THE ROYAL AIR FORCE

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CONTRIBUTIONS TO THE ROYAL AIR FORCE AIR POWER REVIEW

The Royal Air Force *Air Power Review* is published quarterly under the auspices of the Director of Defence Studies (RAF) and has the sponsorship of the Assistant Chief of the Air Staff. It is intended to provide an open forum for study which stimulates discussion and thought on air power in its broadest context. This publication is also intended to support the British armed forces in general and the Royal Air Force in particular with respect to the development and application of air power.

Contributions from both Service and civilian authors are sought which will contribute to existing knowledge and understanding of the subject. Any topic will be considered by the Air Power Review Management Board and a payment of £200 will be made for each article published.

Articles should be original and preferably not previously published, although those of sufficient merit will not be precluded. Between 2,000 and 10,000 words in length, articles should list bibliographical references as end notes, and state a word count. Lengthy articles may be published in instalments. Contributions from serving military personnel should be in accordance with DCI GEN 313 dated 26 November 1999.

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FOREWORD

It is fitting that the leading article in this, the 20th issue of Air Power Review, is the text of the Andrew Humphrey lecture delivered by the Chief of the Air Staff at the Royal Aeronautical Society on Tuesday 19th October 2002. In the article CAS first looks at how air power developed over its first 80 years from the perspective of interrelated technological and doctrinal changes. He then looks at how air power has developed in the post Cold War world, taking a closer look at more specific RAF issues. CAS then offers his own views on how the use of air power may develop in the next 20 or so years and concludes with his thoughts as to how one of his predecessors, Sir Andrew Humphrey, a consummate aviator with an extensive technical background, would have viewed the rapid developments in air power as we approach the centennial of the first powered flight.

The second article, by Air Commodore Peter Dye, is an abridged version of his Slessor paper recently published in full by King's College London. This very informative paper is based on the thesis that expeditionary air power has always been built on an inherent logistics frailty. The paper takes as its starting point recent European political initiatives, in particular the Helsinki Headline Goal, and then examines the impact of all areas of logistics upon the delivery of expeditionary air power in a European context. He then concludes by highlighting the challenges that exist in both the military and political arenas in creating an effective European Rapid Reaction Force with an air power element founded on a coherent logistical structure.

The next article, by Major M de Haas RNLAF, examines the use of Russian air power in the second Chechen War. The article looks at the Russian application of air power at the strategic, operational and tactical levels, and then draws conclusions by comparing the use of air power between the first and second Chechen conflicts. Major de Haas's sources are primarily Russian and the lessons he draws out are highly instructive when considering the use of air power in what can be considered as the resurgence of counter-insurgency operations.

The next article, by Professor James Corum of the USAF School of Advanced Airpower Studies, is an excellent historical analysis based on a wide range of German sources that set the doctrinal basis for their employment of air power in the Second World War. It is interesting to conjecture how the first couple of years of World War II would have transpired if the Germans had developed their concepts of strategic bombing rather than using the Luftwaffe as primarily a supporting arm of their land forces.

The next article, by Lieutenant Colonel 'Goldie' Haun USAF, is something of a departure from the normal focus of articles in Air Power Review. The article provides a personal, very readable, insight into the tactical employment of the A10 in the forward air control role over Kosovo. However, and as the recent operations over Afghanistan have shown, FAC is one way of

However, and as the recent operations over Afghanistan have shown, FAC is one way of shortening the sensor - decision maker - shooter loop, and their employment, particularly against fleeting or emerging targets, can have operational and strategic effect.

The next article, by Major R L Banks USAF, is the first of a 2-part article drawn from a thesis presented to the School of Advanced Airpower Studies at Maxwell Air Force Base. The 2 articles examine USAF policy during and between the Korean and Vietnam wars and ask to what extent and why the US development of tactical air power was secondary to that of strategic air power. One aspect of the article is a detailed and illuminating history of the development of the 'Century' series of fighters and their associated weapons systems.

The final article, by the then Wing Commander T Leigh-Mallory, was published in the Royal Air Force Quarterly in April 1931 and discusses the maintenance of air superiority in a land campaign. The article concentrates on what we would now call the OCA/AD balance. Whilst Leigh-Mallory is by no means convinced of the value of OCA, he does view it as a tactical opportunity and perhaps, more importantly, as one of pre-emption. His suggestion about a surprise attack carried out to disorganise an enemy air force on the eve of some important military operation describes exactly the Israeli air operations at the start of the 1967 war. However, his conclusions appear somewhat contradictory, suggesting on the one hand that bomber and fighter squadrons should be parcelled out to military formations to enable air power to be brought to bear against identified weaknesses, but on the other hand suggesting that command and control should be centralised and that all available forces be concentrated on attaining air superiority if the opportunity presented itself. This is, however, perhaps not so contradictory if one views 'parcelling out' as evidence of the understanding of what we would now call a joint apportionment process where the flexibility of air power is maximised by centralised command and control and flexible decentralised execution.

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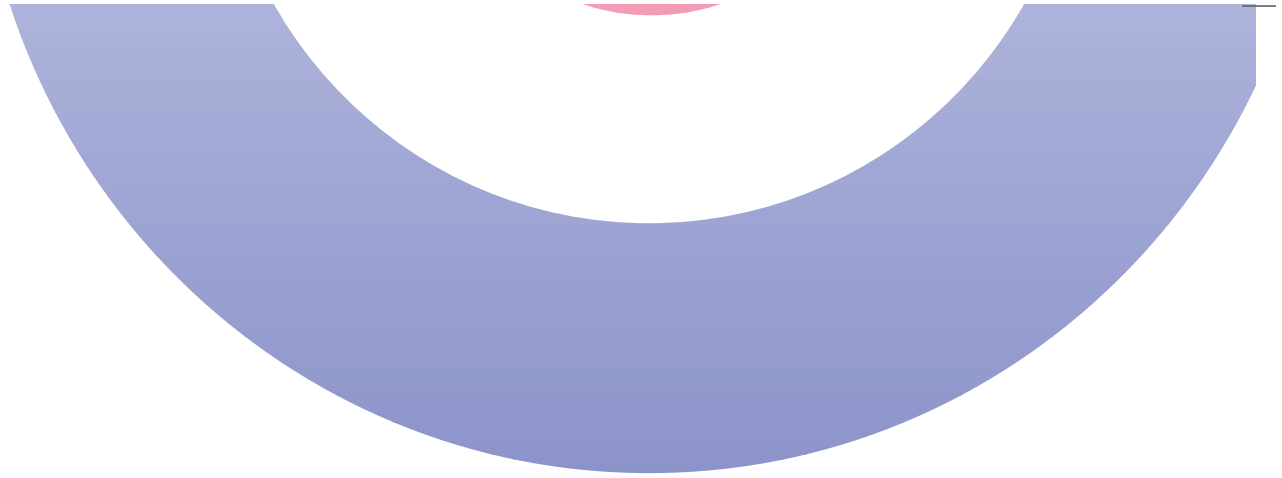

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Air Chief Marshal Sir Peter Squire, Chief of the Air Staff

ANDREW HUMPHREY LECTURE

Air Power into the 21st Century

By Air Chief Marshal Sir Peter Squire, Chief of the Air Staff

I regard it as a huge privilege to be invited to address you this evening under the banner of the Andrew Humphrey Memorial Lecture. Sadly, I cannot claim to have known Sir Andrew for, as a junior officer, I was never under his direct command. He was AMP when I was out in the Far East cutting my teeth under the watchful eye of your President. When I returned to do my stint as a QFI at Valley, the great man had moved on to be CinC Strike Command before becoming the sixteenth CAS. That said, we might have met 20 years previously when in 1954 my father completed the Flying Course at Manby. The then Wing Commander Humphrey was the Senior Instructor for that course and, you will recall, it was at this stage of his career that Sir Andrew made his mark in pioneering a series of long range flights of navigational acclaim. As a student on the Course in 1951, he flew as a co-pilot over the North Pole in the Lincoln ARIES III. Two years later, and now as a member of the Staff, he piloted ARIES IV, a Canberra B2, on its record breaking flight from Cape Town to London and in 1954, relying almost exclusively on astro navigation, he flew the same aircraft on the first jet flight to the North Pole.

But if our paths did not cross, then there was no doubting the enormous reputation he brought to the post of CAS and subsequently CDS. It is entirely appropriate to link his name with the theme of my presentation this evening, as his career spanned the crucial years of air power development – from the outset of World War 2 to the height of the Cold War, when the pace of modernisation was starting to accelerate – specifically for air forces – such that in relative terms, the Western Alliance could begin to outmatch the Soviet Union.

When one recalls all that has been achieved by airmen, together with the scientists and engineers behind them, it is sometimes difficult to believe that we have yet to be in business for 100 years. Indeed, the first century of manned powered flight will be celebrated in just over 12 months.

This evening, I want to take a look at air power as we move into the 21st Century. I will start by considering the developments of the last 90 years and see how it has measured up to the various prophesies made on its behalf. I will then offer a commentary on how air power has changed since the end of the Cold War and look at strands of further development for the first half of this century.

Many commentators, in recent times, have made the link between air power and technology. It is normally the case that developments in technology give rise to new capabilities and thence changes in doctrine. On the other hand, visionaries with ideas and radical concepts can be the catalysts for new technology. The role, therefore, of the individual cannot be excluded in this relationship, the dynamics of which I would wish to consider as they are fundamental to the story of air power.

Only 8 years after the first flight at Kitty Hawk, the Italians deployed a mixed force of 2 airships, 2 Drachen balloons and 9 fixed wing aircraft to Libya. Within days they were conducting both reconnaissance and bombing operations. So we can already see, in the classification of roles of air power, the developments of a rudimentary doctrine. By the time of the Somme offensive in July 1916, the Royal Flying Corps had a full expeditionary air force in place in France, with fighter, Army co-operation, reconnaissance and strategic bomber aircraft. But the pace of technological change, given such an impetus by war, can clearly be seen by starting with the Bleriots that the Italians used in 1911 and then considering the slow, almost defenceless, BE2Cs which were flying reconnaissance missions in the winter of 1915/16. These suffered under the 'Fokker' scourge - the effect of the German Fokker Eindeckers which were the first fighters to be fitted with a machine gun synchronisation gear, which enabled the pilot to aim the whole aeroplane at his opponent. They in turn were repulsed by the DH2 pusher fighters which were then outclassed by the German Albatross and Halberstadt single-seat fighters. The balance shifted once more in the favour of the RFC in 1917, when the Sopwith Camels and SE5s came into Service. Finally, by the end of the First World War, the DH4 was in service with a ceiling of 23,000 feet, an oxygen system and electrically heated clothing for the crew which, although it was a bomber and reconnaissance aircraft, was also used for air defence against the Zeppelins.

In parallel, there were continual developments in doctrine. Larger and larger formations were being flown, without the benefit of R/T, while Army co-operation – in particular artillery spotting – was developing well. There was also recognition, particularly from the RNAS, that long-range bombing could take the war to the enemy's heartland, though Haig and Trenchard both insisted that only when air superiority had been established over the Western Front should other uses of air power be considered. Long-range bombing raids against Germany, in retaliation for the Gotha raids on England, and a raid by carrier-borne aircraft on the Zeppelin sheds at Tondern – examples of power projection and offensive counter-air – were tasked only fifteen years after the first heavier than air flight. In May 1918 the decision was taken to create the Independent Force tasked with conducting a strategic bombing campaign into Germany and marked the true beginning of the RAF as a separate service. The force only operated for some 5 months until the Armistice, but it highlighted the ability of air power to be operated in an independent offensive role.

Now, even before the Italian foray in 1912, people had started to predict how air power would transform warfare. H G Wells' book, *War in the Air*, contained visions of aerial leviathans and was the first published use of the term 'air power'. But it was Douhet's book *Command of the Air*, published in 1921, which was the first systematic treatise on air power and in particular the transformational effect of air power on warfare in general. Douhet took a very purist view, insisting that the bomber was invincible and would terrorise populations such that governments would be powerless to oppose it. But even before Douhet's writing, the Smuts memorandum of 1917, which led directly to the creation of the Royal Air Force, stated: "as far as can at present be foreseen, there is absolutely no limit to its future independent war use. And the day may not be far off when aerial operations with their devastation of enemy lands and destruction of industrial and population centres on a vast scale may become the

principal operations of war, to which the older forms of military and naval operations may become secondary and 'subordinate'.

But the RAF's main role in the inter-war years, apart from fighting for its own survival, was empire policing. The defeat in Somaliland of the Mad Mullah by a squadron of 12 DH9s, in collaboration with a small force of the Camel Corps, in just 3 weeks marked the start of the use of the technique of 'air control'. The expeditionary use of air power, developed in the 20s in Iraq, achieved something that neither land nor maritime power could do at an acceptable cost.

Now, in addition to air control, Sir Hugh Trenchard also emphasised the primacy of independent – ie strategic – bomber operations against an enemy's material and moral resources. This I would suggest was not only because he was fighting for the continued existence of the RAF but also because of a genuine desire to avoid the slaughter of trench warfare in a future war – incidentally in his view, against the French. 'Billy' Mitchell was also stressing the 'bomber doctrine', but as part of a mixed force which would also need to achieve control of the air and support the land battle. On the other hand both Fuller and Liddell Hart discussed the synergy of air and land power in armoured warfare. And the then Wing Commander John Slessor, in his book *Air Power and Armies,* emphasised the need for air superiority and air intelligence, and argued that in addition to the direct support of land forces, enemy armaments and supplies should be targeted – in other words, interdiction. But the most influential military 'think tank' of the time was the US Army Air Corps Tactical School, the ACTS, which by the 30s was teaching that the independent strategic bombardment role was dominant. Now whilst Douhet and Trenchard in particular were emphasising the 'morale' effect of air power, without any evidence to support that thesis, the ACTS was starting to explore the concept of the 'bottleneck' target – in other words effects-based targeting. Thus, we were already seeing a dichotomy between at one level the exponents of the strategic bomber and the air-land battle doctrines and, at a higher level, between the strategists and the pragmatists.

For the RAF the expansion schemes of 1934–39 came only just in time. At the start of World War II the total regular and reserve strength of the RAF was less than half the strength it had been in November 1918. Again, technological developments under the impetus of a forthcoming war ensured that the RAF had sufficient Hurricanes, Spitfires, Blenheims and Wellingtons as the basis for a modern and balanced force, although there were still plenty of Gladiators and Fairey Battles on the front line. Perhaps more important even than the development of the Hurricane and the Spitfire was the development of radar and the institution of the Chain Home system, the first modern Integrated Air Defence System, without which the RAF would have been unable to win the Battle of Britain. Again in World War II, we see the steady progression of technological improvement, countered by doctrinal change and overcome by further technological improvements on the other side. During the bomber offensive, navigation and bombing accuracies were slowly improved and doctrinal changes, such as the creation of the Pathfinder Force, were implemented to give the less well equipped Main Force the best possible chance of finding and bombing its target. The first doctrinal response to German air defences was to bomb at night. This was met by the German IADs, the Kammhuber Line, and the increased night fighter threat was then countered by improved tactics and innovations such as the use of Window.

By early 1944, the Allies had achieved air supremacy over western Europe, and I want to touch on two aspects of the use of air power at that time, both of which have resonances today. First is the 'transportation' plan, which was the use of all available bombers, principally those from Bomber Command and the Eighth Air Force, to interdict communications nodes, in particular, the rail network, throughout the whole of France. This was initially fiercely resisted by both Harris and Spatz, who believed the war could have been won within a matter of weeks by an all out strategic bombing effort. They were overridden in the end by General Eisenhower, whose decision was subsequently endorsed by President Roosevelt, who believed that ensuring the success of Operation OVERLORD was paramount.

Over some 40 years, people exemplified perhaps by Harris and Spatz and their advocacy of the strategic bombing of Germany, had sought to use air power to achieve strategic effect. With the possible exception of the use of atomic weapons against Japan, strategic bombing did not live up to the 'war winning' claims made for it. At the same time, the bombing campaign against Germany was not given the resources its proponents demanded. Air support for the battle of the Atlantic and the preparation for OVERLORD, for example, were competing priorities. However, at both the political and strategic levels the contribution of the bombing campaign was such it could be argued that, without it, the war in Europe would have been lost. And at the operational level, the bomber campaign caused the diversion of significant amounts of manpower and 88mm guns for the anti-aircraft role thus providing direct support to the war on the Eastern Front.

Technologically the Korean air war was one of contrasts, with the USAF Shooting Star jets, deployed from Japan and America to South Korea, being swiftly replaced by ageing F-51 Mustang ground attack aircraft because of their greater robustness and their ability to operate off semi-prepared strips. The most well known technical and tactical battle was that between the Mig-15 and the F-86 Sabre. Here we saw the key differences; higher speed, rate of climb and ceiling favouring the Mig-15, while for the F-86 – greater manoeuvrability, better tactics and increasing numbers.

The major technical advance in the Vietnam War was, of course, the introduction of laser guided bombs when, during Operation LINEBACKER 1, between 10 –13 May 1972, the Tanh Hoa and Paul Doumer bridges were attacked by F-4s of the Eighth Tactical Fighter Wing. Enormous efforts had previously been made to close both these two crossings; over the 2 year period 1967/68, some 380 tons of unguided bombs were dropped on the Paul Doumer bridge alone. Both bridges were damaged but not beyond relatively swift repair. On switching to precision guidance, it is interesting to note both the number and weight of the weapons dropped. Nine 3,000 lb and fifteen 2,000 lb LGBs were used on the mission against the Tanh Hoa bridge, with the result that one span was knocked completely off its abutment and the superstructure damaged such that it was unusable for several months. Similar results were obtained in the raid on the Paul Doumer bridge, where two 3,000 lb LGBs dropped 3 spans into the river and damaged 3 more. Furthermore, whilst the term 'tank plinking' would not be invented until the Gulf War, during the summer of 1972 individual North Vietnamese tanks were destroyed by aircraft using LGBs; a sign of what was to come.

The Falklands War in 1982 saw the first operational use of laser guided weapons by Royal Air Force aircraft and although by 13 June – when the second of 2 weapons destroyed a command centre on the outskirts of Stanley – the writing was already on the wall, I have always contended that the knowledge that we now had a weapon of such accuracy may have been instrumental in forcing the decision to surrender. But Operation CORPORATE will be remembered most for the demonstration of what can be achieved through reach. At the outset of the campaign it was difficult to see how air power could make a full contribution because of the distances involved and a lack of forward mounting bases. But within a remarkably short time we fitted AAR capabilities to Nimrod and C-130, and restored the system in the Vulcan which had not been used for many years. The importance of strategic reach was demonstrated in spades. Whilst considered an aberration at the time, the Falklands War can now be seen as the exemplar of modern joint, expeditionary operations, albeit there were many lessons to be learned in terms of command and control. The starkest lesson of all, however, was again the vital requirement for control of the air without which land and maritime forces are exposed and vulnerable.

Now perhaps we should not overlook, from a historical perspective, the war that was never fought – the Cold War. In terms of technology, there were huge changes over time. If we look at the RAF in Germany and taking a very broad spread, you have the Sabre, Swift and Hunter wings of the 50s, the Canberras and Lightnings of the 60s, the Phantoms, Buccaneers and Jaguars of the 70s, and finally the Tornado, Phantom and Jaguar wings of the 80s. It would also be unfair to say there was a complete stultification of doctrine in the Cold War period, as that was not the case at the tactical level.

But I would suggest that the GDP, or citadel, mentality did nothing to foster any general thought about the development of air power at the operational level and higher. Indeed, one only has to look at the fourth edition of AP1300, the Royal Air Force Operations Manual; published initially in March 1957, reprinted in September 1964, withdrawn in 1971 but still in use 4 years later as a primer for flight lieutenants taking the C promotion exam. It was not until 1991, in the aftermath of the Gulf War, that the first edition of AP3000, Royal Air Force Air Power Doctrine, was published.

Now whilst both Trenchard and Mitchell had written about the concept of 'strategic paralysis', this idea was to re-emerge in the 70s and 80s in the theories of Boyd and Warden. Most will be familiar with Boyd's OODA Loop, but his underlying theory was that the target was the mind of the enemy command; the desired result was moral collapse and imposed policy change, and this was to be achieved through mental paralysis. Boyd never wrote on the subject but lectured extensively including to the USAF Checkmate Team which in the lead-up to the Gulf War was headed by Col John Warden. The main thrust of Warden's seminal book *The Air Campaign* is that air power possesses the unique capability to achieve the strategic end state with maximum effectiveness and at minimum cost. His 'five ring' construct is a method for analysing Centres of Gravity and he makes much of the concept of 'ends, ways and means' as a campaign planning framework. Not surprisingly as Commandant of the USAF Command and Staff College he was known as the 'Lord of the Rings'.

So what of air power in the current context? Only 7 years after Operation CORPORATE the Berlin Wall fell and in the following September Iraq invaded Kuwait. The main point about the Gulf War was the actual scale of it. It was a genuinely expeditionary conflict, for which we had a 4 month breathing space to build up the ramp capacity of the airfields in the region and to configure our forces for the conflict. Following Operation DESERT SHIELD, which provided that breathing space, Operation DESERT STORM, which was primarily an air campaign, lasted 43 days and culminated in a 100 hour ground offensive. The air force that accomplished this comprised 2,640 aircraft from 11 different nations. However, we were enormously fortunate that for the previous 13 years we had been participating in Exercise RED FLAG; the Gulf War was, in terms of packaging and air command and control, RED FLAG writ large. It was in that respect a validation of all our tactics developed in the central region during the Cold War.

On the other hand, there were some significant differences from the central region. Firstly, there was a major tactical change in the move from low level operations to medium level where aircraft could operate outside the AAA threat envelope. To do so relied on extensive suppression of enemy air defences to achieve the required level of control of the air. Next, there was the use of stealth technology in the form of the American F-117s which, with precision weapons, the innovative use of attack helicopters to take out some air surveillance radars, and the extensive use of Cruise missiles, provided the opening waves of the air war. The Gulf War also saw the first extensive use of PGMs; although they only accounted for some 7% of the weapons dropped, they were responsible for 80% of the targets destroyed. At the operational level, the Gulf War was the catalyst for the formation of the Air Warfare Centre and for the Royal Air Force the start of formal training in air campaign planning and air battle management.

I would now like to move on to the role and the contribution of air power today, and I will do this by taking the core capabilities of air power and using examples from Afghanistan and other recent operations to show what air power can deliver as we reach the end of the first century of powered flight. The core capabilities of air power, and by capability I mean the ability to achieve something, rather than the mechanism by which it may be achieved, are laid out in AP3000. And it is worth emphasising that it is entitled *British Air Power Doctrine* and has joint endorsement.

The first core capability is information exploitation. The fundamental value of this capability has been very clear in Operation ENDURING FREEDOM where the products from strategic intelligence assets,

including the RAF's Nimrod R.1 and Canberra PR.9 aircraft, of unmanned aerial vehicles and of multinational Special Forces on the ground were integrated by the Americans to achieve a level of information superiority that was far greater than that of previous campaigns. The Americans describe this as Network Centric Warfare, and their aspiration is to have total information superiority, through technological means, over any battlespace. But the overarching function of information exploitation is to provide that linkage between the sensor, decision-maker and shooter, to enable the required effect to be achieved in a timely manner.

The second core capability is control of the air. Achieving that control, or a significant degree of it, has been critical in all the operations, to which I have previously referred. The achievement of air supremacy, or even air superiority, cannot be assumed. The loss of 2 US helicopters on Operation ANACONDA earlier this year, the significant air threat posed during Operation ALLIED FORCE over Serbia in 1999, and the considerable effort put into the opening SEAD campaign during the Gulf War were all evidence of this. Moreover, control of the air does not just mean fighters and SAMs, it is all about achieving that degree of freedom required to operate in terms of both time and space. Furthermore, like all aspects of air power, it is entirely joint in its application. Again, it is a matter of smart targeting through a fully integrated command and control system.

However, what do we mean by strategic effect? Here I think the concept of the levels of war, whilst falling out of favour with some commentators on the grounds that the information age has made them redundant, still have some utility. But the strategic level is different from the operational and tactical. It is that level at which senior military leaders and politicians set the end states that they expect their forces to achieve. This is exemplified in Afghanistan, for which the United States' strategic objective was the removal of the Taliban Government in its entirety. In the event this was achieved in just 78 days largely by the use of air power. It is a commonly held view that the role of air power is to support maritime and, in particular, land power – only land power can hold ground. But what we saw in Afghanistan was a reversal of that in which air power was dominant and land power was an enabler. Air was in this case the supported rather than the supporting command. The same was true in Operation DELIBERATE FORCE and in the majority of the Gulf War and Kosovo campaigns. But if proof were needed of the ability of air power to achieve strategic effect, one has only to look at the Berlin airlift where the Allies' determination to retain their control over West Berlin thwarted Stalin's plans to reunify and demilitarise Germany using the fall of Berlin as the lever to break the Allies' resolve.

The next core capability is that of air power to shape both the maritime and land battlespace to enable surface manoeuvre. Again, Operation ENDURING FREEDOM provides contemporary examples. In terms of the direct support to land forces, we saw B-52 bombers providing close air support, to troops in contact, under the direction of a forward air controller. This mechanism was also used against what the Americans described as 'emerging targets'; those which were not threatening at the time but would be so in the future, or those which, because of the strategic end state of destroying the Taliban, would lead to that effect. What we actually saw then was the use of forward air control procedures to target CAS, air interdiction and strategic effects missions.

