, just as they equally clearly can be applied in various combinations of jointness. Any suggestion that air power is either inherently 'independent' or 'indivisible' thus is illogical.

'Unity', however, is a different matter. There are two main justifications for the concept, one concerned with organisational effectiveness and the other with combat potential. Those justifications have particular relevance for a small defence force which must minimise costs while maximising flexibility and the ability to concentrate force.

In a small defence force, expensive and valuable air assets are likely to be at a premium. Thus, the advocates of unity argue that air power should not be 'penny-packed', but rather should be controlled at the highest practicable level to facilitate the allocation of the right amount of air power to the right place at the right time.³⁰

²⁵ Evans, Senator Gareth, *Australia's Regional Security*, 1989, pp 16-17.

²⁶ Stephens, Alan, *The Implications of Modern Air Power for Defence Strategy*, APSC Paper Number 5, Canberra, 1992, pp 1-16.

²⁷ Stephens, *Power Plus Attitude*, pp 130-131, 188-190.

²⁸ Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force*, Vol I, p 406.

²⁹ In addition to the USAF, the US operates powerful air forces in its Navy, Marines and Army; while in the ADF both the RAN and ARA operate significant numbers of aircraft.

³⁰ RAAF, AAP 1000, *The Air Power Manual*, APSC, Canberra, 1990, pp 35-36.

The second justification rests on the need to maximise combat potential, and can itself be broken down into three components. First, the application of military power is a highly specialised business, which is based on environmental – that is, land, sea and air – expertise. The three environments are unique, and demand the unique skills of the three single Services. Taking the example of the air environment, modern aircraft and air weapons systems are complex, versatile and flexible, and can bring enormous firepower to bear. Those are factors which demand the expert matching of crews and capabilities to tasks, which in turn dictates that the control of air assets should be vested in a commander with a deep understanding of air power and its application. The principle applies equally to the management of scarce and valuable land and sea assets.

Second, a specialist organisation is more likely to develop innovative uses for its platforms and systems, not only because the application of the particular form of military power is its *raison d-etre*, but also through its access to a wider range of people and experiences. A good example of that belief in practice was the RAAF's successful development during the Vietnam War of the Iroquois helicopter gunship, a process in which the Air Force was able to draw on the weapons expertise of its fighter pilots.

The final justification for 'unity' in terms of combat potential turns on the operational practice of 'surge', or rapidly building up specific elements of a fighting force. The campaign of 'control of the air' is used here to illustrate the point. While control of the air is the prime air campaign, there are no hard and fast rules in war. The possibility always exists that, in a particular set of circumstances, priority might have to be shifted to other air missions. For example, the need to resupply army units for a protracted period might assume such importance that a maximum airlift effort becomes essential, regardless of any other consideration. Alternatively, there might be no requirement to fight for control of the air: an enemy might have powerful land or sea forces, but no air power. Unity of command alone confers the ability quickly to reinforce particular force element groups by transferring assets (including pilots and support personnel) to the area of greatest need.

From the foregoing, it should be clear that the *concept of unity applies to all forms of military power* – land, sea and air.

Like any concept, unity must be applied with judgment. A strong argument can be made that the Royal Australian Navy's Seahawk helicopters are so important to the operations of its surface warships that they should be considered 'organic' to that role, that is, they cannot be placed in a 'unified' pool of air assets, but must always be allocated to the fleet. Those kinds of decisions involve a conscious acceptance of reduced efficiency (the application of 'unity' is diminished) for the sake of effectiveness (the RAN's warships are far more effective with helicopters embarked).

Several concluding observations on the historical background to the concept of 'unity' are worthwhile. First, the decision to form the RAF as the world's first independent air force in 1918 was based largely on the dual needs of specialisation and

organisational efficiency.³¹ Second, the decision to form the RAAF in 1921 was partly an inter-Service and political compromise, and partly an acknowledgement of the need for efficiency and economy.³² Finally, the decision to establish the USAF in 1947 was taken on the grounds of organisational efficiencies and specialisation.³³ IN other words, the importance of the concept of 'unity' was implicitly recognised in each of those decisions.

UBIQUITY OF PURPOSE

'Ubiquity of purpose' in aircraft design and, therefore, capabilities, became an article of faith in air forces in the period between the wars. The idea was to develop 'general purpose' aircraft which individually would be capable of performing a range of different roles.³⁴ It was an idea which gained some substance in the late 1930s, when aircraft with a reasonable general purpose performance, such as the Anson, the Blenheim and the Hudson, began to enter service.

In the modern era, the terms 'multi-role' and 'multi-mission' have been adopted to describe the concept and the capabilities it allegedly confers. 'Multi-role' describes an aircraft which can perform a number of different roles, but not necessarily during the one mission, while 'multi-mission' describes an aircraft which can conduct a number of roles during one mission. A prime example of a multi-role aircraft is the variable geometry F-111 which, during its development in the early 1960s, was promoted by US Defence Secretary Robert McNamara as a platform which would be able to undertake many of the combat missions of the USAF and the USN.

The significance of 'ubiquity' as a key concept rests simply on its potential to maximise that most valuable, innate quality of air power, flexibility. An incident from the 1991 Gulf War illustrates the idea. During a bombing mission against an Iraqi airfield, four USN F/A-18s were attacked by two Iraqi MiG-21s. Although configured for air-to-ground operations and loaded with 8000 lbs of bombs, the F/A-18s quickly changed to the air-to-air mode and shot down both MiGs. They then reverted to the air-to-ground mode and successfully completed their task.³⁵ Similarly, an RAAF B-707 deploying a fighter squadron from southern to northern Australia could be completing three roles simultaneously: troop lift, cargo carrier and air-to-air refueller.

The development of multi-role aircraft can be seen as a reaction to four influences. First, it reflects the flexibility and mobility which are inherent characteristics of air power. Second, it is a product of technological development in platforms and systems. Third, cost savings are likely to be achieved by operating a single, versatile aircraft type instead of a number of special-purpose types. Finally, the idea of developing

³¹ See 'Extracts from a Report by General Smuts on Air Organisation and the Direction of Air Operations', in Stephens and O'Loughlin, *The Decisive Factor: Air Power Doctrine by Air-Marshal H. N. Wrigley*, pp 145-148.

³² Coulthard-Clark, C. D., *The Third Brother*, Allen and Unwin, Sydney, 1991, pp 1-31.

³³ Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force*, Vol I, pp 191-200.

³⁴ The concept also raises images of Douhet's 'Battleplane', a machine which the Italian envisaged would combine the capabilities of bomber and fighter aircraft. See Douhet, *The Command of the Air*, pp 117-120.

³⁵ *Jane's Defence Weekly*, 15-6-91.

aircraft which can perform a number of roles effectively was a response from airmen who in the early years of military aviation were formally committed to supporting surface forces (tasks which, like any, have implications for aircraft performance), but who wanted to apply air power in its fullest sense.

Thus, in 1936, the CAS of the RAF, Sir Edward Ellington, stressed to the RAAF the need to avoid acquiring aircraft which were suitable solely for roles 'ancillary to land and sea forces'.³⁶ Ellington urged his Australian colleagues to equip their air force with 'general purpose' aircraft which, while still capable of meeting their primary role of army and navy support, would also be able to produce 'an offensive air effort'. As Australia embarked on a rearmament program with World War II approaching, Ellington again took the opportunity to remind the RAAF of the need to incorporate 'ubiquity of purpose' as a prime characteristic of any aircraft they acquired, making the interesting observation that while the 'striking power' of the RAAF seemed rather weak on paper, the fact that the RAAF could supplement its bomber force with its army cooperation aircraft made that weakness 'more apparent than real'. In other words, by acquiring aircraft for army support which were in fact multi-role, the RAAF had at the same time strengthened its strike potential.

The concept of ubiquity was not without its shortcomings in the early years. The problem was a familiar one in air power theory: an inability to match ideas with suitable hardware. For example, the types of aircraft Ellington had in mind were the Anson, Hudson and Blenheim. As twin-engine, retractable undercarriage monoplanes, those machines represented a significant advancement in performance and capability over the previous generation of general purpose aircraft. However, their lack of specialisation (such as high speed, or large bomb load, or extreme range) limited their utility in the intensely hostile operating environment of a world war. The demands of combat quickly exposed the need for specialised, essentially single role aircraft. Nevertheless, in the crucible of war, several outstanding multi-role aircraft did eventually emerge, with the Mosquito being perhaps the best example.