All the post Cold War air operations that I have described, highlight the importance of combat support air operations, the fifth core capability. Operation ENDURING FREEDOM could not have been mounted in the time, and at the level it was, without the extensive use of strategic and tactical airlift; and one has only to look at the speed with which we achieved an operating capability on Kabul airbase to see that. Furthermore, support helicopters played a key part in the deployment of Special Forces of all nations, and in the deployment of combat formations in offensive land operations such as ANACONDA. But it was air-to-air refuelling, perhaps, that was the key supporting element. B-1 aircraft operated from Diego Garcia and B-2 bombers flew 40 hour sorties; missions that required substantial AAR support. Furthermore, all the fast jet sorties from the US carriers in the first 3 months of ENDURING FREEDOM,

which comprised 45% of all the sorties flown, required extensive air-to-air refuelling to enable them to reach and remain within the operating area. The longest of those sorties was some 15 hours duration and anyone who has sat on an ejection seat for any length of time can only sympathise with the pilot concerned.

A related capability is that of force protection. One has only to remember the Khobar Towers and the USS COLE incidents to realise that the protection of bases, personnel and supplies is absolutely vital in this new era of expeditionary warfare. This does, I suggest, mean far more than just subsuming the old concepts of combat service support and ground defence into a more all-embracing concept. Rather it means all members of armed forces likely to be deployed on expeditionary operations being trained, equipped and having the self-sufficiency and attitude of mind to enable them to look after both themselves and their comrades at all times when deployed into a hazardous situation.

The last core capability is sustainability; this was adopted a few years ago by the UK as a principle of war. Sustainability is more than just logistics, as it embraces equipment, personnel and training and, to a certain extent, links back into force protection as I have just described. But the continuing presence of air forces in the Balkans, over the no-fly zones of Iraq and, indeed, the continuing presence of troops in Afghanistan, shows that sustainability does not just extend to the initial, often short, periods of combat but to the long haul. To take but one example – weapon stocks, the use of Precision Guided Munitions for reasons of minimising of collateral damage, increased mission effectiveness and relatively low cost has meant that there has been a steady proportional increase in the use of these weapons from the Gulf War through to Afghanistan, and indeed an absolute increase in that number in the Afghanistan conflict itself. This requires both adequate ready use stocks and the manufacturing base to replace those used in short order.

Whilst Afghanistan has featured highly in my analysis of the employment of air power capabilities today, we have to be very careful that we don't draw specific lessons from individual conflicts, especially when the scale of the conflict and the level of enemy response is significantly different to that which has been seen previously. But what comes out of the above analysis, particularly in the expeditionary context, is the increasing value placed on the essential characteristics of air power. Those are: responsiveness, reach, range, rate, flexibility and ubiquity, evidence of which was present throughout my brief historical and contemporary survey.

But as I said at the beginning, the employment of air power is all about harnessing technology, and I would now like to take a brief look in equipment terms at what the RAF in particular, and also the Army and Navy, are going to be able to bring to any future conflict which will undoubtedly involve the major use of air power. From a Royal Air Force perspective, the decisions in the Strategic Defence Review of July 1998 to confirm the purchase of 232 Eurofighter Typhoons and the mid-life upgrade of the Tornado bomber to a GR4 standard were extremely welcome. The decision to purchase Storm Shadow, the conventionally armed stand-off missile which will be carried on Tornado, Typhoon and Harrier, will provide a rapidly deployable war fighting capability to complement the Tomahawk missile carried by Royal Navy submarines.

In weapon terms we are also awaiting a decision on the replacement of our depleted stocks of the older Paveway 2 and Paveway 3 laser guided weapons with a more adaptable weapon which may be guided by laser, miniaturised inertial navigation or GPS systems, or a combination thereof. In the meantime, and learning from our experience in Kosovo, we have brought into service an autonomously guided bomb, using laser and/or GPS guidance. This is working extremely well, as is the ASRAAM which, while a little late, has given the F3 force a step change in IR capability. But, of course, the most recent decision has been that we will procure the STOVL version of the Lockheed Martin Joint Strike Fighter to replace both the Harriers of the Royal Air Force and the Royal Navy. The STOVL variant will enable us

to operate not only from the future carrier but also from austere land bases. The attack helicopter has brought a new dimension to the Army's deep fire power and a concept of air manoeuvre is now being developed by the Joint Helicopter Command and the Doctrine Centres. But if the AH's true potential is to be realised, then it is essential that it is considered along with all the other offensive air systems to be integrated with all the other joint forces to achieve the effects desired by the Joint Task Force Commander.

Whilst the emphasis on blue water operations has reduced, Nimrod MRA4 when it enters service will be a world leader in terms of its sensors and processing systems and will reflect another significant technical improvement, in this case against the SSK in littoral waters. It has also been designated MR**A**4 to reflect a greater surface attack capability than its predecessors with its ability to detect and attack a range of surface contacts with a far broader range of weapons than just the Harpoon as at the moment. But I also see the MRA4 as a multi-role platform with enhanced capability in the ISTAR arena.

In terms of strategic and tactical lift, the C-130J is now well established in service and, with its defensive aids suite, is proving to have far more utility in theatres such as Afghanistan than did the earlier Mark. And, of course, we are currently employing four C-17s for strategic lift, pending the introduction of the Airbus A400M to replace both the C-17s and the remainder of the Hercules fleet. Additionally, the Future Strategic Tanker Aircraft, which is a PFI solution to replacing our ageing VC10s and Tri-Stars in both the strategic transport and tanker role, will provide us with a routine number of 'hoses in the sky' for daily training and operations, with a surge capacity to generate additional aircraft should the operational tempo increase. If the provision of tankers is one critical path for future operations then I think the other is the provision of support helicopters. The Merlin has now entered service and the Chinook fleet is in the process of being upgraded. Finally, in terms of aircraft, our information exploitation capabilities, which currently comprise the Nimrod R.1, E-3D Sentry and the Canberra PR-9, are being augmented by the formation at Waddington of a jointly manned ASTOR squadron which will provide a stand-off battlefield surveillance capability similar to that of the US JSTARS.

So what of the future? The capabilities of air power I've just outlined will still be valid and the essential attributes of air power – reach, range, rate, responsiveness, flexibility and ubiquity - will be even more so. The fundamental role of air power will continue to be offensive, often as the sole or certainly the primary mechanism for delivering controlled force in support of political objectives. More than anything, the advent of stealth technology and precision weapons have enabled air forces to deliver destructive force onto a designated point of impact with levels of confidence that the early theorists could only dream of. And the achievement of regime change in Afghanistan in just 78 days, and the coercive effects of ALLIED FORCE on Milosevic would seem to vindicate the Strategic Effect theorists. Indeed, technology has now enabled us to fulfil the 1917 Smuts Report prophecy concerning air power as the principal means of delivering force.

But there are issues which we cannot easily dismiss and I suggest they are these. Firstly, there is the problem of access to a theatre, not only in terms of range, strategic lift and basing, but also in terms of achieving the required level of control of the air at the earliest time. Then there is the ballistic missile threat and the issue of force protection. Finally, there is the linked issue of weapons of mass destruction, particularly when the adversary is immune to deterrence, as in the new wave terrorist organisations, or uses them as a last resort rather than submit to coercion. Indeed, this last consideration may drive us away from coercive strategies to ones involving the rapid and overwhelming use of destructive force.

Setting to one side the use of ballistic missiles, the offensive use of space-based systems is the exclusive domain of the United States. However, its use as an enabler, for communications, some forms of reconnaissance and for navigation and weapon aiming is far broader. UAVs, I suggest, have the

potential to become affordable substitutes for space-based reconnaissance and for some air-breathing systems in the future. The challenge will, therefore, be firstly to integrate sensors and shooters, operating in all three environments, through what we in the UK are calling a 'network enabled capability', rather than the US concept of Network-centric Warfare. The second, and much more important challenge, will be how we fit the decision makers into this architecture. On the one hand, networking all participants should make it easier to follow the principle of 'centralised command and decentralised execution' with decision making delegated to the lowest practical level – genuine 'mission command'. However, and ENDURING FREEDOM is a case in point, it can also lead to 'centralised execution' where decisions are taken at the highest possible level, particularly as a result of concerns about legality, and quite simply because technologically they can be. The danger is that the inherent flexibility of air power is eroded or even negated by a centralised command and control structure that can not cope with the deluge of data and is incapable of making sufficient timely decisions to function properly. This is, of course, an issue to do with the scale of a conflict and the critical path will be ensuring that an effective and robust command structure is in place before the start of any operation.

Now, if air power is inherently a strategic, offensive force I don't think it a contradiction to say that it is also inherently joint in nature. Maritime, land and air power all have their strengths and weaknesses, and the dominant partner can change as a campaign progresses. But the increasingly expeditionary nature of warfare does place more emphasis on the supporting applications of air power, both to land and maritime forces, to the offensive aspects of an air campaign and to the joint campaign itself.

As I come to the end of this presentation, I have been conscious of trying to answer the question of what Sir Andrew Humphrey would have thought about the developments that I have just outlined. Andrew Humphrey was a consummate aviator, determined, aggressive in combat, skilful, able to turn his hand to flying a wide range of aircraft and able to put over his knowledge to the benefit of others. He had the ability to grasp new technical concepts, and had experienced the ability of air power to project itself globally. As a Group Captain in Operational Requirements, he had flown the aircraft he was responsible for – the Lightning – something that few if any in MOD get the opportunity to do these days! Nevertheless, I think he would have hugely enjoyed the challenge that delivering any of the RAF's operational capabilities I have just outlined, would have given him.

As AMP, I think he would have been most concerned at the challenge we face in recruiting and, more importantly, in retaining the numbers of dedicated and professional young men and women that we require to operate those equipments. As CinC Strike Command, he saw his most important task as reversing the run-down of the UK's air defences that had taken place in the 60s, obtaining not only more and better fighter aircraft but also updating the command and control system and addressing the requirement for an airborne early warning system. In that post today his concern would have been to enhance the RAF's expeditionary capabilities.

He would be pleased, therefore, to see the additional measures being applied to deployability through the enhancements in the AT Force, reversing the reductions made in the 1970s as we withdrew from our overseas garrisons to focus our efforts on the NATO task. Above all, he would be delighted to see how the effectiveness of airpower has been significantly improved through advances in technology but supported by the skill, leadership and courage of today's young men and women who remain the practitioners and must distil and fuse the data, both in the air and on the ground, in order to make the decisions that make the difference between success and failure in the timely and effective delivery of airpower in the 21st Century. Thank you.

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Portuguese F-16s patrolling the skies over Bosnia

The European Rapid Reaction Force

The Contribution of Aviation Logistics

By Air Commodore Peter Dye RAF

There can be few military projects that have been received with so much scepticism, suspicion and hostility as the European Union (EU)'s proposal to create a European Rapid Reaction Force (ERRF).[1] Some commentators have questioned motive, rationale and practicability while others have expressed deep concerns about the implications for the North Atlantic Treaty Organisation (NATO) and the US–Europe relationship. It might have been thought that, given the long-standing demand for a greater European contribution to the defence of the continent and continuing worries about the US–Europe capability gap exposed in Kosovo, the ERRF initiative would have been warmly welcomed. Instead, notwithstanding strong support amongst the EU governments for a policy that is very much a UK initiative, media criticism has ranged from suggestions that the ERRF is a 'paper tiger' created by federalist politicians playing at 'armchair generals'[2] to fears that it is a barely disguised blueprint for a European Army.[3] Even dispassionate observers have wondered whether the resources will be available and the programmes in place to match the planned institutional changes.[4]

Major changes have occurred in armed forces world-wide – but largely driven by falling defence budgets and rapid downsizing

It would be naïve to suggest that funding issues are likely to be quickly resolved – although some would claim to see glimmers of hope [5] – but this should not hide the fact that a great deal more could be done within existing resource levels. It has been pointed out that the European members of NATO spend 60% of what the US does for about 10% of the military capability.[6] Much of this imbalance is driven by the fragmented, expensive and highly inefficient manner in which weapon systems are procured and supported. It is no exaggeration to claim that logistics is a battlefield on which European military capabilities could be readily improved.

To date, there has been little objective analysis of the progress towards creating a viable European rapid reaction capability. As events in the Gulf, the Balkans and, most recently, Afghanistan have demonstrated, air power remains key to achieving an expeditionary capability. However, European air forces were forged in an era when, with some exceptions, a deployment role was neither required nor envisioned. Moreover, the weapons systems and infrastructure that remain in place, and some still to be introduced, are the product of Cold War procurement and support strategies. Transformation is proving slow and painful.

THE EUROPEAN RAPID REACTION FORCE

The end of the Cold War unleashed a process of major geopolitical uncertainty that continues largely unabated. The creation of a new international system and the emergence of diverse and unfamiliar threats have seen the military struggling to adjust effectively. Major changes have occurred in armed forces world-wide – but largely driven by falling defence budgets and rapid downsizing. The evidence indicates that doctrinal change and the deployment of new capabilities have proved much more difficult to achieve. In assessing the progress of military transformation, the Strategic Survey 2000/2001 has commented that, *'Efforts are likely to be inhibited not only by institutional malaise and caution but also by the fact that most contingencies call for proven capabilities more than untested ones'*.[7] The Gulf War undoubtedly provided momentum for reform and consolidated the move to joint, multinational crisis management operations, but it also exposed the gap between military capabilities and political aspirations. The need to reconcile the two has become, if anything, more pressing over the last decade as a result of the continuing cycle of instability and intervention in the Balkans.

A milestone in this process was the new Strategic Concept, adopted by NATO at the 1991 Rome Summit, that emphasised the greater responsibility to be assumed by the European Allies for their own security. The European Security and Defence Identity (ESDI) was developed further at the Brussels and Berlin Summits, notably in the form of the Combined Joint Task Force (CJTF) intended to provide rapidly deployable, multinational task forces, together with command and control capabilities, for employment in Western European Union (WEU) operations. However, it was not until 1998 – and the Anglo-French agreement at St Malo on carrying forward the ESDI under the aegis of the EU rather than the WEU – that a credible vehicle emerged, in the form of the Common European Policy on Security

The qualities expected of armed forces in the new environment – rapid, responsive and flexible – have sometimes seemed to represent the end rather than the means.

and Defence (CEPSD). Following the endorsement of NATO's 1999 Washington Summit, the European Council moved rapidly to create the structures and mechanisms within this second 'pillar' of the EU.[8]

A common thread throughout this process has been the commitment of both NATO and the EU to intervene militarily in crises outside national or alliance homelands – on the basis of the so-called 'Petersberg tasks' of humanitarian and rescue missions, peacekeeping, peacemaking and crisis management.[9] Indeed, this aspiration has been articulated so frequently that the qualities expected of armed forces in the new environment – rapid, responsive and flexible – have sometimes seemed to represent the end rather than the means. Even so, and despite the popularity of this mantra with defence departments world-wide, such sentiments have generally failed to prove father to the deed.

THE HELSINKI HEADLINE GOAL

The need to take specific action to build the means and capabilities for crisis management under the CEPSD was not lost on the EU. Mindful of the disparity between Europe's ambitions and actual military capabilities, it was decided at the 1999 Helsinki European Council to adopt a common target for deployable military capability; the so-called Helsinki Headline Goal. At the same time it was also agreed to establish the necessary EU bodies to provide co-ordinated political and strategic control of these deployable forces.

The Headline Goal committed the EU member states, by 2003, to be able to deploy rapidly – and support for up to a year – forces capable of the full range of 'Petersberg tasks' in operations up to corps level (some 50,000 to 60,000 personnel). These forces were to be self-sustaining with the necessary command, control and intelligence capabilities, logistics, other combat support services and additionally, as appropriate, air and naval contingents. They were to be capable of being deployed at this level within 60 days as well as providing for smaller rapid response elements at high readiness.

PROGRESS

In the 3 years since Helsinki, progress towards achieving these aims has been rapid although the implication that a full operating capability would be available at the end of 2001 was never a realistic prospect.[10] There is no doubt that the creation of the necessary bodies has moved quickly – the Political and Security Committee (PSC), EU Military Committee (EUMC) and EU Military Staff (EUMS) have already evolved from interim to permanent status.[11] Considerable effort has also been expended in elaborating a Headline Goal target that, as expressed at Helsinki, was more about political commitment than a detailed requirement suitable for military planning purposes. The methodology employed has been to establish a clear strategic context, articulate key planning assumptions,[12] select illustrative scenarios, identify capabilities, develop force packages and, finally, define the full range of requirements.[13]

In parallel with the creation of a full-time EUMS,[14] it was agreed to pursue the necessary enabling work through a Headline Goal Task Force (HTF) comprising individual specialist sub-groups drawn from national military staffs and relying on NATO expertise. The outcome was a 240 page Helsinki Headline Goal Catalogue (HHC) built around 144 generic capabilities under 7 categories: command, control, communication and information (C3I); intelligence, surveillance, target acquisition and reconnaissance (ISTAR); deployability and mobility; effective engagement; protection and survivability; sustainability and logistics; and general support. The document was reviewed at a Capabilities and Commitments Conference held in Brussels on 20 November 2000 during which EU member states nominated provisional national contributions (presented in the form of a Helsinki Force Catalogue), identified short-falls and agreed on measures to tackle them.

THE AIR COMPONENT

Three generic scenarios formed the basis of the HHC: separation of parties by force (SOPF); conflict prevention/preventative deployment (CP); and assistance to civilians (AsC). The former represented by far the most demanding scenario and the largest resource requirements. The overall force pool was significantly larger than the figure called for at Helsinki because of the need to satisfy the differing operational needs of the 'Petersberg tasks'. Aside from the air contingent, a total of 80,000 ground troops and 80 ships were envisaged out of a pool of 100,000 troops and 100 ships.[15]

The aviation contribution in the SOPF scenario comprised a substantial number of combat and support aircraft.[16] In addition, Heavy Lift (C-17/A400M equivalent), General Cargo Lift (C-130 equivalent) and Passenger Aircraft (A-300/330 equivalent) were needed to meet strategic airlift requirements. The resources involved in sustaining this level of capability were not directly identified, since forces were to be offered on the understanding that they could be sustained for the required period of time. However, during the Gulf War, the ratio of deployed personnel to operational aircraft averaged around 35:1.[17] On this basis, an air component equivalent to the anticipated pool of 400 combat aircraft would necessitate the deployment of an additional 14,000 personnel in-theatre. The strategic lift required to move the associated support and aerospace ground equipment would also be large – amounting to a minimum of 800 C-130 equivalent sorties. This excludes the outload of munitions or any provision for sustainment.[18]

The proposed UK contribution to the air contingent comprised 72 combat aircraft[19] and over 30 support aircraft as well as some 50 transport aircraft dedicated to strategic lift.[20] The majority of these assets would be available at 10–20 days' readiness. Specific logistic elements included the specialist units and equipment needed to operate a single Air Port of Debarkation (APOD) and 2 Deployment Operating Bases (DOB).

SHORTFALLS

The shortfall in European (and also NATO) military capabilities for crisis management operations had been recognised, in general terms, well before the Brussels Conference. Indeed, the Defence Capabilities Initiative (DCI) launched at the 1999 NATO Washington Summit was designed specifically to bolster interoperability and to develop well-equipped and balanced forces that could deploy rapidly to meet a range of potential missions. The DCI called for improvements in 5 areas: deployability and mobility; sustainability and logistics; effective engagement; survivability of forces and infrastructure; and command and control. Some 58 separate initiatives were identified of which 5 tackled lift capabilities and 8 related to logistic shortfalls ranging from the development of multinational logistic formations through to improved co-operation in the acquisition and management of stocks. Experience from Bosnia

The strategic lift required to move the associated support and aerospace ground equipment would also be large – amounting to a minimum of 800 C-130 equivalent sorties. This excludes the outload of munitions or any provision for sustainment

and Kosovo has only served to confirm this analysis and reinforce the argument for change.[21] Although the DCI has delivered improvements, NATO intends to pursue further changes through the forthcoming Prague Capabilities Commitment.[22]

A WEU audit of assets and capabilities for European crisis management operations against illustrative mission profiles revealed a similar story. Although it was concluded that the Europeans, in principle, possessed the force levels and resources needed to prepare and implement military operations over the range of 'Petersberg tasks', a number of gaps and deficiencies were identified as well as areas where assets and capabilities needed to be strengthened. These included strategic intelligence and planning as well as force and operational capabilities. Aviation-related concerns included: the limited availability of strategic and tactical airlift; the scale of deployable airfield support required; the ability to sustain operational tempo (notably the number of tanker aircraft available); the limited capability for the suppression of enemy air defences (SEAD); and the lack of precision guided munitions (PGMs).[23]

The EU nations' progress in tackling these operational deficiencies was the subject of a 2-day Capabilities Improvement Conference held in Brussels on 19–20 November 2001. It was concluded that 5 of the 55 major shortcomings (against the 144 generic capabilities described in the HHC) identified at the Commitments Conference had now been solved while a further 10 were essentially remedied during the course of the conference. Shortfalls had been reduced to minor levels in 5 other areas and improved in a further 10.[24] Despite the optimistic language of the Conference there must be some concern that no progress was reported in any logistic-related areas, most notably strategic airlift.[25]

AVIATION LOGISTICS

'Aviation logistics' comprises all the varied activities that supply, move, store, sustain, maintain and repair the weapon systems, associated components and equipment employed by air forces. The complex nature of these activities, together with advanced technologies and extended supply chains, have produced a logistic environment comprising a matrix of interdependent, real-time processes linking industry with the frontline, operating at high tempo and involving large quantities of spares, consumable items and technical information. This complexity means that air power is built on what has been described as 'an inherent logistic frailty'.[26]

LOGISTICS DOCTRINE

Allied logistics doctrine has undergone a major transformation since the Cold War. Previously, logistics was a national responsibility aimed at providing a sustainable forward defence that would enable NATO to repel a massive attack in depth. Logistic preparations reflected this scenario: large stockpiles; a resilient supply system; provision for surge; and support arrangements with sufficient redundancy to continue to operate in an attritional environment. Logistic lines of communication were relatively short and well tested.

Under NATO's Strategic Concept, logistics was no longer a purely national activity but was to be focussed on supporting a range of contingency

The employment of the Apache attack helicopter as part of the UK's rapid reaction force has been described by one commentator as a 'possible logistic nightmare'

plans including out-of-area multinational operations. Nations and their respective NATO commanders had a collective responsibility for the logistic support of the forces involved.[27] Even so, nations still retained ultimate responsibility for ensuring adequate provision of logistic support for their units.[28]

EXPEDITIONARY AIR POWER

Supporting combat aircraft operations in the field remains the most complex of military logistic activities.[29] This is not an air force centric view; simply recognition that a weapon system capable of operating over long distances and at great speed, demanding substantial infrastructure and extensive support arrangements, with high consumption rates allied to ever increasing complexity and sophistication, presents a logistic challenge unmatched as yet by sea or land systems. Interestingly, the employment of the Apache attack helicopter as part of the UK's rapid reaction force has been described by one commentator as a *'possible logistic nightmare'*[30] – for the very same reasons that make supporting fixed wing aircraft in the field so difficult.

In short, the delivery of effective air power does not depend upon 'brute-force' logistics – rather it demands the close and timely integration of a wide range of supply and support activities stretching from the factory to the airfield. This is not to suggest that air forces have ever been particularly modest in their consumption of resources – as the size of their ground organisations and overall support budgets testify – but air power and logistics are intimately and inexorably linked, to a degree yet to be demonstrated by armies or navies.

OPERATIONAL LESSONS

Although the post Cold War military-strategic debate has highlighted the need for responsive, flexible and rapidly deployable forces, the reality has largely fallen short of the rhetoric. Few nations have engaged seriously in developing such capabilities and even fewer have been willing to be tested against the 'new paradigm'. The United States Air Force (USAF) and Royal Air Force (RAF) provide honourable exceptions but even they have found it a hard struggle to deliver the necessary capabilities.

The Gulf War revealed the immense scale of the logistic activities needed to support what was the largest contingency military deployment ever undertaken. During the 43 days of Desert Storm, the USAF flew over 34,000 combat sorties compared to some 46,000 transport sorties within the theatre of operations and 17,000 strategic lift missions. The harsh desert environment and accelerated training severely tested the provision of spares and consumables. The large distances involved, the new technologies deployed, the uncertainties of host nation support (HNS) and the complexity of multinational operations combined to make the logistic support of air operations extremely challenging. From the aviation logistics perspective, there were a number of important lessons to be drawn:

- The need for greater strategic airlift.
- The unsuitability of many weapon systems and associated ground equipment for deployed operations in unfamiliar environments.
- The poor air-portability of much equipment.

- The significant in-theatre resources needed to support air operations.
- The utility of deployable specialist aviation support units.
- The large effort required to outload munitions and to provide effective support in-theatre.
- The complexity of multinational logistics.
- The contribution of civilian (contractor) personnel to operational support.
- The importance of real-time asset tracking.
- The difficulties of in-theatre distribution.
- The need for accurate, comprehensive information and pre-planned deployment scenarios on which to base effective logistic planning.

Subsequent crises in Bosnia and Kosovo have confirmed the importance of these issues in supporting deployed air operations. The embarrassing delay in deploying a brigade of Apache attack helicopters from Germany to Albania, partly owing to logistic difficulties, merely highlighted that such problems can bite very hard.[31] Kosovo also demonstrated, once again, the overriding need to establish logistic arrangements that were efficient, integrated and flexible. From the European perspective, it also revealed how modest were their capabilities compared to the US.

The 150 or so C-130 aircraft available to the European air forces would be very hard stretched to provide the number required each day by the SOPF scenario

STRATEGIC AIRLIFT

EUROPEAN AIRLIFT CAPACITY

The European Air Group (EAG)[32] recently completed a study of European airlift capabilities and possible enhancements. It concluded that while there was a substantial European airlift fleet – at least in numerical terms (some 249 C-130/160 transport aircraft) – the majority were over 30 years old and there were competing demands on the same airframes for a wide range of roles. Although there were also 55 civil-type aircraft, of which 37 were cargo capable, no nation had the capability to move outsize military cargo, such as helicopters and main battle tanks.[33] Thus, while European air forces appeared to posses a significant cargo and passenger capability, almost every nation believed it had a significant shortfall in airlift capacity.[34] The 150 or so C-130 aircraft available to the European air forces would be very hard stretched to provide the number required each day by the SOPF scenario – even presuming there were no conflicting operational demands, serviceability and availability remained high, an adequate number of crews existed and some form of tasking co-ordination was available.

It can be safely concluded that the A400M programme will not make a major contribution to reducing the shortfall in European airlift capabilities much before 2012

Airlift co-ordination, between planning and tasking agencies, is fundamental to achieving effective strategic lift. Pending realisation of European procurement plans for additional airlift capacity, the EAG has sensibly proposed that measures be introduced to improve co-operation and co-ordination of existing airlift assets. This would embrace the recent Air Transport and Air Refuelling and other Exchanges of Services (ATARES) initiative and the introduction of a permanent co-ordination cell. ATARES has already proved a success in allowing European air forces to share existing transport and tanking capacity and so overcome

some shortfalls. The creation of a European Airlift Co-ordination Cell (EACC) should permit a more efficient and proactive approach to meeting military airlift needs. It is expected that an interim capability will be in place by March 2002 and full capability by May 2002.[35] Welcome as this development is, it would be helpful if the EACC's activities could be harmonised with the ACE Air-to-Air Refuelling Cell (AARCC), newly established alongside NATO's Reaction Forces Air (RFAir) Staff at Kalkar with the specific task of expanding AAR interoperability.

NEW PROGRAMMES

The planned acquisition of 196 A400M military transports by 8 partner nations promises to improve significantly the strategic lift available to support ERRF operations – albeit that the full number seems unlikely to be procured. Turkey has already reduced its requirement from 26 to 20 and there are suggestions that Germany might need to reduce its share from 73 to 55 aircraft.[36] The projected in-service date of 2007 has already slipped to 2009/2010 and further delays would not be exceptional for such a large and challenging programme. It can be safely concluded that the A400M programme will not make a major contribution to reducing the shortfall in European airlift capabilities much before 2012. When it does arrive, it will certainly overcome Europe's lack of general cargo capacity and go some way to meeting the ERRF's need for heavy/outsize lift.[37] In the meantime, the decision by the RAF to lease 4 C-17 transport aircraft has helped bridge the immediate gap in heavy/outsize lift but will not greatly reduce the overall shortfall in European strategic lift – even if additional C-17s are leased/purchased.

AIRLIFT MANAGEMENT

Procuring additional airlift is one matter; the management of these assets is another. Although there has been some speculation about the possibility of a European Air Transport Command, particularly in Germany, this seems to owe more to the simplistic view that joint procurement leads inexorably to joint management rather than careful analysis of the practicalities or the military value to be gained.[38] While the A400M programme is hugely important to Europe, in both investment and capability terms, it will not represent the entirety of European airlift. Moreover, there is an alternative model – in the form of the NATO E3 Sentry Force – that would permit national assets to be subordinated to a supranational operating agency with full command and control authority (as the UK and France have regularly and successfully demonstrated).

In the past, consideration has also been given to the adoption of the Civil Reserve Air Fleet (CRAF) strategy first employed by the USAF in the 1950s to enhance airlift capacity by funding on-call commercial capability. Although there are obvious attractions to such an approach, actual experience indicates that any gains are modest and fall far short of expectations. This is partly because of the difficulty of finding sufficiently attractive, but cost-effective, incentives for commercial participation and partly because of the competitive and dynamic nature of the market. The CRAF programme has become increasingly moribund and shows little sign of being given a new lease of life – notwithstanding the current US airlift shortfall.[39]

A significant obstacle to be overcome in rectifying the EU's shortfall in strategic airlift is the prioritisation, allocation and co-ordination of tasking. The EAG's proposals in this regard are timely, realistic and likely to prove effective in making better use of current and future EU air transport assets.[40] Even so, they do not pretend to provide for the efficient and simple management of airlift assets under operational conditions – as provided by NATO's Allied Movement Co-ordination Centre (AMCC) and subsidiary agencies. Although this question has yet to be resolved, there is no prima facie case for the creation of a European Airlift Command with its additional costs and bureaucracy. The key issue is how can

The Eurofighter – yet to enter service – has not been designed with deployed operations in mind. The scale and size of the ground support equipment required for day-to-day operations militates against a small deployment footprint or ready transportability

European airlift assets be best managed to provide for the rapid deployment and effective sustainment of the ERRF? Employment of the AMCC with its established procedures, IT systems and broad experience would appear to provide a solution.[41]

WEAPONS AND EQUIPMENT

SUPPORT CHAIN INITIATIVES

European air forces have made gradual progress in improving supply and support chains in the decade since the Gulf War. However, the pace has been constrained by falling resources and a Cold War legacy in the form of weapon systems and support arrangements optimised for a short, intensive attritional struggle with the Warsaw Pact. Thus the Eurofighter – yet to enter service – has not been designed with deployed operations in mind. The scale and size of the ground support equipment required for day-to-day operations militates against a small deployment footprint or ready transportability. Even so, considerable effort is underway to transform legacy support chains. The outsourcing of support and the involvement of contractors in logistic activities are being increasingly employed to achieve greater efficiencies in delivering military capability for many European air forces.[42] Nevertheless, substantial reductions in the cost of ownership can only be achieved if these aspects are

studied early in the procurement of new weapons systems. This is increasingly the focus of work, often in partnership with the contractor(s) – a trend aided by the ongoing rationalisation and integration across the European defence-manufacturing base.

SUSTAINABILITY

Logistics sustainability aims at providing effective support for the duration of a deployment. The arrangements put in place need to cope with extended crisis management operations, redeployment in-theatre, the roulement of personnel and aircraft and variations in operational tempo. Expeditionary warfare also largely denies the ability to pre-plan or pre-position. The units making up the ERRF air contingent must, therefore, be largely self-sufficient – at least in the early stages of an operation.
A balance has to be struck, however, between cost and risk. Few if any air forces can afford to move large quantities of spares into theatre against possible arisings. Whereas during the Cold War the RAF relied upon flyaway packs (FAPs) capable of sustaining squadron operations for up to 30 days, these needs are now met by priming equipment packs (PEPs) intended to support individual squadrons for up to 10 days. While this strategy saves considerable expense, it does rely upon a more responsive supply chain, reduced pipeline times and the provision of in-theatre facilities to assist faultfinding and the more rapid turn round of some components.[43]

An RAF Tornado squadron requires upwards of 400 personnel in-theatre, of which probably no more than 150 are engaged in direct maintenance activities

DEPLOYED OPERATING BASES

Deployed Operating Bases (DOBs) require a wide range of supporting units in order to function. The essential airfield capabilities (including operations, air traffic, fire and crash, air defence, security, etc) need to be matched by both specialist and general engineering elements. The RAF has grouped these into air combat support units comprising mobile engineering support, explosive ordnance disposal, transport, fuels, logistics and supply, communications and information systems, air movements, administration, tactical medical, catering and hangar erection. Regular deployments and wide operational experience, including the development of an extensive range of deployable component test and repair facilities, portable fuels equipment, hangarage, shelters and tentage have raised these units to a high degree of professionalism and efficiency – well able to cope with the challenges of deployed air operations.[44]

DEPLOYMENT FOOTPRINT

None of the combat aircraft currently represented in European air force inventories, with the possible exception of the Harrier, were designed with deployed operations in mind. As a result, the deployment footprint (the number of maintenance personnel and quantity of ground equipment and support facilities) is relatively large. For example, an RAF Tornado squadron requires upwards of 400 personnel in-theatre, of which probably no more than 150 are engaged in direct maintenance activities. If this total can be reduced, not only does it place less pressure on already hard pressed airlift assets but it also reduces the roulement burden. Unfortunately, while aircraft designed to operate under Cold War conditions remain in the European inventory, the scope for significant improvement is necessarily constrained. Indeed, the airlift required to deploy a Eurofighter squadron may yet prove to be greater than for a Tornado squadron.[45]

The USAF has also made strenuous efforts in recent years to reduce the size of the deployment footprint. By focussing on improvements in the speed and responsiveness of the supply chain it has proved possible to reduce stocks and the range of engineering and support activities undertaken in-theatre as well as the number of personnel deployed forward. This does, however, inevitably increase the reliance on pipeline performance. As ever a balance has to be struck between risk and efficiency; between redundancy and resilience.

Although European air forces have introduced similar initiatives (under the ‘express chain management’ and ‘lean support’ labels in the UK) the fragmented nature of the European aviation support chain further restricts the efficiencies that can be realised. Some reductions can certainly be achieved by sharing specialist aviation resources as well as by creating joint multinational logistic units. On balance, however, it is to future weapon systems that one should look for substantial reduction in the level of logistic support demanded by deployed operations.

SURVIVABILITY

Aviation logistics is, as already noted, an inherently fragile activity. Protecting deployed air assets and safeguarding the supply chain presents an ever-increasing challenge. In this context, survivability embraces both passive and active defence – including air defence measures. As greater reliance is placed on the efficiency and speed of the pipeline to sustain air operations and minimise the

deployment footprint, so vulnerability to interdiction grows. This can arise through either military or political action (such as the closure of NATO's supply lines to Kosovo by Macedonian nationalists).[46] The increasing employment of contractors introduces new uncertainties and additional vulnerabilities. Moreover, while the drift towards greater multinational co-operation and the shared employment of assets provides an opportunity to enhance resilience, it also introduces the possibility that a key element in the supply chain may be outwith the coalition partners. Thus, the level and degree of multinationality of the supply chain will have to be balanced against both effectiveness and vulnerability.

STANDARDISATION

NATO has pursued the goal of standardisation for many years. This has included efforts to improve compatibility, commonality and interchangeability in both the operational and logistic fields. The underlying aim has been the enhancement of interoperability – and hence military capability. The NATO Defence Planning Process together with the Planning and Review Process have been key drivers in this respect for both Allied and EU force development. Amongst air forces, the main focus has been on the standardisation of equipment, connectors and supporting systems for refuelling systems, weapons handling, drop tanks and towing of ground equipment.[47] Progress beyond such relatively undemanding areas was limited by the doctrine of national logistic responsibility.

Both the RFAir Staff and the EAG have sought to develop further standardisation and improve interoperability – with some success. Nevertheless, if European military aircraft are to operate successfully together on deployed operations a great deal more needs to be done. A focussed approach is required with an agreed programme of work and specific targets for interoperability (or 'mutualisation' as it is sometimes described). This should look beyond the cross-servicing capabilities and examine how commonality might be improved, ground equipment shared and specialist aviation support units employed more efficiently – with the specific aim of delivering greater military output. The creation of multinational force packages, operating from common DOBs, would provide a further incentive for change. The joint logistic arrangements that exist for the Dutch and Belgian air force F-16 fleets and the extensive system of co-operative support between the various Nordic air forces indicate what might be achieved.[48]

TRAINING

Many of the air forces providing units or personnel to the ERRF may never have been involved in expeditionary warfare or deployed operations. Even experienced air forces, comfortable with operating from austere bases and confident in their logistic arrangements, find it essential to train regularly through exercises, squadron exchanges and routine overseas deployments. There are also cultural and psychological barriers to be overcome in operating complex aircraft away from the well-prepared and familiar home base. These problems can only be overcome by a comprehensive and sustained training programme that develops skills, experience and confidence amongst individual units and between allies.

No deployed operation matches previous experience or the contingency plans – however exhaustive. The inherent frailty of aviation logistics coupled with the near certainty that significant air power will be required from the earliest stages of an operation, necessitate the development of flexible, efficient and responsive logistic arrangements. Realistic deployment training and regular exercises are essential if these aims are to be realised.

MUNITIONS

The support of munitions is the Cinderella of deployed operations – on both sides of the Atlantic. This is partly because it is the area where there is the least practice – outloading and handling munitions provide significant physical difficulties – and partly because of an historic preference for focussing on weapons platforms rather than weapons. The increasing utilisation of PGMs has to some extent disguised the problem by creating an expectation that large quantities of iron bombs will no longer need to be shipped to forward operating bases.[49] While it is certainly true that the proportion of smart weapons employed in recent operations has steadily grown, the overall quantity of ordnance remains substantial as the table below indicates). Indeed, the range and variety of armaments employed during an air campaign make the movement and handling of munitions a highly challenging activity requiring ever-greater specialist support.[50]

UK Air Munitions Consumption – Operations 1982/1999

	Operational Sorties	Attack Sorties	Freefall (Qty)	LGB (Qty)	% Smart
Falklands	2,347	215	251	11	4.4
Gulf	5,417	2,146	6,075	1,117	18.4
Kosovo	1,618	1,008	1,005	244	24.3

The option of pre-positioning equipment and stocks, as in the Cold War, is no longer a realistic strategy – not least for reasons of affordability. It would be sensible, therefore, for European air forces to seek more efficient ways to employ existing weapons stocks and specialist armament support systems.

MULTINATIONAL LOGISTICS

Multinational endeavours in any field create distinctly different challenges – if only because of the political, historical and cultural barriers to be overcome or accommodated.[51] Not surprisingly, progress in developing effective multinational logistic arrangements has been slow, notwithstanding NATO's encouragement of multinational co-operative measures such as lead nation (LN), role specialist nation (RSN) and multinational integrated logistic units (MILUs).[52] The key enabler in assisting and promoting these concepts is the multinational joint logistic centre (MJLC) – in effect, the logistic arm of the CJTF. Some success has been achieved but generally in the non-specialist support areas such as transport, port activities, reception and staging, policing and fuel distribution. A recent study has indicated that manpower and equipment savings of between 9% and 45% can be achieved through the establishment of such joint logistic operations.[53] Thus, although the impact on aviation support has to date been limited, there is every reason to explore the wider employment of MILUs across the entire logistic spectrum.

ERRF JOINT LOGISTICS

There is clear potential for the introduction of the MJLC concept in the provision of logistic support to the ERRF. A 'European' MJLC could play an important role in the operation of the ports of debarkation (APODs and SPODs) as well as the efficient allocation of HNS. At present, any extant in-theatre facilities or resources tend to gravitate to units and nations on a 'first come first served' basis. There is also an increasing demand for the allocation and co-ordination of support contracts and the management of contractors employed on deployed operations. Finally, some form of high-level oversight is needed to exploit properly the opportunity for co-operative logistic arrangements across the range of specialist aviation support activities. In short, the creation of a 'European' MJLC would enable the NATO joint logistics doctrine to be further developed to the advantage of the ERRF.

CONTRACTOR SUPPORT

The employment of contractors for battlefield support is not a recent concept but it has been given new impetus as part of ongoing initiatives to reduce logistic support costs. So far no clear consensus has emerged on the appropriate activities for contractors and the risks involved.[54] Attitudes vary across European air forces as to the level of support that should be retained in-house (to provide for surge, reinforcement, benchmarking, monopoly reduction, obsolescence management and intelligent customer capabilities) and what can be profitably and sensibly outsourced without reducing operational capabilities. For example, the national support strategies for the Eurofighter – beyond the initial period of contractor logistic support – vary greatly with some air forces intent on retaining as many support activities as possible in-house and others seeking the greatest possible involvement of contractors. The result is a confusing tapestry of support strategies across the European air forces, varying from weapon system to weapon system and within individual projects, some mature but many groundbreaking.

ASSET TRACKING AND DISTRIBUTION

The efficient management of spares and equipment on deployed operations rests on IT systems to track and distribute in-theatre stocks and to expedite re-supply. The RAF has developed deployable engineering and supply systems to meet these needs, although individual item tracking is still an aspiration. Considerable effort has been expended over many years by air forces to improve the control of equipment and spares. Progress has been slow for a variety of reasons but it has to be said that even the commercial marketplace has yet to establish a worldwide standard for parts traceability across the entire supply chain, albeit that efforts are underway to solve the problem.[55] The NATO Asset-tracking Information Routing Network (NAIRN) project aims to provide a viable and effective information system for tracking critical assets. In the meantime, short-term improvements in asset tracking are likely to rest with the various national programmes.[56]

The difficulty of managing assets in-theatre should not be underestimated. At times during the Gulf War it was found easier and quicker to despatch replacement equipment and spares to the deployed RAF squadrons rather than to track down the items that were known to be in-theatre already but lost somewhere in the pipeline or safely out of reach amongst the hundreds of thousands of items held at the ports or airheads. These problems are unlikely to get any easier with the passage of time.[57]

LOGISTIC PLANNING

The need to deploy air power quickly and effectively has significant implications for the logistic planning process at both the operational and strategic level. Rapid response times require a balance to be found between the amount of support to be deployed, the HNS available, the responsiveness of the supply pipeline and the speed at which in-theatre logistic arrangements can be set up. The challenge of logistic planning is to confront these issues for both the current operational environment and across the longer-term where there is an opportunity to implement alternative support strategies. Indeed, it has already been suggested that the RFAir should rethink its entire combat support system, using the analytical framework developed for the USAF's Agile Combat Support initiative, to provide the strategic context in which to study deployment metrics such as: logistic footprint and bed-down time.

EUROPEAN LOGISTICS DOCTRINE

The varied initiatives currently underway to improve standardisation and interoperability of European air assets are to be applauded. The more that differences in equipment and logistic processes are eroded the greater the potential operational benefit. But, these improvements are modest compared to what could be achieved if individual national air components were able to function on a co-operative basis across the entire operational spectrum.[58] This can only come about if there is a common vision of what is to be achieved and a shared logistics doctrine.

NATO has already provided an air logistic doctrine that tackles the requirements for deployed operations. Given that this meets the needs of many EU air forces and has been built around the principles of joint, co-operative logistics, there would be considerable utility in using this as the basis for ERRF planning.[59] At a practical level there remains a need to create a successor to the WEU Logistics Group (WELG) that sought to enhance logistic interoperability and achieve more effective support for military operations. Without such a forum, it is difficult to see how the efforts of individual nations can be harnessed to the task of improving European military capabilities.

There is also a need to provide a clear statement on future aviation support arrangements that will inform and guide acquisition programmes – managed by OCCAR, the Western European Armaments Group or national procurement agencies – and help reshape support strategies for legacy systems.

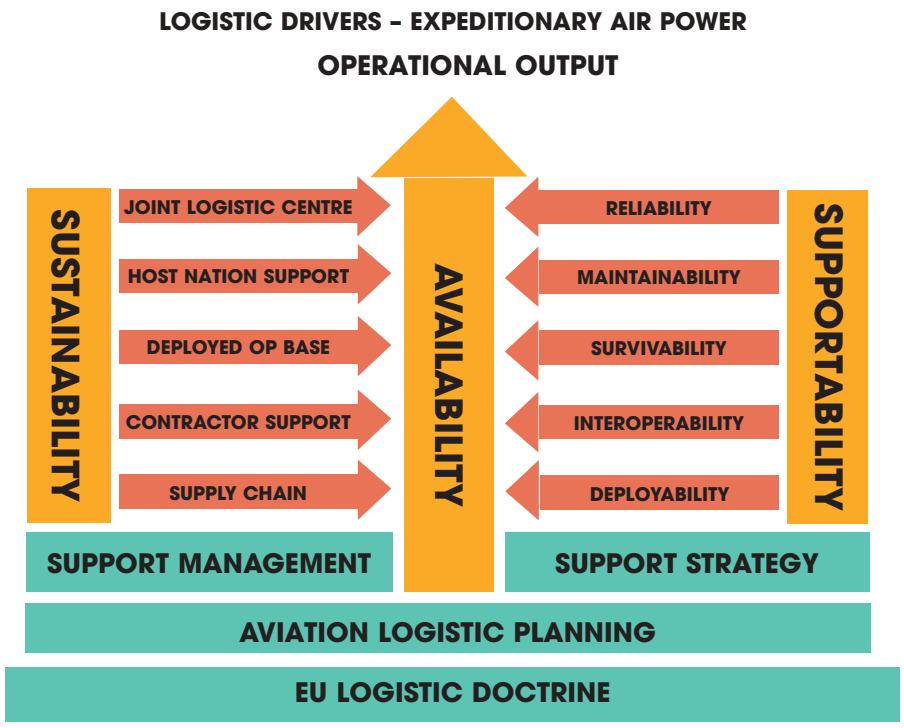
PLANNING TOOLS

The planning of deployed operations can prove to be a complex and time-consuming process embracing both conferences and negotiations – threatening any semblance of rapid response. To avoid some of these difficulties, NATO has a variety of generic logistic planning tools in place or under development.[60] The RFAir Staff has developed a modular deployment planning process, allied to the creation of an extensive database incorporating HNS capabilities and ACE-wide deployment-related data, to speed decision making.

A comprehensive and well-tested deployment planning process is critical to achieving acceptable activation and deployment timescales as well as to reducing the subsequent bed-down period. It also opens the way for contributing nations to focus on effective force inputs, the identification of logistic shortfalls and potential duplication as early as possible and, when linked to the movements planning process, the efficient utilisation of lift assets.

DELIVERING EXPEDITIONARY AIR POWER

One might be forgiven for concluding, from this brief survey of the logistic problems confronting European air forces that there are no realistic prospects for success. But, air power has always been built on an inherent logistic frailty and, although supporting complex weapon systems engaged in expeditionary warfare is hugely challenging, the collective resources available to the EU are more than adequate to the task.



Military capability is the product of complex decisions, involving political, environmental, technical and resource considerations, taken over many years. Deployed, multinational air operations add further levels of complexity. There are, however, some fundamental drivers that apply equally to air power as to other forms of military output. All of the logistic issues explored earlier contribute to aircraft availability and hence to operational capability. These elements can be broadly grouped into either support management (processes) or support strategy (environment) – as indicated in the attached schematic. Support management focuses on real time activities that directly influence sustainability. For deployed air operations, these are the responsibility of the logistic organisation within the theatre of operations (such as the DOB and HNS) and the enabling supply chain. Support strategy, on the other hand, aims to shape the logistic environment by, for example, examining the supportability of new equipment through design and of legacy systems through improvements in reliability and maintainability.

The provision of effective logistic arrangements for the aviation element of the ERRF depends on both support strategy and support management. These activities are largely interdependent but operate to

different timelines. The aim should be to blend strategy and management into a single holistic support activity through careful logistic planning that balances availability, supportability and sustainability to deliver cost-effective military output. The temptation, however, is to focus on sustainability since improvements in support management can be achieved relatively quickly and shortfalls in supportability can be abated (at least temporarily) by providing greater resources. On the other hand, improving the supportability of legacy equipments is a time-consuming process that may threaten longstanding national arrangements. If the ERRF is to provide the sustained flexible expeditionary capability envisaged, it is essential that a comprehensive and balanced joint logistic doctrine is developed to underpin the planning process.

There are several logistic weaknesses that restrict the current ability of European air forces to contribute effectively to the ERRF

CONCLUSIONS

The establishment of an effective ERRF presents the European nations with an immense challenge. The creation of the Helsinki Headline Goal has provided a spur to the necessary transformation and thrown into sharp relief Europe's limited capabilities to mount deployed operations without the support of US forces. Although much has been made of the Helsinki Force Catalogue, it cannot be regarded as the 'end of the beginning', let alone the 'beginning of the end'. There is a significant amount of work remaining before the ERRF can be declared fully operational.

The dominant role of air power in facilitating and sustaining deployed operations has been readily apparent over the past 10 years in successive crises in the Gulf, the Balkans and most recently in Afghanistan. However, air power is built on extensive and expensive logistic provision that requires careful management and the deployment into theatre of large numbers of personnel and considerable quantities of equipment. There are several logistic weaknesses that restrict the current ability of European air forces to contribute effectively to the ERRF. These include: the lack of strategic lift; unsuitable weapons and equipment; the high cost of deployed support; inadequate provision for munitions; limited co-operative logistic arrangements; fragmented employment of contractor support; poor asset tracking; and little, if any, integrated logistic planning.

Improving European airlift capabilities is clearly essential to providing the ERRF with the necessary deployability. Rapid reaction is fundamental to the ERRF's success – in as much as it is feasible to separate this from the political decision making process. Without the ability to deploy quickly (given the requisite availability and mobility of the force elements) the ERRF would be incapable of participating in the full range of 'Petersberg tasks'. Even where an incremental strategy is employed – that requires force to be applied in a graduated manner (as occurred in Kosovo) – speed of response will still be critical. The current European initiatives to improve airlift capabilities (in the form of the A400M and C-17 programmes) are to be welcomed. But, it is equally important that agreement is reached on how such assets are to be managed from the planning and tasking perspectives.

At present, individual European air forces are pursuing distinct and varied support strategies that provide for limited coherence across the EU as a whole. Admittedly, there is a reasonable expectation

that integrated support solutions can be introduced for new weapon systems procured as joint programmes, through OCCAR. By confronting these aspects early in the programme there is every chance that efficient and cost-effective logistic arrangements can be found that will provide better support for deployed operations. However, there is no escaping the problems presented by the legacy weapon systems that will remain in service for a considerable time to come. For the moment, the focus is likely to remain on improving existing national support arrangements, and thus the early delivery of a holistic approach to logistic support for the ERRF is most unlikely.