In more recent years, attempts to develop a genuine multi-role aircraft have been more successful, while still not producing a weapons system that is the best in each of its intended roles. For example, the F-111 is an outstanding strike and electronic warfare aircraft but has a mediocre air defence capability; the Tornado is a good rather than an outstanding aircraft; and the F/A-18 provides an excellent air-to-ground capability but is inferior to the specialised F-15C in the air defence role.

Multi-roling is not restricted to attack aircraft. The Lockheed Hercules is capable in at least six roles, including airlift, anti-submarine, air-to-air refuelling, attack, reconnaissance and AEW&C. It is noteworthy that the prototype C-130, which was designed primarily to carry cargo and troops, first flew in 1954.

The question of how to make weapons systems both more versatile and technologically superior is one of the most important confronting air power planners in a period of extreme financial stringency. It is a problem which essentially turns on the choice of either paying for new platforms or fitting new systems to old platforms. The Rand Corporation's Ben Lambeth has argued that in some roles – notably air-to-

³⁶ Stephens, *Power Plus Attitude*, pp 45-46.

air combat – air forces will continue to need new, highly specialised platforms.³⁷ On the other hand, there is great potential for existing platforms to be given impressive multi-role and multi-mission capabilities through the use of pods (for example, electronic warfare, reconnaissance and weapons systems) which can be fitted as required. There are few better examples of the ‘old platforms, new systems’ approach to achieving ubiquity of purpose than the RAAF’s F-111s. Ordered 30 years ago as strategic bombers, the F-111s now also have excellent close air support, precision strike, maritime strike and reconnaissance capabilities. Largely because they have been made so versatile, the F-111s are likely to remain in front-line service for 40 years.

FORCE MULTIPLIERS

Force multiplication is a relatively new description of an old idea. Air Vice-Marshal R. A. Mason has suggested that while Lord Trenchard would not have recognised the term, he was familiar with the concept: ‘to expand the effectiveness of man and machine without increasing the numbers of either; in that way lies economy’.³⁸ In current terminology the term also comprehends notions like ‘smaller but larger’ and ‘doing more with less’; that is, as well as enhancing force effectiveness, it recognises the need for financial economies.

Force multiplication is relevant to any form of military power, but the inherent speed, range and pervasiveness of aircraft give the concept particular force in relation to air power. The enhancement, or multiplication, of the combat effectiveness of a military asset which can be in Melbourne one day and Learmonth the next assumes an exponential value.

Mention has already been made of the multi-role aircraft, which is itself a form of force multiplication. Other force multipliers include air-to-air refuelling; precision guided munitions; precision attack and navigation systems; night vision equipment; airborne early warning and control aircraft; wide bodied aircraft; electronic warfare; real time, secure, data link communications; maintenance practices which produce a high percentage of serviceable aircraft; R&M (reliability and maintainability); good training; and good people. The relationship between the theory and practice of force multiplication is apparent in those examples. Night vision equipment facilitates the conduct of around-the-clock tactical operations; a high percentage of serviceable aircraft enables more missions to be flown by a given number of platforms; PGMs can destroy in one raid a target which may have required hundreds of sorties using dumb bombs; and so on. In sum, force multiplication describes the kinds of capabilities which ‘expand the effectiveness of man and machine’.

³⁷ Lambeth, Benjamin S., ‘Trends in Air Power: New Systems, Old Platforms?’, in Alan Stephens (ed.), *Smaller But Larger: Conventional Air Power into the 21st Century*, AGPS, Canberra, 1991, pp 129-150.

³⁸ Sir Hugh Trenchard, quoted in Mason, Air Vice-Marshal R. A., ‘Current Air Power Developments’, in Ball, Desmond (ed.), *Air Power: Global Developments and Australian Perspectives*, Pergamon-Brassey’s, Rushcutters Bay, 1988, p 62.

SUBSTITUTION

Like many effective concepts, substitution is simple but not simplistic. It involves the substitution of one form of combat power for another. Because the concept is most likely to arise as a planning consideration when resources are limited, it tends to favour systems which are inherently flexible and provide a range of options. In general, therefore, it applies to the substitution of air power for land and sea power. Indeed, because air power is so flexible, it can be substituted for the other kinds of military power to an extent which is not possible in reverse.