In the ongoing efforts to achieve practical improvements in the support of existing aircraft there is a real danger of 'too many cooks'. Both the EAG and the RFAir Staff are pursuing commendable initiatives to enhance interoperability and improve logistic efficiency by solving many of the problems identified above. There is, nevertheless, a clear need to co-ordinate such efforts. This role should properly fall to the EU member states – exercised through the EUMS in its secretariat role – with the demise of the WEU and the work of its various working groups, such as the WELG. However, there is a much more important role for the EUMS beyond simply filling the post-WEU vacuum. The European air forces urgently need clear guidance on logistic doctrine, processes, procedures and the role of contractors to help determine national and collaborative support strategies.

It may be that the time is now right to overcome one of the remaining barriers to a cost-effective and efficient European aviation support chain – the requirement for 'juste retour'. This continues to distort competition and detract from finding the best commercial solution to meeting long-term support needs.[61] The recent announcement by the Belgian government that they no longer plan to link military procurement spending to industrial offset agreements may prove to be a catalyst for further 'deregulation' of the market and increased competition in the support arena.[62]

Inasmuch as US military capabilities remain a benchmark for other nations, it is vital for the success of future multinational operations, and for the credibility of the Alliance, that the European members of NATO are able to operate effectively alongside their US partners. EUMS-inspired efforts to improve European interoperability would provide the opportunity both to enhance ERRF capabilities and to reduce the US/Europe capability gap. Moreover, beyond this lies the prospect of ameliorating a further technology gap, that between NATO and non-NATO European nations. However, unless the ERRF continues to develop around existing NATO doctrine and planning processes it is likely that the gap (s) will widen rather than reduce.

Perhaps the greatest challenge to achieving any significant improvement in European military capability is the question of resources and the apparently remorseless fall in European defence budgets. There have already been warnings that unless the situation is reversed it will be difficult to create the self-sustaining force that the EU has pledged.[63] But, it is equally true that the combined defence budgets of the EU nations could provide much greater military output. The restructuring of European defence industries may well help this process. It is also true that by facilitating greater co-operative support efforts and the sharing of specialist skills and equipment, the high costs of logistic support can be reduced while enhancing military output. An important step in this direction would be the creation of dedicated European multinational logistic support units and the provision of joint specialist air combat support. This capability could be further enhanced through a programme of regular deployments and joint exercises.

The final hurdle to be overcome, but in many ways the most important, is the provision of an integrated operational planning staff to deliver effective, flexible and efficient logistic support in the field. Common sense suggests that the ERRF should draw on existing NATO capabilities and resources to meet these needs. There is no rational excuse for developing a separate, parallel organisation to serve this purpose – it is neither affordable nor practicable. Just as importantly, pursuing such a path would likely serve to

increase the differences between individual air forces and further weaken interoperability and standardisation.

So far, progress in creating an effective ERRF can be likened to providing a model kit with the requisite parts. They are largely all there but with some duplication. Construction awaits detailed instructions on how the individual pieces are to be assembled and what the finished product is to be. In other words, without the necessary doctrine, and an agreed planning process, construction of the ERRF cannot begin. It little helps that the box art provides a dramatic visualisation of the finished product, other than to the potential purchaser – the hard work lies within. Failure to tackle these issues will not only delay achievement of the Headline Goal but also ensure, as Romano Prodi admitted in the aftermath of 11 September, that the EU remains *'powerless in the united and global war'*.[64]

Notes

1 While the term European Rapid Reaction Force is commonly used in the media, it is not formally recognised by the EU. Nevertheless, for convenience and to avoid confusion, the term is employed in this article. This should not be understood as implying that a standing force has been created or, indeed, is proposed.
2 Daily Telegraph, 12 & 13 June 2001.
3 Daily Telegraph, 18 May 2001.
4 Strategic Survey 2000/2001, International Institute for Strategic Studies, 2001.
5 Including the Secretary of State for Defence, Geoff Hoon, interviewed in The Financial Times, 16 November 2001 and Lord Robertson, ESDI and Transatlantic Defence Co-operation, Chatham House, 29 January 2001.
6 William Cohen, New York Times, 22 September 1999. See also, Heisbourg, Emerging European Power Projection Capabilities, Joint RAND and GCSP Workshop, Geneva 15-16 July 1999, available at www.gcsp.ch.
7 Strategic Survey 2000/20001, Op cit.
8 The other 'pillars' being Community (1st) and Co-operation on Justice and Home Affairs (3rd).
9 Meeting in June 1992 at Petersberg, Germany, WEU members declared their preparedness to make available units from the whole spectrum of their conventional armed forces for a variety of missions outside common defence. These 'Petersberg tasks' were defined as:
   -- Humanitarian and rescue tasks.
   -- Peacekeeping tasks.
   -- Tasks of combat forces in crisis management, including peacemaking.
10 Financial Times, 30 April 2001. Belgium's Foreign Minister subsequently stated that the ERRF had achieved 'limited operationability' at the Laeken Summit held in December 2001.
11 The EUMS, formally established as a permanent body on 11 June 2001, comprises 135 staff drawn from all the EU nations.
12 These included, for example, that: the Headline Goal was to be met if possible by June 2003 and December 2003 at the latest; the most demanding missions would occur in and around Europe; and that provision should be made for concurrent operations - defined as the ability to conduct a single corps-sized crisis management task while retaining a limited capability to conduct a small-scale operation.
13 These steps are described in detail within the 'Food For Thought' document endorsed by the interim PSC on 14 March 2001 – available at ue.eu.int/news.
14 For a description of the role of the EUMS see Messervy-Whiting, The European Union's Nascent Military Staff, RUSI Journal, December 2000.
15 Defence Ministers Meeting, Ecouen, 22 September 2000 – available at ww.weu.int/assembly/eng/reports.
16 The combat elements, to be drawn from a force pool of 400 aircraft, included: Air Defence; Air Interdiction; Suppression of Enemy Air Defences; and Tactical Recce. The support aircraft force elements include: Air-to-Air Refuelling; Airborne Warning and Control; Strategic Recce, Combat Search and Rescue, Medevac; and Tactical Transport. Nice European Council Presidency Conclusions - available at www.ue.eu.int/pesc/Military.
17 The USAF deployed some 1,223 aircraft and over 44,000 support personnel in theatre compared to the RAF's 147 aircraft and over 6,000 personnel. Royal Air Force Air Power Review Spring 1999, page 85.
18 Calculated on the basis of 25 C-130 sorties to deploy a 12 aircraft squadron. This is probably a conservative estimate. For example, the deployment of a German ECR Tornado squadron requires the movement of 1,000 tons of equipment and supplies as well as 800 personnel. Schmitz and Rausch, Operational Logistics in NATO, Air Force Journal of Logistics, Vol XXIV, No 1, Spring 2000.
19 Defence Policy 2001 – available at www.mod.uk/index.
20 NATO Assembly Report AT-247-DSC-00-7, Building European Defence, Nov 00.
21 Aviation Week & Space Technology, 17 May 1999, pages 31-33.
22 Aviation Week & Space Technology, 11 November 2002, page 62.
23 Audit of Assets and Capabilities for European Crisis Management Operations Recommendations for Strengthening European Capabilities for Crisis Management Operations, WEU Council of Ministers, Luxembourg, 23 November 1999. Available at www.weu.int/eng/mini/99luxembourg/recommendations.
24 Progress and shortfalls against the HHC were presented in the form of a Helsinki Progress Catalogue.
25 Jane's Defence Weekly, 12 December 2001. However, on the positive side, it should be said that a number of NATO DCI-related logistic initiatives are likely to benefit the ERRF.

26 NATO, Air Forces Logistic Doctrine and Procedures, ALP-4.3 (ALP-13), October 2000.
27 Principles and Policies for Logistics, NATO MC 319/1.
28 Air Forces Logistic Doctrine and Procedures, NATO ALP-4.3 (ALP-13), October 2000.
29 NATO's Air Forces Logistic Doctrine and Procedures, ALP-4.3 (ALP-13), describes the characteristics of aviation logistics and observes that, across the spectrum of difficulties, fixed wing aircraft are to be found at the most difficult end.
30 Living Logistic-Loca, Gary Stretton, Defence Review, pages 33-34, Summer 2001.
31 Airport congestion at Rinas initially prevented the task force's considerable logistic support equipment and supporting helicopters – including 8 Chinook and 24 Blackhawk helicopter transports–from being deployed in a timely fashion. Ultimately, a combination of factors, including the austere facilities available in Albania, denied the Apache brigade an operational role. Ripley, Conflict In The Balkans, Osprey Aviation, 2001.
32 The EAG was inaugurated in September 1995 as a Franco-British organisation tasked with improving operational capabilities primarily through enhancements in interoperability. Currently 7 European nations are members.
33 This report, of course, predated the lease of C-17 aircraft by the UK. It is also questionable as to whether there is military utility in moving MBTs by air.
34 EAG, European Airlift Study, December 2000.
35 Aviation Week & Space Technology, 9 July 2001, pages 41-42.
36 Aviation Week & Space Technology, 4 June 2001, page 17. The number may fall yet further under budgetary pressure.
37 The A400M is limited in its ability to transport the heaviest Main Battle Tanks – such as the Challenger - or the larger support helicopters without some disassembly of rotor heads, etc.
38 Sunday Telegraph, 22 April 2001.
39 Palmby, Enhancement of the Civilian Reserve Air Fleet: An Alternative for Bridging the Airlift Gap, Air University, June 1995.
40 Once again, NATO work stemming from the DCI, to achieve greater logistic co-operation (DM2) and assured access (DM5), may be of benefit to the ERRF.
41 Notably, the Allied Deployment and Movement System (ADAMS).
42 See, Military Aviation Maintenance Support Strategies, Air Force Journal of Logistics, Vol XXV, No 1, Spring 2001.
43 It was calculated in 1992 that the continued policy of providing FAPs for the RAF's Tornado, Harrier, Jaguar and Puma fleets would cost £230 million compared to £125 million for the equivalents PEPs. For the Eurofighter – for which spares provisioning had yet to occur - the PEP was expected to cost some £97 million compared to £222 million for a FAP. Mobility and Deployed Support Study, MOD, 1992.
44 Additional specialist support units include: aircraft battle damage repair; tactical supply; and airfield infrastructure construction and repair provided by the Royal Engineers.
45 For example, 2-3 Hercules equivalent loads are required just to deploy the ground-based IT support systems for the Eurofighter. On the other hand, the introduction of multiskilling amongst the ground support trades may yet reduce the deployment footprint.
46 The Daily Telegraph, 2 August 2001.
47 The NATO common procurement programmes of the 1960s, such as the FIAT G91, saw very little development of common support arrangements other than a limited role for NAMSA.
48 Other important initiatives include the Nordic helicopter programme, the Nordic Co-ordinated Arrangement for Military Peace Support and a range of Baltic multinational projects.
49 The carriage life of PGMs is relatively short (it can be under 20 hours) and thus 'consumption' may prove to be higher than operational utilisation rates indicate.
50 For a detailed analysis of the issues involved, from the USAF perspective, see Underwood & Bell, AEF Munitions Availability, Air Force Journal of Logistics, Vol XXIII No 4, Winter 1999 and Abell et al, Alternate Munitions Prepositioning, Air Force Journal of Logistics Vol XXIV No 2, Summer 2000.
51 See, Gorman, Multinational Logistics – Managing Diversity, Air Force Journal of Logistics Vol XXIV No 3, Fall 2000
52 Progress is likely to remain slow until the direction is clearer and an agreed doctrine emerges.
53 A Cost Benefit Analysis Study Of NATO Multinational Logistics In The Balkans, LR 010/SX Dated 25 May 2001.
54 The DLO has provided guidelines for the employment of Contractors on Deployed Operations (CONDO) by the UK Armed Forces but there is no similar document describing common principles amongst the European nations.
55 Using the Air Transport Association's SPEC 2000 permanent bar code ID standard.
56 The DLO is developing a single codified inventory under the Defence Stores Management System (DSMS) programme that will provide for selected serial number tracking of items.
57 Robert Tripp, A Framework for Evolving Agile Combat Support Concepts to Meet NATO RFAir Operational Requirements, RFAir Conference December 2000.
58 This is not to argue, however, for role specialisation.
59 Significantly, the EU has agreed that it only create doctrine if no other exists.
60 These include Logistics Reporting (LOGREP), Logistics Database (LOGBASE) and Logistics Functional Area SubSystem (LOGFASS). Logistics Topics In A Small Air Force, Air Warfare Centre Logistics Seminar, Madrid, 1999.
61 The OCCAR Convention, House of Commons Defence Committee, First Report, Session 1999-2000, 25 November 1999.
62 Aviation Week & Space Technology, 2 July 2001, page 21.
63 International Institute for Strategic Studies, Strategic Survey 200/2001.
64 Financial Times, 16 November 2001.

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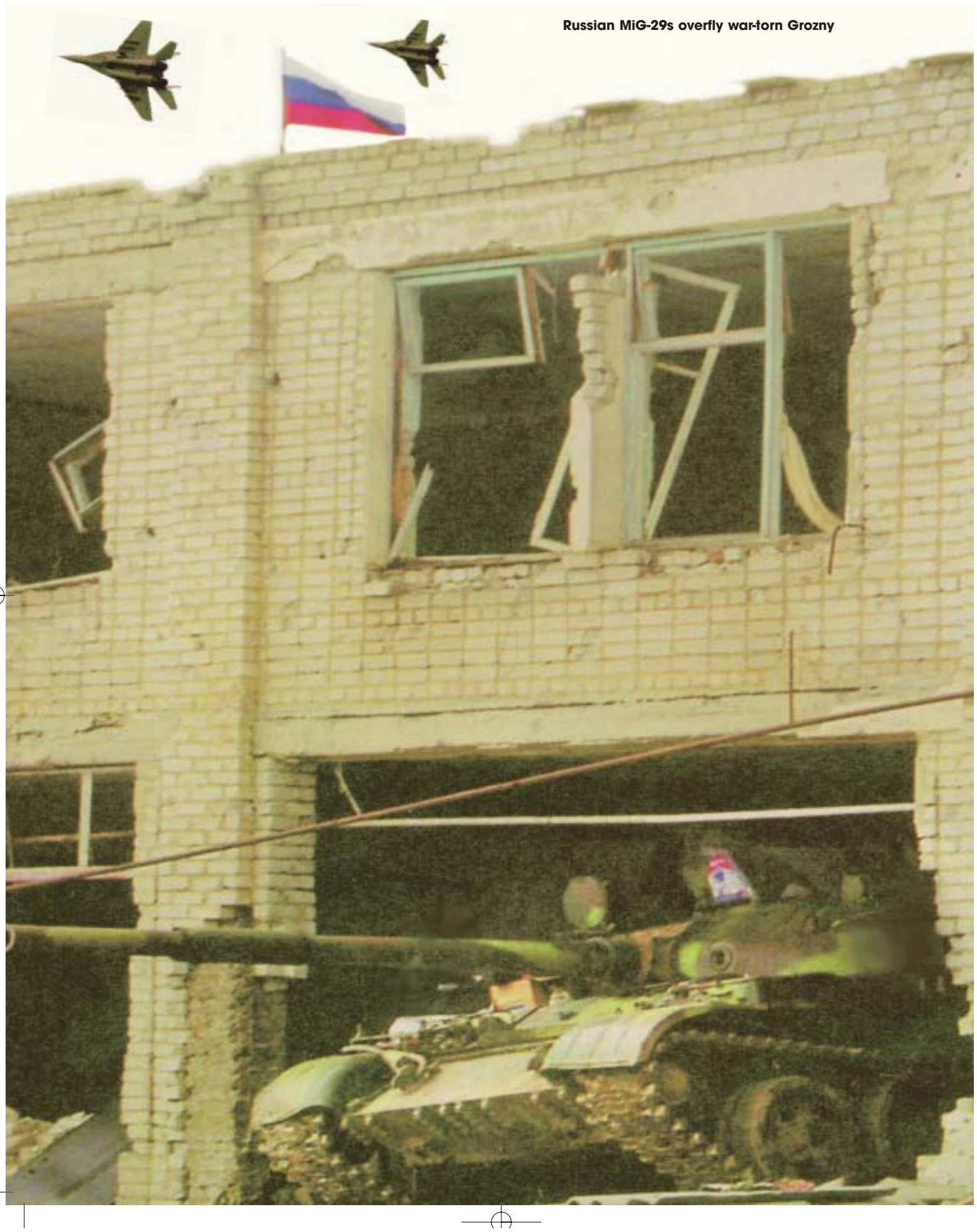

Russian MiG-29s overfly war-torn Grozny

The use of Russian Air Power in the Second Chechen War

By Major Marcel de Haas RNLAF

This paper describes part of the second Chechen conflict, which started in the fall of 1999. The purpose of this document is not to provide a comprehensive study of this conflict; others have already done so.[1] This study offers an analysis of the use of Russian airpower and the Chechen response to the use of military force.

For pragmatic reasons I have divided the conflict into two parts. The first part comprises three military actions in Dagestan, from August – September 1999. The second part describes the second conflict in Chechnya, which started in September 1999 and still continues.

In my assessment I will provide a comparison of the use of airpower between the present conflict and the first Chechen conflict (1994-1996).

Fig 1. Levels of strategy in the conflicts in Dagestan and Chechnya (1999 —)

RUSSIAN AIRPOWER IN DAGESTAN (AUGUST-SEPTEMBER 1999)

At first I will provide a brief overview of the conflict. Following this, I shall elaborate on the different levels of strategy of the Russian forces and of the Chechen insurgents. I will end by adding a few assessments.

BACKGROUND AND COURSE OF THE CONFLICT

Dagestan is a republic within the Russian Federation, three times the size of Chechnya, a population of just over two million and 30 different, primarily Muslim, ethnic groups. In August and September 1999 Russian forces conducted three operations in Dagestan. The Russian Federal forces had to counter two assaults from Chechen Islamic insurgents in two districts of Dagestan and to put an end to the Islamic rule, which had been installed in a different area of Dagestan a year before.[2]

Tensions had raised in the border region between Chechnya and Dagestan, early in August 1999. The first operation of the Russian forces was in response to an invasion by groups of armed Islamic fighters, possibly around 1,500 men, led by the Chechen field commanders Basayev and Hattab, who from 2 August had infiltrated from Chechnya into the Botlikh and Tsumadin districts of western Dagestan, occupied some villages, and declared the area to be under Islamic law. The second operation of the

Prime Minister Vladimir Putin

The objectives that the military–political leadership had laid upon the Federal armed forces were to cut off the rebels' fuel and financial base in Chechnya

Russian forces, commencing on 29 August 1999, was in an area consisting of the villages of Chabanmakhi and Karamakhi in the central Dagestani district of Buynaksk, to bring an end to Islamic control, which had been installed there a year before. On 5 September Federal forces for the third time were employed, on this occasion to counter a second incursion by a force in the order of 2,000 Chechen Islamic fighters in the Novolaksk district, north of the earlier invaded districts. After two incursions and a number of (sniper) attacks on Russian troops on the border between Dagestan and Chechnya, the conflict escalated to Chechnya. On 7 September Colonel General Valery Manilov, First Deputy Chief of the Russian General Staff, officially announced the first air attack on Chechnya.[3] After some 45 days of fighting the insurgents were driven back to Chechen territory. According to Russian authorities, 1,500 rebels were killed during the operations. The joint Federal forces lost approximately 300 men and close to 1,000 were wounded.

RUSSIAN GRAND STRATEGY: ACTORS AND OBJECTIVES

At the political-strategic level of the Russian Federation (RF) two actors were deeply involved in the operations in Dagestan. Vladimir Putin, just appointed as Prime Minister, regularly expressed his views in the media on the official policy towards the conflict and visited the area together with the Chief of the General Staff (CGS), Army General Anatoly Kvashnin, on 27 August. CGS General Anatoly Kvashnin kept a close watch on the execution of the military operations and accompanied visits of Putin and of the Minister for Internal Affairs *(Ministerstvo Vnutrennykh Del* [MVD]), Vladimir Rushaylo, to the conflict area. As early as 17 August Kvashnin announced that if necessary, enemy bases inside Chechnya would be targeted.[4]

From the start of the counter-insurgency operations media coverage was restricted. According to official sources the reason for media limitations was to prevent the enemy from acquiring intelligence on the

course of action. Another reason must have been to give the Russian population the impression of a smooth operation and to keep up the morale of the forces. A third reason was to prevent the rebels from spreading propaganda.[5]

The objectives that the military-political leadership had laid upon the Federal armed forces were to cut off the rebels' fuel and financial base in Chechnya (illegal gasoline trading), to destroy their main arsenals and training centres in Chechnya and to prevent further incursions.[6] Another objective was to put an end to the already existing independent Islamic rule in a central district of Dagestan. In sum, Federal law and order over all of Dagestan was to be restored.

RUSSIAN MILITARY STRATEGY: COMMAND AND CONTROL STRUCTURE

The Russian forces involved in the operations in Dagestan initially consisted of Ground and Air Forces of the RF Ministry of Defence (MoD) and Internal Troops of the MVD (*Vnutrennyye Voyska* [VV]). The ground component, with an original strength of 4,000 up to 10,000 men at the end of the operations, was at the start made up of two brigades, 136 Brigade (MoD) and 102 VV Brigade (MVD). During the conflict reinforcements were sent comprising airborne and naval infantry units from distant locations such as the Siberian Military District and the Northern Fleet.[7]

At first, operational command of the Federal forces, i.e. MoD and MVD forces, was given to the MVD. However the Commander in Chief of the VV, Colonel General Vyacheslav Ovchinnikov, who himself led the operation, had no experience in commanding troops of different RF departments (MVD and MoD).[8] Already during the conflict the inadequacies of the MVD troops and their failure to properly co-ordinate became public when an Army commander of the Ground Forces uttered this complaint in the media. This meant MVD troops had to cope with fierce resistance, as were not used to procedures of calling in the necessary artillery fire support or close air support. Therefore the situation demanded a change of command. On 17 August the command was transferred from MVD to MoD in order to improve the conduct of the operation of repelling the incursion. CGS General Anatoly Kvashnin put Colonel General Viktor Kazantsev, Commander of the North Caucasus Military District (NCMD), in command of the Joint Grouping of Forces in Dagestan. On 27 August, after finishing the first operation in the Botlikh and Tsumadin districts, operational command was returned to the MVD to start the second operation in the Buynaksk district of central Dagestan. On 4 September, following a meeting attended by MVD Minister Rushaylo, CGS Kvashnin and Commander NCMD Kazantsev, command of the Joint Grouping of Forces was once more transferred from MVD back to MoD. Lieutenant General Gennady Troshev, Deputy Commander NCMD, would now lead the second operation of the Russian forces, in the Buynaksk district.[9]

RUSSIAN OPERATIONAL LEVEL: ORGANISATION OF AIRPOWER

COMMAND AND CONTROL STRUCTURE

The Russian air component in the Dagestan operation consisted of two parts. The Russian Air Forces (Voyenno-Vozdushnyye Sily [VVS]) formed the larger part of the air component of the Russian Federal troops. The other part was made up of army aviation (Aviatsiya Sukhoputnykh Voysk [ASV] or Armeyskaya Aviatsiya). The VVS component of the RF forces operating in Dagestan was commanded by the 4th Air Army, headquartered at Rostov-na-Donu. Later a forward HQ for the VVS component was

Su-25 Frogfoot fighter-bomber

Mi-24 Hind attack helicopter

The backbone of the air component in Dagestan consisted of Hip and Hind helicopters and Su-25 Frogfoot fighter-bomber aircraft

placed in the Dagestani capital Makhachkala. Co-ordination was established with MVD forces, to make preparations for cooperation between ASV, VVS and air assets of the MVD. Mozdok, close to the western border of Chechnya and earmarked as the main operational base, was linked to mobile command and co-ordination posts in the front line of the ground troops.

FORCE BUILD-UP

Assets that ASV deployed in the Dagestan operation were especially the Mi-24 Hind combat helicopter and the Mi-8 Hip transport helicopter. ASV also employed the Mi-26 Halo heavy lift helicopter. VVS' input consisted of the Su-25 Frogfoot fighter-bomber, Su-27 Flanker fighters, Su-24M/MR Fencer D/E fighter-bomber/reconnaissance (recce) aircraft, An-30 Clank photorecce aircraft and A-50 Mainstay early warning aircraft. The backbone of the air component in Dagestan consisted of Hip and Hind helicopters (ASV) and Su-25 Frogfoot fighter-bomber aircraft (VVS). VVS quickly sent reinforcements to the conflict area. Between 12-15 August 16 aircraft were flown over to the airfield of Makhachkala.[10] In the end the number of Hinds had raised to more than 120 helicopters. The total number of air assets used in the Dagestan operation, i.e. helicopters and aircraft, counted up to 300 by mid-September.[11]

RUSSIAN TACTICAL LEVEL: APPLICATION OF AIRPOWER

COUNTER-AIR OPERATIONS
Flankers fulfilled Combat Air Patrol (CAP) missions, to prevent reinforcements of the rebels by air. The Chechen rebels did not have an organised air-defence system with radar and missiles. Their air-defence armament essentially consisted of some man-portable SAMs (Surface-to-Air Missiles), heavy machine-guns and ZSU 23/2 twin barrel anti-aircraft guns on trucks. The Chechens did not possess an air component, so the Russian air forces had air supremacy in this operation. Therefore counter air operations could be limited to CAPs, as mentioned above, and occasionally Suppression of Enemy Air Defences (SEAD), during Offensive Air Support (OAS) missions and supporting air operations.

The Chechens did not possess an air component, so the Russian air forces had air supremacy in this operation

ANTI-SURFACE FORCE AIR OPERATIONS
Fencer-D and Frogfoot aircraft and Hind helicopters conducted OAS and Air Interdiction (AI) missions. Frogfoots attacked targets such as bunkers and mortar positions. Apart from attacks against strong-holds, Frogfoots were also used to mine mountain roads. Another task was to cut off the supply routes of the rebels between Dagestan and Chechnya. To achieve this objective Frogfoots carried out missions on rebel camps and supply bases in the border area. By performing Tactical Air Reconnaissance (TAR) missions, and thus supplying targeting, terrain and other intelligence, Fencer-E aircraft supported OAS and AI of fighters and combat helicopters.

Mainstays provided airborne early warning over Dagestan and Chechnya

By demolishing fortifications, bridges, supply and ammunition stores, destroying or mining all major routes . . . the air component had taken its share in achieving the expressed military-political objectives

SUPPORTING AIR OPERATIONS
ASV's Hip helicopters were used to deliver special (Spetsnaz) and conventional airborne units behind enemy lines, transporting airborne command and control posts, for medical evacuation (medevac), (Combat) Search and Rescue (CSAR) and lastly recce purposes. In these missions Frogfoots provided cover for the Hips by means of SEAD and CAS. Halos took care of supply and transport tasks. The Clanks conducted photorecce missions. And finally Mainstays provided airborne early warning over Dagestan and Chechnya.

TACTICS
Hinds operated in combat groups of two or four, attacking from a height of 3,500 to 4,000m, with steep diving descents down to tens of meters, followed by making surprise pop-ups from different directions, with one pair covering the other two after attack. Thus suppressive attacks on rebel positions were conducted. Two to four Fencer-Ds or two to four Frogfoots generally carried out tasks, such as "search-and-destroy" or "bomb-storming" missions. The former, flying at high altitudes (at least 3,500m), and therefore protected against portable air defence systems, often bombarded with high precision weapons. The Frogfoots attacked from lower altitudes (1,000-3,000m) and with their high-manoeuvrability, normally used conventional arms in the bombardments.[12]

FAILURES OF AIRPOWER
On 12 August due to a lack of enemy awareness one MVD Hip came under fire, among others three MVD generals were wounded.[13] Two other helicopters were destroyed approaching the Botlikh landing strip. A second mistake was the accidental bombing of a village in Georgia, by a VVS Frogfoot. A third error was in the field of friendly fire (blue-on-blue attacks). A MVD detachment was attacked by VVS.[14] To a large extent these failures in using airpower were the result of shortcomings in the co-operation between VVS, ASV and MVD. In reviewing the operations in Dagestan Russian military leadership concluded that in future operations these shortcomings could be avoided by creating a single system of aviation control in joint operations. Another measure to improve the co-ordinated use of airpower was to install air support controllers in ground component units.[15]

SUCCESSES OF AIRPOWER
ASV and VVS had flown more than 1,000 combat sorties in which four to six helicopters and one to three fixed-wing aircraft were destroyed.[16] By demolishing fortifications, bridges, supply and ammunition stores, destroying or mining all major routes between Dagestan and Chechnya, the air component had taken its share in achieving the expressed military-political objectives.

CHECHEN INSURGENTS: STRATEGY AND OPERATIONS

With regard to the political-strategic level (grand strategy) it must be stated that both commanders of the Chechen insurgents, Basayev and Khattab, seemed to operate independently of the Chechen government of President Maskhadov. The Chechen fighters invaded Dagestan with the objective to change it into an Islamic state, seceded from Russia. Following this, their next objective would be unification with Chechnya in order to form an Islamic republic. The Chechen intruders misjudged their potential support in Dagestan for establishing an Islamic state in that republic. The ethnic diversity in

It was mainly luck other than well-prepared defence, which enabled them to shoot down some helicopters and aircraft

Dagestan and historic confrontations between Chechens and Dagestani worked against local support. In some villages the Chechen fighters had to face resistance from local inhabitants even before Federal forces arrived. Since Basayev and Khattab apparently operated independently, the military-strategic level was absent. Both commanders were only active on the lower levels of strategy.

Concerning the operational and tactical level it was rather remarkable that the Chechen insurgents in Dagestan changed their way of warfare a number of times. At first they invaded in the form of an irregular raid, not as conventional armed forces. This was of course also due to their mostly light armament. Because of the lack of local support after occupying some areas of Dagestan, they resorted to building fortified strongholds to defend themselves against Federal troops. This can be considered as a form of regular warfare. Being out-numbered and badly equipped, the insurgents were not capable of launching counter-offensives against the Russian forces. However, being aware of the limitations of the Russian forces under bad weather and night conditions, they took advantage of this by operating especially under these circumstances. After they had been forced to leave the occupied villages and return to Chechnya, the insurgents again changed over to partisan warfare.[17] For instance by using snipers, mining roads and laying ambushes. With regard to air defence it was mainly luck other than well-prepared defence, which enabled them to shoot down some helicopters and aircraft.

ASSESSMENT

Assessing the conflict I will follow the same approach as already mentioned, describing the different levels of strategy of both sides.

RUSSIAN STRATEGY AND WARFARE

On the grand strategy level it was remarkable that not RF President Yeltsin but Prime Minister Putin took the lead in the operations in Dagestan. By tradition the Russian Prime Minister would deal with internal socio-economic affairs and not with (military) security. Two reasons come forward for the fact that Putin was deeply involved in the Dagestan conflict. First of all, it was indicative of his interest in security affairs, being a former intelligence officer. Secondly he was climbing the ladder of political hierarchy. Victory in Dagestan would promote his career.

Another point of interest at the political-strategic level was how the media were dealt with. The RF authorities restricted media coverage on the operations in Dagestan. In the first Chechen conflict the unrestrained reporting by the press, especially of civilian casualties, had a negative impact on public opinion and on morale of the soldiers. Due to political demands it also limited military operations, especially with regard to targeting. By controlling the media the Russian authorities gained a success in information warfare.

Regarding the military-strategic level it turned out that the command and control structure of the joint Federal Forces failed on various occasions. Since the MVD forces were not capable of handling the situation, operational command was moved a number of times between MVD and MoD. Undoubtedly this must have had a negative influence on the outcome of the operations. Bearing in mind similar experiences of the first Chechen conflict, the failures in co-ordination during the operations in Dagestan proved that co-operation between MVD and MoD troops was still insufficient. Just like in 1994-96, MoD and MVD units not earlier than in battle learned to co-operate with each other.

On the operational level the conclusion must be made that the original ground component of the Federal forces, consisting of two brigades, was not capable of defeating the insurgents. Reinforcements had to come from distant peacetime locations and from elite forces such as airborne and naval infantry troops. This was an indication of the low level of combat readiness of a large part of the Russian armed forces.

The Chechens have a history of showing fierce resistance against Russian occupation, which goes back to the expansion of the Russian tsarist empire in the 19th century

Another observation at this level is that the air component made a number of mistakes, mostly due to shortcomings in the co-ordination between VVS, ASV and MVD. With regard to the use of airpower, co-ordinated mission planning between VVS, ASV, Ground Forces and MVD troops should already, prior to the Dagestani operations, have been considered imperative for achieving joint military objectives and avoiding blue-on-blue attacks.

Overall, in spite of a number of shortcomings, the operations in Dagestan were successful. This was especially due to a change of conduct at the tactical level, compared to the 1994-96 conflict. The Dagestani operations showed that the Federal forces had altered their tactics. Only after heavy artillery and air bombardments did ground forces start their assault to destroy the rebels.[18] Modern, high-tech precision arms, part of the RF defence capability, were used, especially in the initial bombardments. In the first Chechen conflict modern weapons were less used and ground forces were often from the very beginning in direct contact with the enemy. This approach had resulted in a high casualty rate and had affected morale. The new approach of employing ground troops only after initial artillery and air bombardments, seemed to have been more successful.

STRATEGY AND WARFARE OF THE CHECHEN INSURGENTS

At the political-strategic level the Chechen insurgents incorrectly assessed popular support for Islamic rule in Dagestan. Not only did they lack support, in some cases Dagestani actively resisted them. The lack of Dagestani support was probably due to the ethnic diversity of the population, who were not united in favour of secession from Russia. Nor did the majority of the Dagestani people feel drawn towards radical Islamic ideas, which were propagated by the Chechen intruders.

With regard to the operational-tactical level, after losing the battles in three successive operations, the intruders were driven back to Chechen territory. It can be concluded that apart from defending fortified strongholds, which was an example of regular warfare, the Chechens mainly operated as insurgents, using tactics of irregular warfare.

THE SECOND CHECHEN CONFLICT (OCTOBER 1999-PRESENT)

As in the previous part on Dagestan, I will first provide a setting on Chechnya in general. After that I will deal with the course of the conflict. Subsequently I shall examine the different levels of strategy of the Russian and of the Chechen forces, followed by some assessments.

BACKGROUND ON CHECHNYA

Chechnya is a small Russian republic. To really understand the Chechen conflict two premises are essential. First, the Chechens have a history of showing fierce resistance against Russian occupation, which goes back to the expansion of the Russian tsarist empire in the 19th century. Second, to the Chechens tribal adherence outweighs a one nation state.

I will now elaborate on the first argument, the Chechen resistance to occupation. In fall 1991, Chechen leader and former Soviet VVS General Dudayev, taking advantage of the disarray after the attempt of a coup d'état in Moscow, declared Chechnya independent from the USSR. Due to the disorder after the break up of the USSR, it was not until 1994 that Russian President Yeltsin deemed it necessary to respond to this secession. From December 1994 until August 1996, Russian forces intervened Chechnya, later known as the first Chechen conflict. However, as a result of heavy casualties and several hostage situations as well as the recapture of cities such as Grozny by the Chechens, the

Russians were forced to sign a truce. Defeated, the last Russian forces left Chechnya in December 1996. From 1996 until 1999, Chechnya regained its independent status. However, the country became a centre of anarchy, in which abductions, especially of foreigners, turned out to be the major source of income for local warlords.[19] In October 1999, Russian forces for the second time invaded Chechnya. The second premise is Chechens preferring clan adherence to loyalty to a one nation state. Chechens belong to some 135-150 clans.[20] Recent history makes it clear that as a result of a lack of 'national feeling' and in the absence of the 'foreign invader', Chechens will fight against each other. For instance, President Dudayev as well as his successor Maskhadov have experienced a number of assassination attempts. Especially under Maskhadov, central power lacked and warlords ruled over large parts of Chechnya. The two premises I described hamper any attempt to establish solid governance over Chechnya, either by the Russians or by the Chechens themselves.

Course of the second Chechen conflict

I will divide the course of the conflict into five phases. The air campaign in September 1999, followed by the installation of a security cordon in northern Chechnya (October-November 1999), after which a larger part of Chechnya was occupied, including Grozny (November 1999-February 2000). Then came the fourth phase, which was conquering the mountainous part, south of Grozny (March 2000-January 2001), and finally the fifth phase, which was restoring Russian Federal law and order, under command of the internal security service, FSB (Federal'naya Sluzyba Bezopasnosti) (January 2001-present). I will now describe in detail these five successive phases of the conflict.

Phase one: the air campaign (September 1999). For weeks Russia mounted an air campaign against Chechnya in which not only the insurgents, withdrawing out of Dagestan, were targeted, but also strategic objectives such as telephone and electricity infrastructures, water reservoirs and the airport of the capitol, Grozny. Tactical targets that were destroyed were military bases, bridges, roads and vehicles. Although denied by VVS Commander-in-Chief, Colonel General Anatoly Kornukov, many civilians were killed as a result of the air strikes.[21]

Phase two: the installation of a security cordon in northern Chechnya (October-November 1999). Putin's statement, that the authority of Chechen President Maskhadov and of his Government was illegitimate, on 1 October, was the signal to start the ground campaign. The objective was to capture territory to establish a security zone until the river Terek, north of Grozny, officially to prevent any further incursions into RF territory. The Russian forces used "go-slow" tactics, sending in infantry only after heavy artillery and air barrages, to avoid the heavy casualties of the first Chechen conflict. On 15 October, the Commander of the Joint Grouping of Forces, General Kazantsev, announced that the security zone, comprising one-third of Chechnya, was complete. After this, and although officially denied, Russian troops made efforts to encircle Grozny in preparation of an invasion of the Chechen capitol. On 12 November Gudermes, Chechnya's second largest city, was taken. At the end of that month Russians forces largely surrounded Grozny and held more than 50 percent of Chechnya.

Phase three: the occupation of the larger part of Chechnya, including Grozny (November 1999-February 2000). On 4 December Grozny was fully blockaded by Russian troops. By 13 December the Russians had regained control of Grozny's airport. As of the next day, Russian forces met fierce resistance in advancing into the outskirts of Grozny. On 3 February 2000 the Federal forces held half of Grozny. In the following days 2,000 Chechen fighters pulled out of their capital into the southern mountains. The Russians had recaptured Grozny.

Phase four: the battle for the southern mountains (March 2000-January 2001). From mid February 2000, VVS bombed Chechen positions in the southern mountains, where around 8,000 fighters were

believed to be hiding. The Chechen benefited from the mountainous terrain by their hit-and-run attacks on the Russian troops. Still lacking a sufficient counter-insurgency doctrine, the Russian forces were unable to deal with the Chechen guerrilla tactics and to complete the operation.

Phase five: the swift change from a military operation to an FSB-led anti-terrorist operation (January 2001-present). In January 2001, President Putin announced that the military campaign in Chechnya was successfully completed and that this allowed turning over command of the "anti-terrorist operation" from the military to the FSB.[22] The FSB would further restore Russian Federal law and order in Chechnya by employing special units (spetsnaz) in conducting extensive search-and-destroy operations against rebel groups and their commanders. Although Russian officials claimed that the military conflict had ended, the Chechens continue their guerrilla warfare not only in the southern mountains, but also throughout Chechnya and even by bomb attacks and incursions into Dagestan and Ingushetia. In September 2002, three years after the second Chechen conflict had started, the official total number (MoD forces and troops of the power ministries) of Russian soldiers who were killed was 4,500, which exceeded the loss of around 4,000 servicemen in the first Chechen conflict. Also according to Russian officials, at that moment 12,500 Russians were wounded and nearly 14,000 Chechen fighters were killed.[23]

Russian grand strategy: actors and objectives

Economic, internal and external politics, as well as military and ideological grounds gave rise to the second Russian invasion of fall 1999. The motives for this invasion can be divided into structural and opportunistic ones. Structural motives are present in the fields of economy, geo-strategy and internal politics. The economic drive was the presence of oil in Chechnya and the area of the Caspian Sea. Oil was and is an important source of income for Russia. Furthermore, Russia considers the Caucasus to be of vital strategic importance, as it leads towards Turkey and the Middle East. In order to maintain its influence in that area, a stable southern border, on which Chechnya is situated, was an essential prerequisite. Concerning internal politics, Russia considered the secession of Chechnya as a threat to its integrity. This could create a domino effect of separatism; other entities within the RF might follow this example, which eventually could lead to the break up of the RF.

Secondly, opportunistic motives can be found in the fields of internal, military and ideological politics. Regarding internal politics, as I described in my assessment of the Dagestani conflict, in fall 1999 Putin was on his way to the leadership of the country. A successful campaign in Chechnya would strengthen his position for the presidential elections of March 2000. The military motives were twofold. Firstly, the Russian generals were vindicated to having their revenge for the humiliating defeat they suffered in the first Chechen conflict in 1996. Secondly, the top brass wished to increase the defence budget with the intention of modernising and strengthening the armed forces. A victory in Chechnya would increase their influence in the Kremlin in order to reach this target. Finally, the ideological argument being the threat of Islamic-fundamentalism, which is a constant theme in Russian foreign as well domestic policy. Internationally, Russia pointed at the Islamic terror attacks in Central Asia, developments in Afghanistan, and domestically at the incursions by Islamic-extremists in Dagestan and the installation of Islamic rule in Chechnya. Often these developments have been portrayed as connected, especially by Osama bin Laden's terror network.

The most likely direct motives, that gave rise to the decision of using military force against Chechnya, were the aforementioned incursions of Chechen insurgents into Dagestan and a number of bomb attacks in Russia. The latter occurred in Dagestan, one explosion, Moscow, three explosions, and one

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Russian authorities justified the invasion using the Chechen incursions and the bomb blasts as reasons. However, to this very day no proof has been given that Chechens were behind the bomb attacks.

in Volgodonsk, all between 31 August-16 September 1999.[24] Russian authorities justified the invasion using the Chechen incursions and the bomb blasts as reasons. However, to this very day no proof has been given that Chechens were behind the bomb attacks. On the contrary, quite often it is the FSB, which is accused of these terror attacks. Another point of interest is that the invasion of Chechnya was well-organised, which makes the option of a sudden decision to use military force not so likely. Probably a reason was found for conducting an already planned military campaign.

Russian military strategy: command and control structure

At the outset of the second invasion into Chechnya, in October 1999, the estimated number of the forces, the majority being MoD troops, was 100,000. In August 2000 the Joint Grouping of Forces consisted of 80,000 men, of whom 50,000 were MoD troops.[25] In January 2001 it was announced that the total personnel strength of the forces in Chechnya, MoD and MVD troops and militsia (military organised police), was to be reduced to 50,000-60,000 men.[26]

Initially the Joint Grouping of Forces, under command of Colonel General Kazantsev, Commander NCMD, conducted the operations in Chechnya. The Joint Grouping of Forces was divided into five parts: the western, northern, eastern, southern and Grozny (later Argun) groups. Each group consisted of MoD troops (ground, air, naval infantry and airborne forces) and troops of the power ministries (MVD, FSB, Civil Defence and border guard forces).[27] The main headquarters of the Joint Grouping of Forces was originally based in Mozdok, west of Chechnya, and then moved to Khankala, near Grozny.[28]

Since January 2001, the FSB has taken command of the operations in Chechnya. With regard to command and control, a Main Staff of Operations was formed, consisting of the Director of FSB, the heads of the so-called “power ministries” which had troops employed in Chechnya, such as the MVD, and of members of the Joint (military) Staff. The Joint Staff had until then been in command of the Chechen campaign. Furthermore a Regional Staff of Operations was formed, led by a Deputy Director of the FSB, and made up of representatives of the power ministries and of the local authorities in the southern district of the RF. For the command and control of military units the Joint Staff was continued.[29]

Russian operational level: organisation of airpower

COMMAND AND CONTROL STRUCTURE

All air assets, both MoD and power ministries, were under unified command of Lieutenant-General Valery Gorbenko of the Joint Staff.[30] Just as in the Dagestani conflict, the air component of the Joint Grouping of Forces was made up of fixed-wing aircraft of VVS and rotary wing aircraft, belonging to army aviation ASV. The VVS component comprised air regiments assigned to the 4th Air Army, and some separate units from the Moscow Air and Air Defence District.[31] Roughly half of the ASV helicopters were divided over the different groups of the Joint Grouping of Forces; the remaining half was used as reserve of the Joint Grouping of Forces.[32]

Su-24M FENCER-D fighter bomber

Hip and Hind helicopters and Fencer-D and Frogfoot fighter-bombers have formed the core of the air component

The former bomber base of Mozdok, North-Ossetia, some 90 km northwest of Grozny, was again the primary staging base for the fixed-wing part of the air component, as well as the main airhead for supplies from elsewhere in Russia. Clearly, military operations in this region had been planned in advance. The airbase received an order, which stated that within two months, June and July, the runway had to be prepared for operational use.[33] Other bases used by the air component were Budennovsk, on RF territory, and locations in the republics of Dagestan and Ingushetia.[34]

FORCE BUILD-UP

The aircraft of the air component in the second Chechen conflict were for the most part similar to those used in the Dagestan. Rotary wing aircraft employed by ASV were the Mi-24 Hind combat helicopter, the Mi-8 Hip transport helicopter and the Mi-26 Halo heavy lift helicopter. The latter was extensively used for the forward movement of troops. In September 1999 the contribution of ASV for the operation was 68 helicopters, consisting of 32 Hinds, 28 Hips and 8 Halos. Three years later, in September 2002, the number of helicopters was reduced to 40, 22 Hinds, 17 Hips and 1 Halo.[35]

VVS' fixed-wing aircraft were the Su-25 Frogfoot fighter-bomber, Su-27 and Su-30 Flanker fighters and Su-24M Fencer-D fighter-bomber aircraft. For air recce Su-24 MR Fencer-E and MiG-25RBK Foxbats-D aircraft were utilized. From Mozdok operated at least a squadron each of Fencers and Frogfoots.

Intelligence gathering was conducted by AN-30B Clanks (photo surveillance), A-50 Mainstays (AWACS) and by Il-20 Coots (signal intelligence).[36] So again Hip and Hind helicopters and Fencer-D and Frogfoot fighter-bombers have formed the core of the air component.

Russian tactical level: application of airpower

COUNTER-AIR OPERATIONS

At the outset of the conflict, the Chechens were reported to use two helicopters for flying in supplies. In order to prevent this, VVS carried out Offensive Counter-Air (OCA) missions, by keeping two Flankers and two Frogfoots on constant alert for conducting CAPs. In these missions Mainstay AWACS aircraft provided aerial radar cover. To secure RF airfields and cities against possible air attacks, Defensive Counter-Air (DCA) missions were conducted.[37]

An-30 Clank, similar to those used by the VVS over Chechnya

In the second Chechen conflict more than in the first one, emphasis was placed on effective recce and intelligence collection

ANTI-SURFACE FORCE AIR OPERATIONS
Fencers and Frogfoots took the large share of the amount of strike sorties. Initially, the missions were conducted in support of the ground campaign and were targeted against bridges, major roads and buildings. Another task was to mine mountain roads and areas, in order to cut off supply routes and diminish freedom of movement. Hinds carried out missions of tactical suppression of suspected rebel positions. With the start of the fourth phase, missions were directed against camps and hardened shelters in the mountains and to cut Chechen supply routes from Georgia. Pairs of Frogfoots conducted "free-hunt" missions, to suppress new strongholds in conquered territory.[38]

STRATEGIC AIR OPERATIONS
Although initially VVS authorities suggested that the strategic bomber force (strategicheskaya aviatsiya) might be employed, VVS commander Kornukov later on repeatedly insisted that the necessity to do so was absent. There is no evidence that the Russian strategic bomber force was ever used in the conflict. However, in addition to OAS missions, ASV and VVS conducted offensive missions to destroy strategic targets. Thus the air component carried out missions against strategic targets, such as telecommunications (telephone, radio and TV) installations, command, control and communications networks, as well as against the oil refinery and the airport of Grozny.[39]

SUPPORTING AIR OPERATIONS
Hips were extensively used to transport ground forces (for instance Spetnaz units of MoD and MVD), to interdict communications and supply lines, to react to guerrilla raids, CSAR missions, as well as to transport supplies and ammunition into the mountains. In these missions Hinds or Frogfoots provided cover for the Hips.[40]

In the second Chechen conflict more than in the first one, emphasis was placed on effective recce and intelligence collection. Clanks, Mainstays and Coots were used to gather (electronic) intelligence and Fencer-Es, Frogfoots and Foxbat-Ds conducted air recce missions. However, entering phase four of the conflict, intelligence gathering became complicated, because enemy bases in the mountains, without meaningful signals to intercept, were hard to detect.[41]

TACTICS
As in the Dagestani conflict, ASV operated in groups of two to four Hinds and one or two Hips. These formations were described as aviation tactical groups (ATGs). In a ATG Hips would direct Hinds to their targets. Another task of the Hips in the ATGs was CSAR, in support of downed Hinds. ATGs were assigned to regiments, together with a forward air controller (FAC) in the regimental HQ. FACs were

also posted at lower levels, on battalion and sometimes even at company level. Two-thirds of the CAS missions of ASV were organised in this way. In addition to this tactic, without support of Hips, pairs of Hinds also carried out “free hunt” missions, which comprised the remaining third of the total number of missions. Targets of these missions were similar to those of the aforementioned “free hunt” missions of Frogfoots.[42] Helicopter strikes involved energetic manoeuvring, simultaneous attacks from opposing directions and dives from a formation outside anti-aircraft defence range.

VVS COMMANDER’S APPRECIATION OF TASKS AND LESSONS LEARNED

In July 2000, reviewing the operations in Dagestan and Chechnya, VVS commander Kornukov gave an explanation of the tasks and lessons learned so far.[43] He defined the tasks of the air component as follows:

- Air support for ground forces (Anti-Surface Force Air Operations);
- Security against air attacks (Counter-Air Operations);
- Psychological warfare, by harassing the enemy;
- Air recce of assigned areas (Supporting Air Operations);
- Relay of command and control (Supporting Air Operations);
- Transport of troops and supplies (Supporting Air Operations).

According to Kornukov, the effectiveness of airpower had to be increased by improvements in the field of maintenance of aircraft and equipment, training and number of pilots and troops, upgrading of aircraft with state-of-the-art avionics, procurement of newly developed aircraft, combat readiness of units and airbases, command and control structure of airpower as well as manuals on the application of airpower. However this ‘shopping list’ would not prove to be very realistic in the light of structural cuts in the defence budget.

FAILURES, PROBLEMS AND LOSSES OF AIRPOWER

A number of failures arose in using airpower. Although fewer than in the earlier conflicts, friendly fire now and then still occurred. For instance in March 2000 an OMON (special police unit) detachment was wiped out by friendly fire from VVS.[44] Although improvements had been made since the first Chechen conflict, co-ordination between forces/troops still was not optimal.