The point must be made that substitution should not be used to promote one Service at the expense of another. Rather, it offers a method by which defence planners can manipulate the force structure so that capabilities are consistent with strategic policy and funding.

Substitution as a strategic concept was developed by the CAS of the RAF, Sir Hugh Trenchard, in a series of campaigns conducted by the RAF in the Middle East and the Northwest Frontier of India in the 1920s. In 1921, acting on the advice of Trenchard, Winston Churchill as Minister of War and Air transferred responsibility for defending Imperial interests in Iraq from the Army to the RAF. Churchill's decision was based partly on a wish to save money, and partly on Trenchard's assurance that Imperial authority could be enforced through the strategy he called 'Air Control'. Consequently, a garrison of 33 Imperial battalions costing 20,000,000 pounds a year was replaced by five RAF squadrons, without any army forces in support, at a cost of less than 2,000,000 pounds a year.

As well as exploiting the pervasiveness, speed and striking power of aircraft, Air Control or the 'Air Method' of policing territories relied heavily on the 'moral effect' of a population's fear of aerial bombardment. Before an errant tribe or community was actually bombed, well-defined procedures were followed, with a sequence of warnings being given, often by proclamation dropped from the air. If that procedure did not work, a 'punishment' air raid was carried out.

Air Control amounted to the substitution of air power for land power and was highly successful.³⁹ Not surprisingly, however, the 'substitution' debate as it became known also generated the most intense opposition from naval and military quarters. That did not deter Trenchard, who in 1929 prepared a paper titled 'The Fuller Employment of Air Power in Imperial Defence', which declared 'unequivocally the belief of the Air Staff that real economies with at least no less efficacy could be secured by the substitution of Air Forces for the other arms over a very wide field'.⁴⁰

With its unmistakable implications for the other Services, substitution has remained a contentious issue over the years, while also retaining its operational and economic logic.

³⁹ See Wrigley, Air Vice-Marshal H. N., 'Precis of Lectures on Small Wars', in Stephens and O'Loughlin, *The Decisive Factor: Air Power Doctrine by Air-Marshal H. N. Wrigley*, p 137.

⁴⁰ Slessor, Sir John, *The Central Blue*, Cassell, London, 1956, p 70.

The experiences of the 1991 Gulf War indicate that substitution could once again emerge as a keenly debated topic in defence circles.⁴¹ In the initial phases of Operation Desert Shield (which preceded Desert Storm), it was air power which the Coalition first deployed to the Middle East. When dissatisfaction arose over Saddam Hussein's apparent refusal to comply with United Nations directives following Iraq's defeat, it was again air power which the Coalition threatened to send back to the Gulf as the means of enforcing compliance. In each crisis, air power was substituted for the old Imperial strategy of gunboat diplomacy. Some senior military officers have described the AWACS aircraft as the gunboat of the late 20th century. General John Shalikashvili, Nato Supreme Allied Commander Europe, has noted that in a crisis, Nato's AWACS fleet can be deployed to demonstrate concern, responsiveness and multinational solidarity, while at the same time monitoring events.⁴² Varying levels of concern could be signalled by supporting the AWACS with combat aircraft.

The application of substitution could be taken further. As the promised massive defence cuts start to take effect in the next five years, the fight between Services for resources is likely to be intense; indeed, in the United States it has already been described as a 'turf war'.⁴³

The continuing improvement in multi-role aircraft and force multipliers seems certain not only to confer a quantum leap in air force capabilities, but also to broaden the potential to substitute air power for land and sea power. Additionally, with the growing ability of aircraft to sustain a presence and protect large areas (through more efficient engines and aerodynamic shapes, and enhanced sensors and weapons), the next generation of aircraft can be expected to intrude further into traditional naval roles such as long range patrol, surveillance and escort.⁴⁴ An aircraft may not perform those tasks as well as a surface vessel, but it will provide a reasonable capability and relatively high survivability while not losing any of its unique primary effectiveness. For small nations with constrained budgets, such considerations should assume central planning importance.

THE TECHNOLOGICAL EDGE

Individual and collective human excellence is the basis of organisational achievement. Nevertheless, the application of air power is an intensely technological business. All else being equal, the air force with a technological edge is likely to win wars. It is for that reason that enormous amounts of resources have been, and continue to be, poured into research and development. The remarkable advances made in aviation during the two world wars provide concrete evidence of the importance of the technological edge.

⁴¹ For a summary of the possible consequences of the Gulf War on force structure planning in each of the Services, see 'Breaking Free: A Survey of Defence in the 21st Century', in *The Economist*, September 5th, 1992.

⁴² See *Defense News*, November 16th-22nd, 1992, p 44.

⁴³ 'Tight Budgets Mean Services Now Openly Fighting for Other's Cash', in *Defense Week*, 2-7-90, pp 12-13.

⁴⁴ *The Economist*, September 5th, 1992, esp. 'Endangered Species, and Others'.

One of the first noteworthy examples of the power of technology was the emergence of the Fokker Eindecker over the Western Front in late 1915. With its unique, synchronised, forward firing gun, the Eindecker suddenly and dramatically swung the advantage in the air war to the Germans, to the extent that the Royal Flying Corps had to modify its tactics until British engineers produced a synchronised gun.⁴⁵

Technology was one of the keys to the allied victory in the air in World War II, through such equipment as radar, precision navigation equipment and advanced aircraft design and weapons. There were also reverses when allied equipment was significantly inferior to the enemy's, notably for the RAAF when its Buffalo, Wirraway and Hudson aircraft were hopelessly outclassed by the Japanese Zero fighter in the early stages of the war in the Southwest Pacific Area.⁴⁶ The RAAF also suffered in Korea, when its straight-wing Meteor fighters were no match for the communists' swept-wing MiG-15s.

While the importance of high technology is difficult to overstate, the human contribution must never be forgotten, as the North Vietnamese demonstrated from 1962-1975 when a peasant-based army defeated the most advanced military technology in the world, by winning the political war and fighting the war on the ground with tactics which maximised their comparative advantage and, as far as possible, minimised those of their vastly technologically superior opponents.

The 1991 Gulf War represents the best example to date of the war-winning qualities of high technology, especially as applied by air power. The platforms, weapons and systems available to the Coalition, when applied by skilled operators, provided the foundation for a crushing victory. While the initial successes claimed for high technology were later modified, the original judgment stands.⁴⁷ High technology generally was reliable and effective. It worked, and continued to work, in demanding conditions on a sustained basis. As *The Economist* concluded, the high-technology equipments which were in the main employed by air forces were 'war-winners'. Those equipments and the strategies which they facilitated were also primarily responsible for the extraordinarily low number of casualties sustained by the Coalition forces.

The effectiveness and availability of such technologies as precision-guided munitions, night vision goggles, infra-red designators, global positioning system, air-to-air refuelling, low observability, AEW&C, J-STARS, advanced missiles, and space-based surveillance and communications, can only increase. It is difficult to imagine how a conventional war could be won in the future if one side had access to those systems and another did not. Hilaire Beloc's aphorism from another era, suitably modified for the developments in weapons systems, could be transposed to the late 20th Century:

Whatever happens, we have got
The Maxim gun, and they have not.

⁴⁵ 'Instructions Issued by headquarters, Royal Flying Corps, 14th January 1916', in Stephens and O'Loughlin, *The Decisive Factor: Air Power Doctrine by Air-Marshal H. N. Wrigley*, p 167.

⁴⁶ See Balfe, J. D., *War Without Glory*, MacMillan, South Melbourne, 1984.

⁴⁷ 'We Have the High Tech, They Have Not', in *The Economist*, September 5th 1992.

CONCLUSION

This paper has suggested that there are seven key concepts underpinning air power doctrine: control of the air, offensive action, unity of air power, ubiquity of purpose, force multiplication, substitution, and the technological edge. Those concepts rest on the essential characteristics of the air weapon. That should not be surprising; nevertheless, it seems a necessary point to make. Perhaps because of the exaggerated claims sometimes made by the early air power theorists and their inability to match ideas with capabilities, qualities which may seem self-evident to airmen are sometimes viewed with scepticism by others.

Given that background, it is noteworthy that six of the key concepts had been identified by the end of the Great War, and the seventh (substitution) by the early-1920s. Whether or not they were fully understood in air forces then and later remains problematic. There is no doubt, however, that the concepts were appreciated by those airmen who planned the air war in the Gulf in 1991, when their application – either tacitly or explicitly – provided the intellectual foundation for the most successful air campaign yet conducted.