Airpower was mostly used as air support for ground troop operations. However, using aircraft as ‘flying artillery’, instead of platforms for precision weapons, caused collateral damage in the form of numerous civilian casualties, which subsequently left a negative impression with the public.[45]

In the fourth phase of the conflict, the lack of sophisticated equipment thwarted effective application of airpower against the mountain hideouts of the Chechens. Dispersed troops were hard-to-find targets and therefore difficult to detect and to destroy. Airpower was not an effective weapon against guerrilla warfare and urban terrorism.

Problems in the areas of finance, arms as well as personnel, owing to constant cuts in the defence budget, had affected the operational capabilities of the forces. The air campaign in Chechnya influenced the combat readiness of the VVS as a whole; in February 2000 it had usurped up to 60% of the annual budget of VVS. Deputy Prime Minister Klebanov stated that VVS had not received any new aircraft since 1992, and

was not likely to receive any the coming year. The Federal forces, and especially its air component, were not capable of operating neither in bad weather conditions nor during the night.[46] Just as in Dagestan and in the first Chechen conflict, the lack or absence of expensive precision guided munitions (PGMs), high-tech communications, navigation and targeting systems, as well as all-weather and day/night capabilities, made airpower less effective than it could have been. According to the commander of the air component of the NCMD, another negative development influencing combat readiness was the fact that Federal forces lacked fuel, spare-parts and maintenance. In official as well as independent newspapers, VVS commander Kornukov openly admitted and discussed a number of these problems. Air component commander Gorbenko also confirmed these problems.[47]

As a result of the low funding levels pilot training and combat experience were insufficient. In 1999 average annual flying hours for attack aviation were around 23 and for bombers around 25 hours, whereas during the Cold War average Soviet flying hours were 150. By Western air force standards the minimum of flying hours for a skilled pilot is 80 hours.[48] The lack of flying hours resulted not only in a higher rate of aircraft losses but also in less effective fulfilment of missions, for instance by dropping bombs too early.

The losses of the air component were as follows. Until March 2000 the air component lost two Frogfoots, one Fencer-E and 18 helicopters. In addition to this 24 aircraft had suffered combat damage. Only half of the helicopters were lost as a result of enemy fire. In June 2000, the number of helicopters lost counted up to 22, including 10 Hinds. In three years, from September 1999-2002, ASV would lose no fewer than 36 helicopters, which was an average of one per month.[49] As aforementioned, this large number of rotary wing losses was only partly caused by enemy fire; other causes could be found in insufficient pilot training and lack of maintenance, due to the reduced funding of the MoD.

SUCCESSES OF AIRPOWER

Airpower (CAS) took care of a large share of the bombardments prior to employing ground forces. VVS and ASV conducted 70-80% of the fire missions, as opposed to 15-17% by artillery.[50] Between October 1999 and February 2000 airpower was used for than more than 4,000 combat sorties, of which the majority were strike sorties. The air strikes caused the destruction of a huge amount of armoured vehicles, ant-aircraft guns, armament-production facilities, weapon storage bunkers, oil refinery factories, fuel warehouses, as well as radar and relay stations.[51] Conclusively, airpower, above all by providing air support to the operations of ground forces, formed a vital contribution to the successful Russian campaign during the first three phases of the conflict.

Chechen strategy and operations

To reach a good understanding of the political-strategic level (grand strategy), the Chechen resistance needs some background explanatory. Russian authorities have always portrayed all Chechen fighters as “bandits and terrorists”. However a distinction can be made between three different groups of Chechen armed resistance.[52] First, the official Chechen Government, represented by President Aslan Maskhadov, a former Soviet army Colonel.[53] The Government is mainly made up of moderate, pro-Western people. The objective of the Chechen Government was to maintain an independent Chechnya. Second, small locally orientated armed groups, whose main interest was the revenge of killed relatives. They can best be described as uncoordinated “soldiers-of-fortune”. They missed any specific political or military objective. The third group is the militarised and well-structured extremist-Islamic organisation of the so-called Wahhabists. The Chechen commanders in charge of the incursions into Dagestan, Basayev and Khattab, belonged to this group. Their objective was not only to throw the Russians out of Chechnya, but also to install Islamic rule in Chechnya and in Muslim areas on RF territory.

At the operational and tactical level the personnel strength of the Chechen resistance was estimated at 20,000 men, of which between 3,000-6,000 fighters defended Grozny.[54] When the overthrow of Grozny came near 2,000 Chechen fighters pulled out of their capital into the southern mountains, where around 8,000 fighters were believed to be based.[55]

From the outset of the Russian ground campaign, Chechen fighters offered little resistance, apart from defending prepared strongholds, realising that they were no match for the large and heavily armoured Russian forces. However, in December 1999 Chechen militants started counter attacks, employing guerrilla tactics. From areas where they could not cope with the strength of the Russians, Chechen fighters withdrew, with the intention of attacking the enemy in and from the southern mountains. The Chechen militants exploited the deteriorating weather conditions to step up attacks on Federal troops and made well use of the mountainous terrain. After the recapture of Grozny in February 2000, the Chechens have continued their guerrilla warfare not only in the southern mountains, but throughout all of Chechnya and even in the neighbouring RF republics of Dagestan and Ingushetia. The guerrilla tactics employed by the Chechens were hit-and-run attacks, mining, ambushes, assassination of individual soldiers, urban terrorism in the occupied villages and cities, as well as sniper and (suicide) bomb attacks.

Next to countering the RF ground forces, the following can be said about Chechen (anti-) air force warfare. In the beginning of the conflict, the Chechen air component reportedly possessed two transport helicopters and one utility aircraft, an An-2 Colt, which was supposedly used for transport of arms and ammunition. At the end of September 1999, during the attack of the airport of Grozny, the aircraft was destroyed.[56] Since the start of the conflict no further mention has been made of the two helicopters. So again, the Russians had air supremacy in this conflict. The air defence capability of the Chechens was similar to the one used in Dagestan. An organised air-defence system with radar and missiles was absent. Man-portable SAMs, heavy machine-guns and ZSU 23/2 twin barrel anti-aircraft guns on trucks were the arms available for air defence.[57]

The Chechens were successful in disturbing the interface between Russian air and ground operations, by waging information/ electronical warfare against the Russian FAC system. Chechens, as former RF conscripts, used their experience, by monitoring FAC radio transitions and impersonating Russian FACs, to misdirect CAS missions, conducted by ATGs and other formations of the Russian air component. Furthermore, FACs were prime targets of Chechen snipers.[58]

Assessment

RUSSIAN STRATEGY AND WARFARE

At the political-strategic level emphasis was on influencing public opinion, which might also be described as information or psychological warfare. Two objectives lay at the foundation of employing information warfare in this conflict. The first objective was to convince the Russian nation of the inevitability of waging war against Chechnya. The second objective was to sustain public support during the conflict.

The bomb attacks of August/September 1999, as well as the Chechen raids into Dagestan and finally the traditional dislike of Chechens, created a solid foundation in Russian society in favour of conducting a war against Chechnya for a second time. Putin's leading role in the campaign guaranteed popular support for his election as President, in March 2000.

To meet the second objective, tight control of the media was meant to ensure an impression of a smooth operation in Chechnya, and thus sustain support in society. The destruction of Chechen

Although the Russian political-military leadership achieved a military victory over Chechnya, they did not win the war politically

mass-media facilities (radio and TV) was also part of the information warfare, to prevent broadcasting of other information than desired. The Russians tried to copy NATO's media campaign in the Kosovo conflict. For instance, VVS commander Kornukov showed pictures and videos to prove that targets were hit, without causing any civilian casualties.[59] However, public support decreased as casualties mounted. The authorities were blamed for understating casualty figures and for making the same operational-tactical mistakes as in the first conflict. In addition to this, foreign non-governmental organisations and media reported on human rights abuses and disproportionate and indiscriminate use of force. So in spite of all efforts to control the media, eventually Russian authorities were unable to maintain a strict control on information.

Although the Russian political-military leadership achieved a military victory over Chechnya, they did not win the war politically. The Russians have failed in combining military objectives with realistic political objectives. Occupation and oppression will encourage the Chechens to continue a protracted insurgency war against the Russians. As long as the Kremlin does not recognise that this conflict can only end by a political solution, the war will continue.

At the military-strategic level, the change in command, from the military to the FSB, was a remarkable move. For two reasons this seems to have been a wrong decision. At first, it was an error with regard to the difference in capabilities between the armed forces (MoD) and the troops of the power ministries. The Russians should have learned from the first Chechen conflict and the recent Dagestani conflict that a sound command and control structure was of vital importance for a military campaign. In the aforementioned conflicts command by the MVD had failed, mostly because of poor co-operation with MoD forces, especially with regard to calling in artillery and air support. This time another power ministry, the FSB, was ordered to take over command from the military. The choice for the FSB might have to do with Putin's background in the security services (career in foreign intelligence and former Director FSB). However, with the example of failed command of the MVD, it was not unlikely that the FSB would face similar problems, having no experience of conducting above all military operations. Secondly, changing the command to the FSB, was a mistake regarding command and control. As a consequence of the FSB taking over command of the operation, new staffs were installed. This was another remarkable decision, which went against earlier experiences. The first Chechen conflict had shown that a divided chain of command had disastrous results. Now, once again staffs were created in addition to the unified (military) Joint Staff. It was not unlikely that the two staffs, led by the FSB, would compete with respectively the General Staff in Moscow and the Joint Staff in Chechnya. In this case, clearly a lesson was not learned.

Gradually, co-ordination between MoD forces and troops of the power ministries has improved, especially by creating a Joint Staff, consisting of all forces and troops involved, and by installing FACs as interface between ground and air operations. According to air component commander Gorbenko, after the installation of a unified command no further problems had arisen between MoD and MVD. Blue-on-blue incidents still occurred, but fewer than in the previous conflicts in Dagestan and Chechnya. Co-ordination and co-operation depended to a large extent on the desire to do so. On several occasions criticism, especially from VVS commander Kornukov on ASV, Ground Forces and MVD, revealed that a true desire for co-operation, shared by all commanders involved, had not reached yet.[60] The 35th loss of a helicopter, a Halo, which was destroyed approaching Khankala airbase on 19 August 2002, would cause a watershed in airpower command and control. A week later MoD sources announced that ASV was to be resubordinated from Ground Forces to VVS, by the end of 2002.[61] The reason for this decision was probably the 'misuse' of helicopters by ground forces commanders. For instance by overloading them, as was the case with the Halo, shot down in August 2002. This decision

Apparently the Russians had discovered that weapons are not the only way to wage a war

would mean a strengthening of VVS in command and control of MoD airpower, as well as a decline in military power of the Ground Forces. The conclusion can be drawn that this alleged resubordination of ASV, which would encourage unified command of airpower, is an important lesson learned from the second Chechen conflict.

In contrast to the command and control problems, Russian psychological warfare was quite successful. They used “hearts-and-minds” tactics, by persuading residents to force the rebels out of their villages and thus saving them from destruction. And before Grozny was invaded VVS aircraft dropped leaflets urging residents to leave, warning them that people staying behind would be destroyed as “bandits” and setting an ultimatum of five days.[62] Apparently the Russians had discovered that weapons are not the only way to wage a war.

Reviewing the operational-tactical level it was atypical that the Russians started the invasion in fall. This meant that Russian military leadership had to face deteriorating weather conditions. Heavy snow hampered the ground campaign, which gave rise to Chechens to increase their counter-attacks. Although politically opportune, commencing a military operation in the Caucasus in fall was a risky endeavour from a military point of view.

At first the Russian invasion gave the impression of being a smooth operation. The concepts of conducting heavy artillery and air barrages before sending in ground troops, as well as the “go-slow” tactic were successful and preserved the Russian troops from the heavy casualties they suffered in the first Chechen conflict. Nonetheless, after recapturing the larger part of Chechnya, the Federal forces, in controlling the area, had to cope with guerrilla tactics. Unfortunately, since the first Chechen conflict the Russians still had not developed a doctrine for a protracted insurgency conflict. As a result of this they still employed regular warfare tactics against the irregular tactics of the Chechens. Long-range air and artillery firepower, as used in the “go-slow” approach, were no answer to guerrilla tactics. This asymmetric warfare made the conflict undecided. It seemed impossible for the Russians to achieve a final victory over the Chechens.

A clear lesson learned from the first Chechen conflict was improving the command over air support and subsequently, improving the co-ordination between VVS, ASV and MVD. In the Joint Staff all air assets (of MoD and power ministries) were now under unified command. FACs were assigned to regimental levels and even further down to company level. In this way the tactical commander on the ground had direct access to air support, which meant more effective airpower. Yet, the effectiveness of airpower could have been much higher if structural cuts in the defence budget would not have affected combat readiness of materiel as well as of personnel.

CHECHEN STRATEGY AND WARFARE

At the operational level the Chechen fighters followed an effective approach. Realising that they could not prevent the overwhelming superiority in numbers as well as in materiel of the Russian forces, they offered little resistance in the beginning of the Russian invasion. Chechen fighters withdrew with the intention of attacking the enemy, at first only in and from the southern mountains. The Chechen militants exploited the deteriorating weather conditions to step up attacks on Federal troops and made well use of the mountainous terrain. Since the recapture of Grozny in February 2000, the Chechens have continued their guerrilla warfare, not only from the southern mountains, but throughout all of Chechnya and even into RF territory. Although the Chechen fighters were unable to defeat the strong Russian forces, by employing irregular warfare they have been capable of damaging Russian control over Chechnya. Eventually this protracted insurgency conflict might result in the loss of public support and

force the Russians to leave, as was the case in the first Chechen conflict. At the political-strategic level this would mean a Chechen victory, not only by military force but also by way of patient psychological warfare.

At the tactical level the Chechens, in addition to employing guerrilla tactics, also waged a successful war against the Russian air component. They did well in disturbing the Russian FAC system, as well as in shooting down aircraft and helicopters.

ASSESSMENT: COMPARISON OF THE USE OF AIRPOWER IN BOTH CHECHEN CONFLICTS (1994 — 1996 AND 1999 —)

The purpose of this article was to describe Russian airpower in the second (present) Chechen conflict, therefore I did not elaborate on the first conflict. The airpower aspects of the first Chechen conflict were well documented by others.[63] However, it is worthwhile to make an assessment of the use of airpower based upon a comparison of both conflicts. In doing so, I will first explain structural problems and secondly, I will go into detail on improvements or lessons learned.

Structural problems

First, annual cuts in the defence budget resulted in limitations of materiel (aircraft) and personnel of airpower in the conflict. The consequences were a low level of combat readiness, limited use of airpower during night and bad weather conditions, as well as many losses of aircraft for other reasons than enemy fire.

Secondly, co-ordination and co-operation among MoD forces and between defence forces and troops of the power ministries were improved but were still far from optimal. For instance, friendly fire also occurred in the second conflict.

Thirdly, in both conflicts civilian casualties and collateral damage due to airpower, left a negative impression with the public. However, civilian casualties were not only caused by low currency of pilots and lack of PGMs. The fact that Chechen fighters would often hide in and use air-defence from urban areas also caused innocent victims, for which the Russians were wrongly blamed.

And finally, airpower was effective as long as ground forces were advancing. Airpower was not an answer to a protracted guerrilla war.

Improvements

First of all, the establishment of a unified air component of VVS, ASV and MVD air assets in the second Chechen conflict improved co-ordination and co-operation and thus the effectiveness of airpower.

Secondly, air support for ground forces operations turned out to be more successful in the present conflict. I would perceive the following grounds for this improvement. By conducting air barrages prior to the advancement of troops, airpower created favourable conditions for ground forces and diminished the possibility of friendly fire. FACs proved to be more effective than in the first conflict. It seemed that more FACs were available this time. Because of their greater number, FACs could be deployed in more units

and at lower tactical levels, sometimes even at company level. And finally, FACs were apparently better trained and perhaps better equipped with more sophisticated communications instruments. Another ground for improved air support for ground forces operations was the formation of Aviation Tactical Groups (ATGs). By combining target-designation and attack helicopters, they proved to be highly effective tactical formations.

A third improvement in the use of airpower, related to the previous remark, was the comeback of rotary wing aircraft as part of the combat force of airpower. In the first Chechen conflict helicopters were mainly used for supporting tasks and were excluded from urban areas for fear of enemy air-defence. It was then thought that for combat tasks fixed wing aircraft, such as the Frogfoot, would replace rotary wing. However, in the second Chechen conflict, most likely due to the introduction of the successful ATG concept, helicopters were “back-in-business” for combat missions, which broadened the scope of airpower. Fourthly and finally, the intention of resubordinating ASV from Ground Forces to VVS will enforce central guidance of airpower, which in turn reinforces its effectiveness.

In conclusion, it is evident that the most important structural problem for Russian airpower was funding. Irregular warfare in Chechnya showed that lack or absence of expensive PGMs, high-tech communications, navigation and targeting systems, as well as all-weather and day/night capabilities, limited the effectiveness of airpower. But in spite of the financial problems, Russian airpower demonstrated that it was capable of enhancing its effectiveness without additional financial support, especially by innovations in command & control and by tactical improvements.

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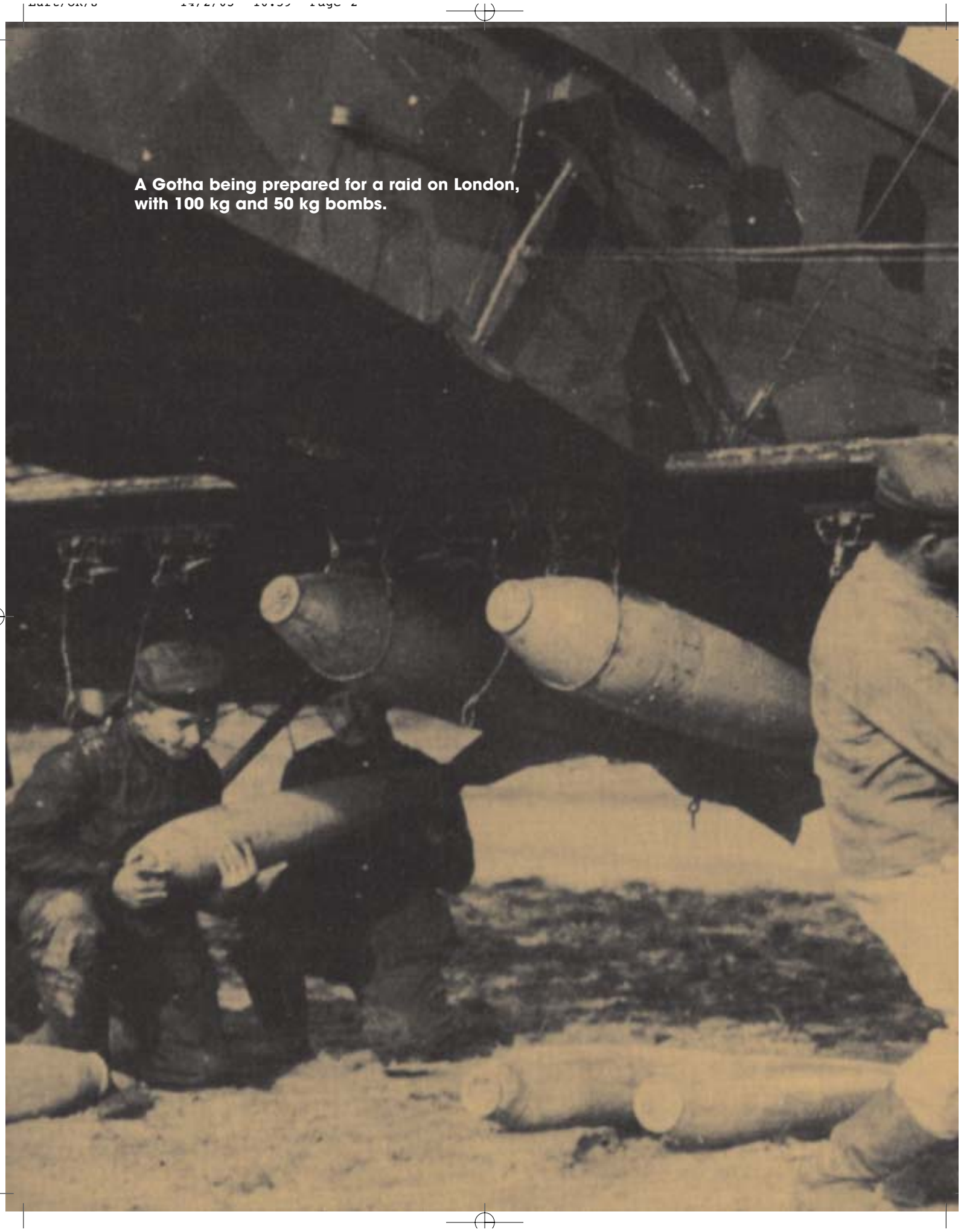


A Gotha being prepared for a raid on London, with 100 kg and 50 kg bombs.

Starting from Scratch

The Luftstreitkräte Builds a Bomber Doctrine 1914 - 1918

By Professor James S Corum, USAF
School of Advanced Airpower Studies

When World War One began, everyone thought that it would be over after a few months and a few big battles. The role that aviation would play in such a war had been considered in some detail by the two major air powers of the pre World War I era, Germany and France. Both nations had airships and balloons a decade before the war but the airplane force of France and Germany and the other European powers had been created between 1909 and 1914. Airplane and airship development had been impressively rapid and numerous experiments had been made to mount machine guns on airplanes and drop bombs from airplanes and airships in order to turn the new technology into a true fighting weapon. At the same time, the primary use of the airplane and airship was to conduct tactical and long-range reconnaissance and the airplanes had been proven especially successful at this in four years of manoeuvres and experiments.

The reconnaissance mission of the airplane was certainly important for obtaining the operational edge over the enemy in the expected grand campaigns and almost all of the aircraft of the German Army were specifically assigned to support armies and army groups. The priority for good information for the ground armies in turn pushed the development of suitable aircraft for the mission. The reconnaissance aircraft (almost all planes) favoured by Germany in 1914 was a sturdy, fairly fast (100mph), manoeuvrable two-seat biplane with a moderate range. Such aircraft could take off from rough landing fields near the army headquarters, fly up to 40 miles behind the enemy lines, observe enemy troop deployment and movement and return to army headquarters with the information. Such light aircraft could be fitted with a few light bombs dropped by the observer, but had little capability to contribute directly to combat operations in 1914.

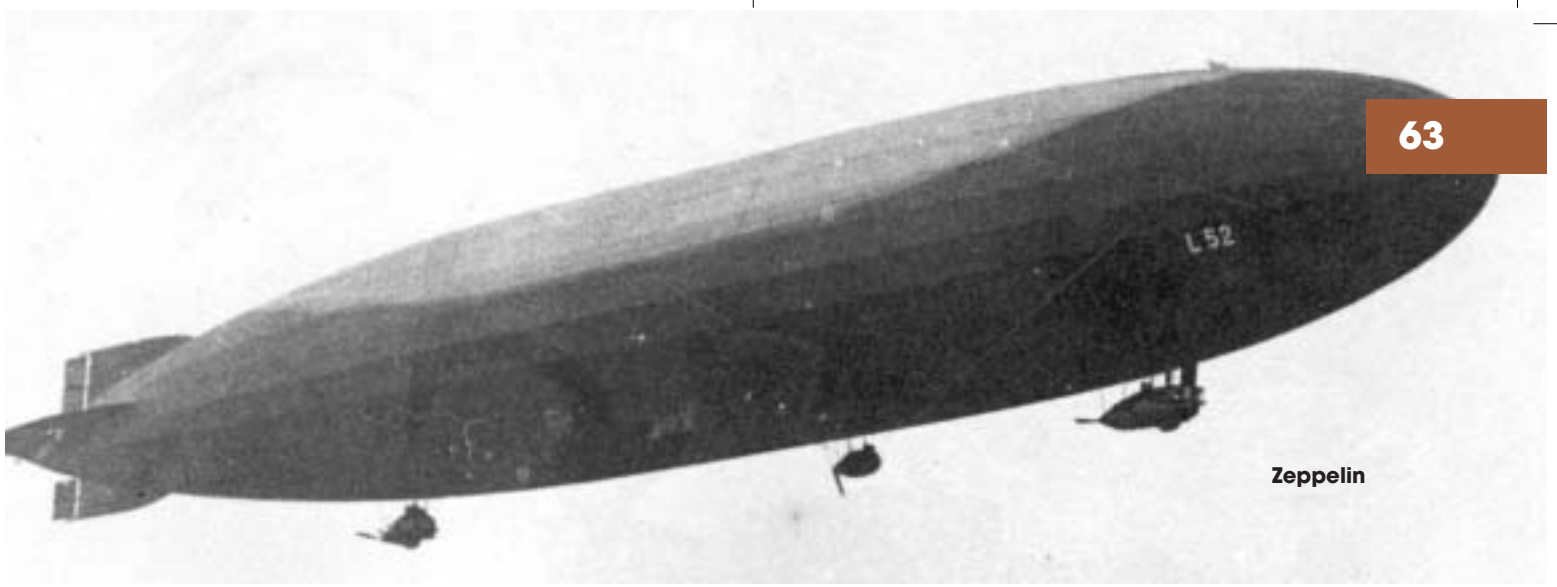
Yet, in the Fall of 1914 little happened as anticipated. On the Western Front the great powers became locked in a bloody stalemate. On the Eastern Front the Germans had delivered a sharp blow to the Russians at Tannenberg but the Russians still had a huge army and was still a grave threat to Germany. In short, Germany had to look at the prospects of a long war. German airmen began to think in earnest about developing a bomber force that could drop heavy bombs deep behind the enemy lines upon vital targets that would disrupt the enemy war production, demoralise his population and damage the logistics upon which the field armies relied.

Within two and a half years Germany built up a heavy strategic bomber force capable of striking a serious blow against the British homeland. Moreover, Germany had built up a bomber force on every front capable of attacking a variety of operational targets. It was a remarkable technological accomplishment. However, even the most impressive weapons need some kind of explicit concept of employment in order to be used with real effectiveness. During the first two years of the war the German Army developed a fairly sophisticated doctrine for employing its heavy bomber force. During the 1917–1918 campaign against British and French cities, the Luftstreitkräfte (Imperial Air Service) learned a good many technological and tactical lessons and continued to refine its doctrine during the last two years of the war. By the end of the war, the Imperial Air Service had matured into a genuine modern air force with a comprehensive view of all aspects of aerial warfare to include anti-aircraft defence, reconnaissance, close air support of ground troops and strategic bombing.

PRE-WORLD WAR ONE DOCTRINE

Although aviation was a new arm in the German army it had already attracted a disproportionate number of the best and brightest officers into its ranks. In 1911, right after the army's first fatal flight accident, more than 900 army officers applied for flight training.[1] Several very talented General Staff officers were posted to the Aviation Branch between 1910–1914 to include Majors Hermann von der Lieth-Thomsen, Wilhelm Siegert, and Lieutenants Wilhelm Haehnelt, Helmuth Wilberg and Hugo Sperrle. By the outbreak of the war two to three dozen of the army's general staff corps had joined the aviation force out of a total General Staff corps of only 622 officers.[2]

From the early days of aviation the German General Staff showed a great deal of interest in the possibilities of using the aircraft as a bomber and fighting machine. From the establishment of a small air arm in 1910, the General Staff lobbied the Prussian War Ministry (which controlled the funds and procurement) for funding for military aviation. The Chief of the General Staff, General von Moltke, showed great interest in experiments with dropping bombs and mounting machine guns on airplanes. In a letter to the Army Transportation Inspectorate in September 1912 Moltke wrote, 'I am placing great emphasis upon determining what is the largest weight that can be safely dropped from different aircraft models.'[3] From 1912 to 1914 several tests were done with bombing and mounting guns on aircraft and



Zeppelin

A means had to be found to attack the British economy and political will – and the means available were the Zeppelin and the submarine

the general staff closely followed the results as they fought to rapidly increase the size of the aviation arm of the army.

GENESIS OF STRATEGIC BOMBING

Once the war had settled into a stalemate in the Autumn of 1914 the General Staff had to develop a long-term plan for prosecuting the war. The General Staff understood that Great Britain was the economic and political centre of gravity for the Allied powers. While Britain's ground force contribution, at this point in the war, was fairly small, Britain's enormous industrial power and financial might was the key to keeping the Allies in the war. Without Britain's money and industry, France and Russia could not expect to win against German power in the long term. Moreover, Britain's navy gave her the ability to attack Germany's weaker allies such as the Ottoman Empire. Yet Britain was virtually invulnerable from direct attack. A means had to be found to attack the British economy and political will – and the means available were the Zeppelin and the submarine.

In late 1914 Wilhelm Siegert, a general staff officer who had served in the Aviation Inspectorate and commanded an aviation battalion, won the approval from the High Command to create a special bomber force that would operate not as part of a field army's aviation force, but would serve under the direct command of the High Command. The unit, given the cover name of 'Carrier Pigeon Detachment – Ostend' (Brieftauben Abteilungen Ostende), was to be an elite force based in recently occupied Flanders with the eventual mission of attacking Britain by means of aerial bombardment. Siegert quickly recruited a corps of experienced pilots who were initially equipped with a variety of single engine reconnaissance planes capable of dropping small bombs. At sea, the navy would unleash its small submarine force to blockade British ports and strangle the economy. Hopefully Britain, which had much less at stake in the war than France or Russia, could be prevailed upon to abandon the Allied cause when placed under attack by sea and by air.

The German Army had no great love for the Zeppelin. However, in 1914–1915 it was the only aircraft available that could conceivably be used to attack Britain. In April 1911 General von Moltke had argued that the Prussian War Ministry should cut funding for Zeppelins in order to buy more airplanes. Army

manoeuvres had found that Zeppelin airships were highly vulnerable to ground fire due to their slow speed and lack of manoeuvrability.[4] Moreover, airships were very expensive, took a long time to build and needed massive hangars and special facilities to operate. On the other hand, airplanes were comparatively cheap and easy to build and repair and could be operated off of any flat field. Airplanes were less vulnerable to ground fire because they were smaller, faster and more manoeuvrable than airships. Airships were highly vulnerable to weather, any wind over 25 knots making them virtually unmanageable. Airplanes could be easily operated in moderate to heavy winds. Indeed, the only advantage that the airships had was their long range and their ability to carry a heavy bombload – often more than a ton of bombs. In short, airships, for all their drawbacks, were the only craft that could cross the Channel with a bombload. The navy, for their part, held a different view on Zeppelins. The navy appreciated the Zeppelins for their long range and endurance, which made them excellent craft for fleet scouting.

The Army's misgivings about the Zeppelin were confirmed by the disastrous performance of the Zeppelins in the first months of the war. At the start of the war the Army had four Zeppelins available in the West and three in the East. The Z-6 made a bombing raid on Lüttich on 6 August and dropped 200 kg of bombs. It was hit by ground fire and crash-landed and dismantled. The Z7 and Z8 bombed French troops in Alsace and were promptly hit by ground fire and disabled. The Z9 made successful bombing attacks on Antwerp, Ostend, Zeebrugge, Dunkirk, Calais and Lille dropping several thousand kgs of bombs. However, it was lost to a British raid on its shed in Duesseldorf on 8 October.[5] The British recognized the latent threat of Zeppelin raids on Britain and began an aggressive program of attacking any Zeppelin shed within range of its planes (carrying a few 20 lb bombs) in October–December 1914.[6]

The German navy was the first to push for Zeppelin raids against Britain. In a naval Staff memorandum of late 1914 the navy argued that raids on London would 'diminish the enemy's determination to prosecute the war'.[7] The Kaiser objected to the idea of bombing his cousins in Britain and concerned about the effect of world opinion in bombing undefended cities. However, the Navy and Army soon overrode the Kaiser's objections. Ironically, although he was virtually an absolute ruler as Emperor and 'Warlord', he turned the whole direction of strategy and the war effort over to the armed forces at the start of the war and served throughout the war as a presiding over innumerable parades and reviews. By late 1914 Germany the military was in charge of Germany and the Kaiser not much more than a figurehead who approved the policies (and chancellors and politicians) that the generals and admirals put before him.

THE ZEPPELIN RAIDS ON LONDON

In early 1915 the High Command had settled on the idea of bombing England. The army disliked the Zeppelins, but they were the only weapons available that could do the job. The navy, on the other hand, was positively enthusiastic about the Zeppelins. By December 1914 the navy had 3,740 men at 9 bases of the airship branch. While the navy awaited new, much larger Zeppelins they trained the force and tested a variety of bombs.[8] In the meantime, Siegert's 'Carrier pigeon Detachment' carried out its first bombing raid in January 1915 when a squadron of 2-seat bombers led by Siegert dropped 123 bombs on the port of Dunkirk.[9] By this time, the High Command was so taken with the idea of a strategic bombing force they directed the formation of another bomber wing to be under its direction at Metz.

The first bombing raids on England with army and navy Zeppelins were against the East Coast in January 1915. By Spring the military had overcome the Kaiser's objections to bombing London and on 31 May the Zeppelins attacked Britain's imperial capital for the first time. The first raids caused a

sensation and a serious panic in the city of London. More raids were made in the Summer of 1915 but by Fall the Zeppelin force found that they had to switch to night attacks and fly at much higher altitude in the face of increased British antiaircraft and fighter defences. Zeppelin losses were heavy and by October the army had lost hope in the campaign, although the navy would continue with a few attacks in the spring of 1916. The whole airship campaign of 1915–1916 had dropped a grand total of 155 tons of bombs and killed 500 and wounded 1,200 Britons. Given the loss of airships and crews, it was not considered to be an effective campaign.[10]

Although the Zeppelin raids were considered unsuccessful, the Germans developed several useful technologies to support the bombing campaign. Long distance aerial navigation was new to every air service and the Zeppelins, flying long distances from Germany and sometimes in the air for more than 12 hours, needed to be able to pinpoint their location and the target. The Germans found that they could 'fix' the location of their airships by sending radio transmissions and have receiving stations with known locations transmit the signal direction back to the airship. With two or more receiving stations providing signal directions to the airship, the Zeppelins were able to triangulate the headings and get accurate location. It was the first use of radio direction finding in aviation history.[11]

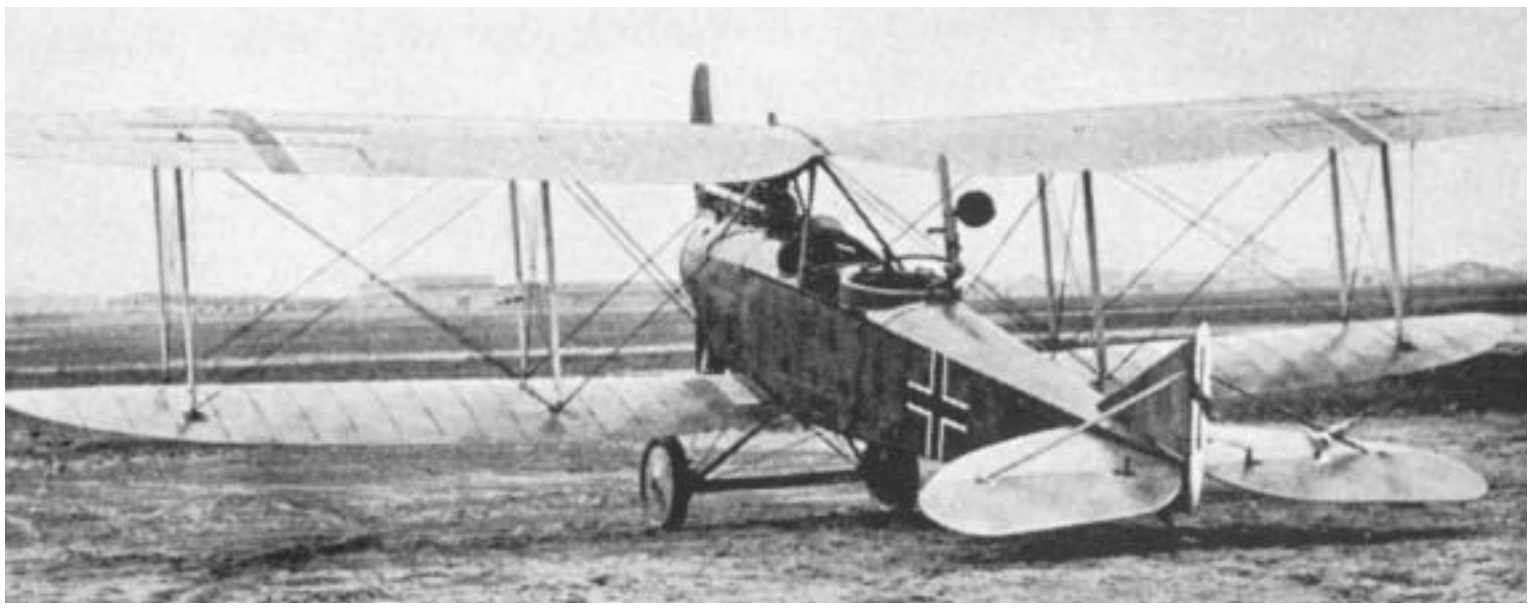
The Germans developed the most effective systems for night landings of all the powers. Sunken lamps acting as beacons were set into the middle of German landing fields

German AEG night bomber

TECHNOLOGY AND LONG RANGE BOMBING

The Germans recognised that Allied air defences would make the heavy bombers highly vulnerable to fighters and flak in daylight raids and that night-time raids would likely be necessary over the heavily defended Western Front in order to avoid the Allied air defences. This led to a whole new range of problems that required new technologies and weapons. As with navigation by means of radio signals, during the course of the war the Germans usually took the lead in developing new technologies for the bombers. One of the most difficult problems was night navigation by the heavy bombers. Germany had built the first aerial 'lighthouse' for night aerial navigation in 1913. As the war progressed, a lighthouse system was established in which the lighthouses would emit a unique signal of lights, usually in a Morse code sequence, which could be regularly changed for security reasons. In addition to lighthouses, various lights in the shape of crosses, triangles etc. were set up behind the front to help steer the bombers to their objectives. In good visibility such signals could be seen for 40 miles. Another ingenious night navigation method was the firing of parachute shells of different colours at altitudes of 6,000 feet. Such shells could be sequence or colour-coded and were visible from 50–100 km. No such system was available to the Allied air forces.[12]

One of the most difficult problems in night flying in World War I was landing at night. The Germans developed the most effective systems for night landings of all the powers. Sunken lamps acting as beacons were set into the middle of German landing fields. A series of red lamps radiating out from the central beacon gave the wind direction so that the pilot could land into the wind. Electric lamps were also used to illuminate the airfields.[13] None of the Allied powers had as sophisticated a system for providing wind direction.



With the Rumpler reconnaissance plane, the Germans could obtain good aerial photos of targets deep within France as the Allied fighter pilots flew at their maximum ceiling 3,000 feet below them

The first true bomber in production was the AEG K I, a two-engine biplane powered by 100 hp Mercedes engines

Numerous other problems had to be solved by the Germans to enable a long-range bomber campaign. The higher altitude of the later Zeppelin models of 1915 meant providing oxygen to the crews. The Germans quickly developed a system of oxygen bottles and a simple respirator to be used by airship, bomber and high altitude reconnaissance crews. The Germans also developed electrically-heated flight suits for extended operations in the extreme cold of the high altitudes. Then, as now, one of the most important requirements for a bomber force was accurate intelligence. The standard German two-seat reconnaissance planes were at great risk flying even a short distance over the front lines to take aerial photos. However, bombing targets deep behind the enemy lines would require long distance photo-reconnaissance missions in skies filled with enemy anti-aircraft and fighters. The German solution was to simply fly over the enemy opposition. In 1917 the Rumpler Company fielded a two-seat reconnaissance planes especially designed for high altitude. With a large wingspan for lift and a specially designed high compression in-line engine, the Rumpler C 7 could take its pilot and observer, both equipped with oxygen, up to 20,000 feet to photograph enemy targets with their excellent Zeiss cameras. No Allied fighter had the ceiling of the Rumpler and antiaircraft guns of the era could not shoot that high.[14] With the Rumpler reconnaissance plane, the Germans could obtain good aerial photos of targets deep within France as the Allied fighter pilots flew at their maximum ceiling 3,000 feet below them.

BUILDING THE BOMBER FORCE

Any discussion of strategic bombing was a mostly theoretical exercise until the technology appeared that could realise the dream. The concept of strategic bombing only became a reality because of the efforts of a few far-sighted German industrialists. In August 1914, Count Ferdinand Zeppelin, the famous airship builder, and aircraft designer Claudius Dornier began work on developing a large, multiengine aircraft that could be used as a bomber. At the same time, the aircraft division of Siemens corporation began development of a large aircraft. AEG, another major aircraft firm, was already working in a large ‘battleplane’ at the start of the war.[15]

The initiative to build large aircraft came from the aviation industry while the army, caught up in mobilising for war and the urgent need to build up the army’s field reconnaissance units, expressed little interest at first in large aircraft development. However, in 1915 when the technological breakthroughs came, the Army Air Service quickly woke up to the possibilities. The Zeppelin-Dornier large aircraft prototype first flew in August 1915. The initial tests were successful and the army, now aware that long-range bombing was technically feasible, began ordering heavy bombers.[16] The first true bomber in production was the AEG K I, a two-engine biplane powered by 100 hp Mercedes engines. The next version, the AEG G II, soon followed and was powered by two 150-hp engines and able to carry a 200kg bomb load a considerable distance.[17]

The Gotha G IV bomber, which arrived to equip the 3rd Bomber Wing (Englandgeschwader) in early 1917 and became a standard bomber on the Western Front, was powered by two 260 hp engines and could carry a 1,100 lb bomb load

As soon as the AEG bombers rolled out of the factory they were deployed to the two bomber wings being organised on the Western Front. From 1915, when the first multi-engine bombers were employed, until the end of the war the size of the bombers, the engines, the range and their bomb-carrying capacity grew rapidly. By 1917 the Friedrichshafen G III (designed by Zeppelin and Dornier) could carry 3,000 lbs. of bombs and had a 5-hour endurance. The Gotha G IV bombers, which arrived to equip the 3rd Bomber Wing (Englandgeschwader) in early 1917 and became a standard bomber on the Western Front, was powered by two 260 hp engines and could carry a 1,100 lb. bomb load.[18]

In April 1915 German army aviation was reorganised. The post of 'Chief of Field Aviation' was created and the experienced airmen Col. Hermann von der Lieth-Thomsen appointed with Wilhelm Siegert as his deputy. The Aviation Inspectorate of the army and control of German aircraft production and development was placed in the hands of Thomsen and Siegert.

As chief of field aviation, Lieth-Thomsen was a strong advocate for bomber development and production. In a memo of August 1916 he argued that the aviation industry needed to speed the development of large 4-engine heavy bombers. He made plans to increase the bomber force of the Luftstreitkräfte to 108 bombers by the Spring of 1917.[19] 1916 became the testing year for the Air Service's new bombers. Small bomber units were deployed to various fronts and tried out in combat. By April 1916 5 bomber wings had been organised, along with two flights (Detachments Rfa 500 and 501) of the huge 4-engine 'Riesen' (Giant) bombers, which were send to the Eastern Front for combat testing in a fairly safe environment.[20]

There was a strong demand for heavy bombers throughout the army. On the Eastern Front and in the Balkans, the bombers were found especially useful for interdiction missions. The more primitive

transportation net in Eastern and Southern Europe offered the Germans the possibility of easily blocking enemy transport. Russia and Romania had far fewer roads and rail lines than the Western Allies and, consequently, each railyard and depot was far more important for the enemy armies. Damage or disruption to the more fragile logistics system of the Russians or the Balkan nations fighting with the Allies would have a pronounced effect, especially as the Russians were already strained past the breaking point in supporting and supplying her army in the field.

The Luftstreitkräfte was again reorganised in late 1916 and given a higher status within the German Army with its own general staff and a very capable senior officer, Lt. Gen. Hoeppner

The Luftstreitkräfte was again reorganised in late 1916 and given a higher status within the German Army with its own general staff and a very capable senior officer, Lt. Gen. Hoeppner, as director of all army aviation and full control of the German aircraft industry. The Luftstreitkräfte tried to increase the bomber force as quickly as possible but was limited by production problems in the aircraft industry as well as a serious shortage of trained pilots and officers for the bomber units. Bombers were far more complicated to fly, navigate, maintain and support than a fighter or observation unit and needed more specialist ground crews. By this point in the war, the shortage of trained personnel became as much of a limitation of the bomber force as aircraft.[21] However, by early 1917 the Air Service had built up a force of over 100 heavy bombers ready to be used on the Western Front.

REVISED BOMBER DOCTRINE 1917

By the Spring of 1917 the Luftstreitkräfte organisation and doctrine had reached a high degree of maturity. By early 1917 most of the Luftstreitkräfte consisted of fighter and bomber units, as contrasted with the mostly reconnaissance and observation force of 1915 – 16. The summer of 1917 witnessed some major organisational changes. Squadrons and flights were combined into larger wing organisations, a step that represented the much larger scale of

aerial warfare. In June 1917 four of the top fighter squadrons were assembled to form Jagdgeschwader1 under the command of Captain Manfred von Richthofen. This force could fly and fight as a single force of 70 aircraft.

By the Spring of 1917 one can speak of true operational-level air campaigns The aviation commander of a German field army might have several hundred aircraft under his command. For example, to oppose the British offensive in Flanders in the Summer and Fall of 1917 the Germans massed over 700 aircraft of all types along with a large flak force in support of the German 4th Army and under command of its aviation commander, Captain Helmuth Wilberg.

To provide some operational doctrine for this new level of complexity in aerial warfare the Luftstreitkräfte commander, General von Hoeppner, issued a manual of considerable length and detail in May 1917. 'Directives on the Mission and Utilization of Flying Units Within an Army'. (Kommandierende General der Luftstreitkräfte. *Weisungen für die Einsatz und die Verwendung von Fliegerverbänden innerhalb einer Armee*) The Directives outlined doctrine for all of the major missions of the Luftstreitkräfte units and the bombers were covered at some length.

The squadrons of heavy bombers (usually two or more engine aircraft) were referred to as the 'High Command's Bomber Squadrons', reflecting the fact that heavy bombers were carefully allocated under the direction of the High Command. The Luftstreitkräfte envisioned the heavy bombers as essentially multipurpose weapons. 'The High Command's bomber squadrons are primarily equipped ... against targets of every type. Their heavy armament enables them to carry out strafing attacks upon ground targets as well. They are capable of reconnaissance flights in addition to their other missions'.[22] Concerning the heaviest bombers, the *Riesenflugzeuge*, the *Directives* noted 'By virtue of their large

Bombing attacks require careful preparation by aerial photography, careful disposition and heavy, repeated attacks against the same target, with little time in between

Captain Ernst Brandenburg

carrying capacity and their powerful armament, heavy bomber aircraft are most suitable for attacks against targets capable of resistance and located deep in enemy territory. Their employment depends upon the amount of enemy anti-aircraft weapons. Employment under the cover of darkness is preferred'.[23] For daytime operations the norm for the light and heavy bombers was to operate in squadron or group strength and support form escort fighters was advised.[24]

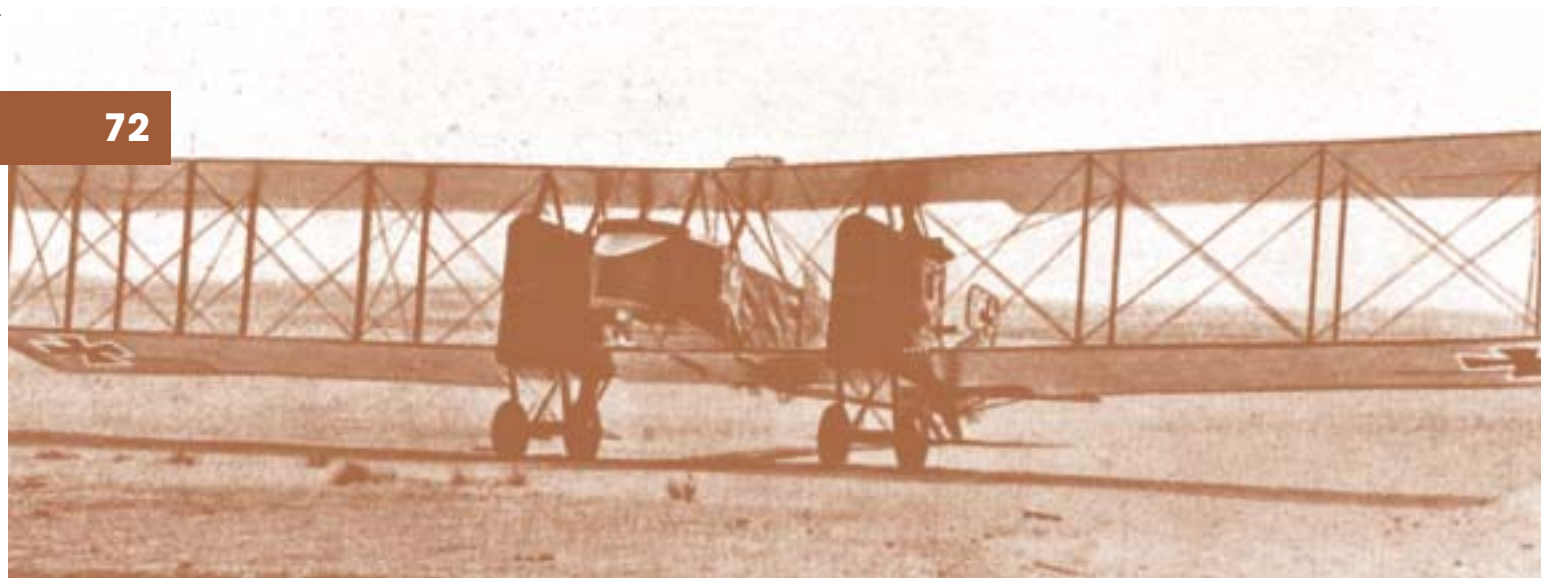
A doctrine of air superiority was laid out. The *Directives* stated that 'A purely defensive campaign does not achieve the goal'.[25] Fighters would be massed and defeat the enemy fighter forces—and open the way for the free operation of the reconnaissance and bomber forces.[26]

The *Directives* contained several paragraphs on the conduct of bombing attacks: 'Bombing attacks require careful preparation by aerial photography, careful disposition and heavy, repeated attacks against the same target, with little time in between'.[27] 'Dispersion of forces by simultaneous attacks against numerous targets must be avoided. Attacks will succeed by narrowing the targets to a few especially important targets. Primary targets are field depots, rear area rail switchyards, headquarters, communications centres, ammunition dumps and, most importantly, industrial facilities producing war material. The greatest effect can be brought about in theatres where air defence is still minimal.'[28]

The *Directives* give responsibility for target selection and the timing of attacks to the Field Army commander and his aviation commander. The aviation commander was responsible for mission orders and planning and the effect of a mass attack was preferred.[29] The strength of the enemy air defence would be the determining factor in choosing whether the bombers would strike by night. 'Defence by enemy aircraft is thereby ruled out and the effectiveness of flak is decreased. The lower flying altitude which is possible increases accuracy and allows for a heavier bomb load.'[30]

THE SECOND BOMBING CAMPAIGN AGAINST LONDON

Captain Ernst Brandenburg prepared his reinforced bomber wing (considerably larger than other German bomber wings), the *Englandgeschwader*, through the Spring of 1917. By late May he had more than 40 Gotha G IV bombers, large biplanes with an 80-foot wingspan, two 260-hp engines and a 3-man crew, ready for the campaign against London. The Gotha had a relatively high ceiling and a 1,100 lb bomb load. However, the over 100 miles to London from the German bomber bases in Flanders was at the extreme range for the lumbering biplanes (maximum speed only 88 mph) which would normally carry a much smaller bomb load.[31] In planning the campaign, Brandenburg had to create a whole system of tactics for the conduct of long distance bombing raids against cities virtually from scratch. Nothing like this had ever been done before. Brandenburg had to create targeting guidelines, plan operations, create formations for massed flight, determine the optimum bomb loads and best fusing for the bombs and decide upon the best attack altitude. Because these would be long-range missions, weather information became central to planning. Long distance bombing raids are an extremely difficult process even today, and Brandenburg deserves a great deal of credit for being the first to make it happen.

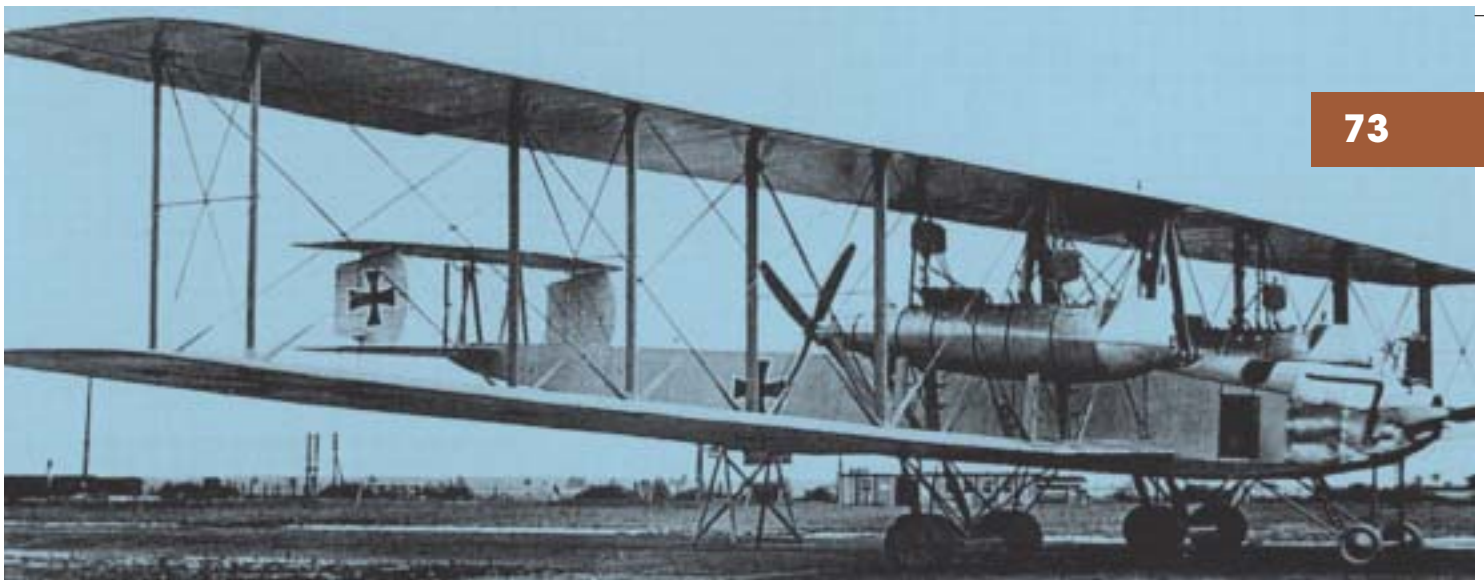


Eighteen Gothas bombed London from 8,000 feet and killed 162 and wounded 432 Londoners. No British planes opposed the Gothas as they bombed the city in a leisurely fashion and departed without losses

Brandenburg led his bomber wing on the first raid against London on 13 June 1917. Eighteen Gothas bombed London from 8,000 feet and killed 162 and wounded 432 Londoners.[32] No British planes opposed the Gothas as they bombed the city in a leisurely fashion and departed without losses. As with the 1915 bombings there were panics and demonstrations. This time it was worse and the British Cabinet met and made several emergency decisions to improve air defences against German raids. British fighters were pulled out of action on the Western Front and brought back to defend London. The London anti-aircraft defences were dramatically increased.[33] The Germans continued with daylight raids for the next weeks when conditions were favourable but the increased British defences concerned the Germans and Brandenburg stopped the daylight raids in August as too dangerous. After a brief period of retraining, the Englandgeschwader resumed bombing London at night. Later raids would feature bombing by the four-engine Riesenflugzuege such as the Siemens-Schuckert, which carried a far larger bomb load than the Gothas. By 1918 R-planes were using 660 lb. bombs.[34] However, the same level of panic among the Londoners did not occur in the later raids. As would be noted in World War II, people can even get used to aerial bombardment.

The Englandgeschwader continued with its raids on England in a desultory fashion until May 1918 when the campaign was called off. In that month Brandenburg lost 6 of his 43 Gothas.[35] The Luftstreitkräfte determined that the strategic bombing campaign against London was simply not worth the price. For the German bomber force, it was an expensive campaign indeed. From June 1917 – May 1918 the Englandgeschwader lost 62 bombers in 27 raids.[36] It was not the British defence measures that drove off the German bombers. Only nineteen of the German heavy bomber losses can be attributed to British antiaircraft fire or fighter planes. The other 43 German bombers were all lost due to operational accidents. Of the forty-three operational losses, 37 aircraft were lost to landing accidents. One of the technological problems that had NOT been solved by the Germans (nor by the Allies) was an effective landing gear for the heavy aircraft. These machines were underpowered, awkward to fly and difficult to land. Landing in a modern controlled airport at night is difficult enough for the average pilot. Trying to land a very heavy, underpowered airplane on a soggy field at night in the lighting conditions of a 1917 airfield took more skill than the average pilot would have.

The entire German bombing campaign against London in 1917 – 1918 cost the English 836 dead and 1982 wounded. A very small loss of life by World War II standards, but shocking at the time.[37] Although



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the first attempt to use the bomber in a decisive fashion to break the will of the enemy civilian population had failed, the German High Command still viewed the bomber as an extremely important weapon.

OTHER BOMBING CAMPAIGNS

London and Flanders were not the only theatres of operations for the German heavy bombers in 1917. Starting in the Spring of 1917 German bombers based in Metz began a series of long-range attacks against the centres of the French armaments industry. The industries around Nancy provided the best strategic targets within range of the German bombers. The first air attacks on Nancy, made before the attacks on London, were viewed by the Germans as a dress rehearsal for London raids. The German raids were considered successful and proved the capabilities of the heavy bombers as they could navigate a long distance and hit the target with some accuracy. New munitions were tried in the French attacks and the German bombers usually carried 90-kg bombs. Although the Germans overestimated the damage inflicted upon the French factories, simply finding and hitting the targets demonstrated great potential. By July 1917 the attacks on French industries reached a crescendo with eleven attacks upon the Nancy region that month. After that, German bombers were generally diverted to attacking French rail lines in an attempt to disrupt the Allied offensive in Flanders.[38]

GERMAN INTERDICTION CAMPAIGN — 1917

While Brandenburg's Englandgeschwader was preparing to bomb London in early 1917, other German bomber wings were being readied for service on the Western Front. The Flanders Front was seen as the most dangerous sector for the German army in the Spring and summer of 1917. Two heavy bomber wings were transferred to the German 4th Army in Flanders to carry out a strategic interdiction campaign to disrupt the logistics for the British offensive.

When the massive British offensive in Flanders began the Germans reinforced their front and built up a force of over 700 aircraft. Captain Helmuth Wilberg, 4th Army aviation commander, used his two heavy bomber wings to conduct a series of raids against the British and French airfields and air depots as part

of an air superiority campaign. Wilberg's bombers attacked the Allies at night and dropped parachute flares to illuminate their targets. The German raids on the Allied airfields turned out to be surprisingly successful. One German bomber raid on the night of 6/7 July 1917 against the British airfield at Bray Dunes damaged 12 aircraft.[39]

The German bombers attacked the British airfield and depot at St. Pol on 24 September and heavily damaged the base. One bomb hit on a hangar destroyed 140 stored aircraft engines.[40] On the night of – October the German bombers returned again to St. Pol and destroyed 36 British and French aircraft as well as severely damaging the hangars and the depot.[41] Just a few raids destroyed a large number of Allied aircraft on the ground and caused heavy damage with little loss to the Germans. This was a cost/benefits ratio that the German High Command preferred to the results of the London attacks.

During the height of the Flanders battle the Germans made numerous bombing raids against the French rail yards supporting the BEF's offensive and against the BEF's most important port facilities in Northern France, especially the ports of Calais and Dunkirk. The German intent was to seriously disrupt the British logistics system and a series of almost nightly raids began in June and July 1917. [42] In A ugust the British ammunition dumps at Dunkirk sustained severe damage. After one especially devastating raid on Dunkirk on 3 October it took four days to put out the fires.[43] The German bombing raids behind the British front lines did not succeed in disrupting the British logistics flow, but they certainly were a serious inconvenience and they caused the British considerable concern.

Just as fighter aces had become popular heroes in the Fatherland, bomber 'aces' were also honoured with the Pour le Merìte and were celebrated in the popular journals and on cigarette cards. Captain Alfred Keller, Commander of the 1st Bomber Wing and a specialist in night bombing was awarded the Pour le Merìte by the Kaiser after his wing dropped 100,000 kgs of bombs on Dunkirk. A total of 300,000 kgs of bombs were dropped by the German heavy bomber force against BEF rear areas during the 1917 Flanders campaign.[44]

Although the heavy bombers were normally used for strikes deep behind the lines, on a few occasions the heavy bombers were used for close support right on the front lines. During one of the most desperate phases of the British offensive, 1st bomber wing Gothas, accompanied by 2-seater attack planes, carried out a one hour attack directly behind the British front lines in order to get the 'maximum moral effect on the first line of the British reserves'.[45] However, it should be noted that such use of bombers for close support was a rare exception and only carried out due to a crisis at the front.

THE 1918 CAMPAIGN

The German high Command had placed a high priority on bomber production when formulating their aircraft production plans in 1917 (the Amerika Plan). The goal was to produce 2,000 aircraft a month in 1918—a goal the Germans did not come close to meeting although the German production did increase to well over 1,000 planes a month. However, the Germans managed to slowly build up their bomber force despite high attrition. By the time of the March 1918 German offensive in the West, the Luftstreitkräfte had 7 bomber wings available, each wing with 4 – 6 squadrons. Although the raids against London were still proceeding, four bomber wings, more than half of the German bomber force, was concentrated for the support of the three German armies that attacked in march 1918.[46]

The mission of the bombers was first to conduct night attacks on Allied headquarters and airfields.[47] As the German offensive progressed the bombers switched their targets to the railyards throughout northern France with the intention of disrupting allied attempts to reinforce and resupply their threatened

sectors.[48] Throughout 1918 the High Command continued to try to build up the strength of the heavy bomber force despite the heavy attrition in all branches of the Air Service. In early 1918 an eighth wing was added to the Air Service and in the Summer of 1918 a ninth wing was organised, mostly by reducing the size of the Englandgeschwader.[49]

After the failure of the campaign to bomb London into submission, the German High Command had not lost faith in the use of strategic bombing to damage Allied morale. After the bombing campaign against London had been called off the Germans turned to attacking Paris with heavy bombers. The Germans bombed Paris on numerous occasions in 1918 with the loss of 308 French civilians killed and 539 wounded. As in England, the French built up a formidable air defence system around Paris and German losses forced the end to the attacks.[50] Interestingly, the French population proved to be better able to take punishment than the English and there were no outbreaks of panic in Paris as had occurred in London in 1915 and 1918.

The development of the technology of strategic bombing continued rapidly up to the end of the war. One of the most important developments of World War I was in bomb design and effectiveness. Starting with small bombs made from modified artillery shells, by 1918 the Germans were able to employ large, purpose-built bombs of up to 1,000 lbs. designed for better ballistic characteristics and accuracy. In 1918 the Germans developed a small (2 kg) magnesium-based incendiary bomb. Many of these could be loaded into a canister that, when dropped, would open and spread the small firebombs over a broad area. This was the father of the Luftwaffe's incendiary bombs that would be used with devastating effect upon the British cities during the Blitz of 1940 – 41. If the Allied bomber force had used gas on German cities in the 1919 campaign, the German High Command planned to retaliate with incendiary attacks upon London and Paris. Luckily for both sides, this plan for strategic bombing would have caused far greater casualties and damage than the small number of high explosive bombs dropped in the 1917–1918 campaigns.

CONCLUSION

When looked at in modern terms, or even in the framework of World War II, the strategic bombing campaigns of World War I did not really amount to much. Despite the great effort that went into the program, the German bombers were too few and the bombloads of the era were simply too small to inflict crippling damage upon the enemy. However, in terms of the development of a major new weapon and an effective doctrine for its employment, the German Air Service's accomplishments are impressive indeed. In only two years the German Air Service went from prototype heavy aircraft, to the employment of large bomber units in a coherent and well-planned strategic campaign against England and targets on the Western Front. By 1917 a fairly sophisticated operational doctrine had been worked out as well as the tactics for conducting bomber attacks by day and night.

Although disappointed by the failure of the bombing attacks upon London or Paris to break the enemy will, the Germans were impressed by the performance of the bombers against transportation targets. The ability of the Germans to bomb the French industries around Nancy was also remembered. At the end of the war, the High Command and general staff was convinced that the heavy bomber had a major role in any future war.

Although Germany was basically disarmed after World War I, the army maintained a secret air staff hidden within the general staff and developed a secret air force to train personnel and to develop and test airplanes and bombs. Convinced that rearmament would someday come, the general staff and secret air staff developed an extensive body of doctrine for a future air war in the 1920s. The wartime

experience of strategic bombing heavily coloured all the German views on air doctrine in the 1920s and 1930s. One of the most notable examples of this was the German preference for interdiction campaigns against rail, port and logistics targets deep behind the enemy lines. General von Hoeppner, commander of the Luftstreitkräfte from 1916 – 1918, argued that the interdiction campaign against the British in Flanders in 1917 had caused some serious damage to the enemy. He also believed that the attacks against the Allied rail centres in 1918 had been fairly successful.[51] This was the mainstream view among the airmen and strategic interdiction was the subject of several studies by experienced German airmen commissioned by the Army staff in 1920 – 21.

The new German Army doctrine, published between 1921 and 1925, emphasised the role of heavy bombers in war, especially in attacking enemy railyards and supply depots in night attacks.[52] This emphasis on using bombers for the interdiction of enemy logistics and transport deep behind enemy lines was characteristic of German air doctrine throughout the interwar period and into World War II.

The use of bombers to attack the enemy cities and industries, as at Nancy in 1917 and against London and Paris was also carefully studied by German airmen after World War I with the intent of drawing tactical and operational doctrine from the experience. The secret air staff, under the direction of LTC Helmuth Wilberg (who had commanded almost half of the German bomber force in 1917), carried out a series of wargames to develop plans and doctrine. The first major air staff wargame was in 1924 and the scenario postulated a French attack against Germany. The Germans drew up a strategy based on attacking the French air force by crippling the aircraft industry. A list of the eight most vital aircraft and motor factories in France was developed as a target plan for a strategic bomber force. If those eight factories could be taken out, then the French Air Force would be unable to replace its losses.[53]

By 1926, the German air staff had secretly published an extensive doctrine for strategic air war (Directives for the Execution of the Operational Air War, May 1926). In the 1926 doctrine, the Germans understood that the heavy bomber would be the core of its air force when rearmament came. The 1926 doctrine discussed in detail a doctrine for bombers attacking 'the sources of enemy power' to include enemy cities, ports, railyards and vital industries.[54] The 1926 air doctrine gave a fairly equal weight to bombing enemy industrial centres and cities and attacking interdiction targets such as enemy transportation centres.

The German army and its secret air staff in the 1920s used the experience of German strategic bombing in World War I to draw up a pragmatic and comprehensive doctrine for aerial warfare. The study of the German strategic bombing in World War I became the foundation of much of the German air war doctrine at the start of World War II. The German general staff and the airmen took great pride in what the heavy bomber force had accomplished in short time and limited resources in 1915 – 1918. Despite all of the technological hurdles and limitations of the era, the German strategic bombing program had been moderately effective. Just as impressive was the creation of effective bomber doctrine and tactics in 1917. After World War I, as new aviation technologies developed with astounding speed, German airmen drew lessons from the experience of the war and looked to the time when the promise of strategic bombing glimpsed in World War I might be fulfilled.

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A-10 FACs over Kosovo

By Lieutenant Colonel P Haun USAF

One of the most interesting and tactically successful innovations of Operation Allied Force in 1999 was the introduction of A-10 Forward Air Controllers (FACs) as mission commanders. In the absence of friendly ground forces, A-10 FACs commanded forty-ship strike packages in the direct attack of the Serbian 3rd Army in Kosovo. Supported by Suppression of Enemy Air Defences (SEAD) and air-to-air fighters, A-10 FACs operated overhead radar-guided SA-6 surface-to-air missiles and Serbian MiG-21 fighter bases. A-10 FACs were given the daunting task of locating, identifying, and attacking Serbian armour while simultaneously minimising collateral damage. Target identification was particularly difficult, given the steps taken by the Serbian army towards concealment and deception, and the potential for collateral damage was enormous, as nearly a million ethnic Albanian refugees streamed toward the Albanian and Macedonian borders. The large number of AAA and man-portable surface-to-air missiles (MANPADS) dictated Rules Of Engagement (ROE) which restricted operations at low altitude and forced A-10 FACs to develop tactics for medium altitude visual reconnaissance.

A-10 FAC expertise resided within a small cadre of some 30 FAC-qualified pilots who flew most of the FAC missions over Kosovo. These pilots improvised tactics for the real time use of Intelligence, Surveillance, and Reconnaissance (ISR) assets to include Joint Surveillance Target Attack Radar System (JSTARS) and Predator Unmanned Aerial Vehicles (UAV). Heavily loaded with general purpose bombs, air-to-surface missiles, and rockets, A-10 FACs struck and marked targets for NATO aircraft from ten different nations. These FACs proved to be NATO's most effective use of airpower against Serbian forces deployed in Kosovo.[1]

This article analyses the A-10 FACs, first by summarising the political and military situation over Kosovo which led to the introduction of A-10 FACs. It then highlights the history of A-10 operations during Kosovo. The final section focuses on the tactics developed by the A-10 FACs, by following a typical A-10 FAC sortie from start to finish.

KOSOVO: DIRECT ATTACK OF THE SERBIAN 3rd ARMY

Tensions between Belgrade and Kosovo increased during the late 1980s. Slobodan Milosevic used protests by minority Serbs residing in the majority Albanian province as the foundation for his Serbian nationalist platform and his subsequent rise to the Serbian presidency in 1987.[2] By 1989, Belgrade revoked Kosovo's status as an autonomous region and placed restrictions on land ownership and government jobs for Kosovar Albanians.[3] During the 1990's, Kosovar dissension spawned a series of both violent and non-violent protests.[4] Opposition rose in 1997 with the formation of a small group of lightly-armed guerrilla fighters known as the Kosovo Liberation Army (KLA). In response to KLA ambushes of Serbian police in early 1998, Serbian forces conducted brutal retaliatory attacks against suspected KLA positions.[5] KLA support swelled within Kosovo and led to an escalation of KLA activity. In July of 1998, Serbian forces conducted a village-by-village search for KLA members, displacing over 200,000 Kosovars in the process.[6] The magnitude of the humanitarian crisis captured the attention of the international community.

Serbia and Montenegro [7]

In response to the KLA and Serbian exchanges, the United Nations Security Council passed Resolution 1160 in March, and Resolution 1199 in September of 1998. The resolutions condemned Serbia's excessive use of force, established an arms embargo, and called for an immediate cease-fire and the introduction of international monitors.[8] The latter demand was met in the cease-fire negotiated between U.S. envoys and Belgrade in October.[9]

However, the massacre of 45 Kosovar Albanians at Racak on 19 January 1999 quickly brought the cease-fire to an end.[10] Under threat of NATO air strikes, Serbian and Kosovar representatives were summoned to Rambouillet, France, to negotiate a peace agreement.[11] The compromise included the key items of a NATO-led implementation force, the recognition of the international borders of the Former Republic of Yugoslavia (FRY, made up of Serbia, Montenegro, and

Kosovo), and an interim 3-year agreement, after which a final settlement of Kosovo could be arranged.[12] The Kosovar delegation initially refused to agree unless reference was made to a future referendum to decide the fate of Kosovo. Under the threat of the withdrawal of international support, including financial and military aid to the KLA, they reluctantly signed on 18 March, 1999.[13] The Serbs, unwilling to accept a NATO-led military force within Kosovo, remained recalcitrant. In the face of diplomatic impasse, NATO air strikes were ordered to commence on 24 March.

Initial planning for NATO air strikes against Serbia began as early as June of 1998.[14] Targeting for the strikes focused on fixed command and control and military facilities in Kosovo, Montenegro, and Serbia. These targets were selected for a variety of reasons, foremost being the low risk of collateral damage.[15] The strikes were intended as the punishment portion of NATO's coercive carrot and stick strategy. The initial target list included only 100 targets.[16] Of these, only 50 were eventually approved by the North Atlantic Council, sufficient for only 2 or 3 nights of strikes.[17] Hence, the constrained nature of the strikes reflected the overarching concern for maintaining consensus among the 19 NATO countries.

In February of 1999, in the midst of the Rambouillet talks, General Wesley Clark, Supreme Allied Commander Europe (SACEUR), became concerned over the prospect of increased ethnic cleansing operations by the Serbian Army within Kosovo once NATO air operations commenced. Two of NATO's stated military objectives involved dealing directly with the Serbian fielded forces: to deter further Serbian action against the Kosovars and to reduce the ability of the Serbian military to continue offensive operations against them.[18] Clark ordered his Combined Forces Air Component Commander (CFACC), Air Force Lieutenant General Mike Short, to increase the scope of air planning to include direct attacks on the Serbian fielded forces in Kosovo. This planning did not include the insertion of U.S. ground troops, commensurate with President Clinton's public announcement that no U.S. troops would enter Kosovo until after a settlement was reached.

With the breakdown of the Rambouillet peace talks and subsequent withdrawal of international observers on 19 March, 1999, Serbian ground forces commenced the systematic expulsion of Kosovar Albanians from Kosovo, codenamed Operation Horseshoe.[20] Ethnic cleansing operations were stepped up once NATO bombing began, leaving several hundred thousand refugees to seek safety in Albania and Macedonia, or to flee to the foothills within Kosovo as internal refugees.

At 1900 Greenwich Mean Time on 24 March, 1999 NATO air forces began bombing Serbian targets.[21] These targets focused on Serbian IADS, military

Kosovo[19]

command and control nodes, and airfields and aircraft.[22] NATO commenced the war with 214 dedicated combat aircraft, 112 of which were from the United States.[23] Initial NATO strikes were met with minimal resistance from Serbian surface-to-air missiles and fighters. The primary response, rather, took place within Kosovo and was directed at the Kosovar population. Concealed within the verdant, cloud covered valley of Kosovo were 40,000 soldiers of the Serbian 3rd Army equipped with hundreds of tanks, APCs and artillery pieces and interspersed among over a million Kosovars. In addition, a wall of mobile radar-guided surface-to-air missiles, man-portable missiles (MANPADS), and AAA, as well as a squadron of MiG 21 fighters protected the 3rd Army against NATO air forces.[24]

In developing air plans against the Serbian 3rd Army, U.S. planners assumed air superiority and relied on Suppression of Enemy Air Defences (SEAD) and electronic jamming assets to confuse and degrade the Serbian Integrated Air Defence System (IADS). Assuming strike aircraft could safely enter Kosovo, two tactical problems still remained: how to locate and identify the targets and how to successfully attack them while limiting collateral damage. A-10 Forward Air Controllers (FACs) trained in visual reconnaissance and air strike control were selected for the task.[25] A-10 FACs would search out targets identified by either Intelligence Surveillance and Reconnaissance (ISR) assets during pre-mission planning, or in real time by the Joint Surveillance Target Attack Radar System (JSTARS). Once targets were identified, the A-10 FACs would control strikes with available NATO fighters. These fighters ranged in strike capability from USAF F-15Es with laser-guided bombs to Italian AMXs with manual bombsights for their unguided, 500-lb bombs.

Responding to the rapidly deteriorating situation within Kosovo, General Clark ordered General Short to commence attacks on Serbian fielded forces on 30 March. While poor weather delayed the first successful strikes until 6 April, A-10 FACs would fly over 1,000 missions controlling the skies over Kosovo until 9 June, 1999, when a peace agreement was reached.[26]

HISTORY OF A-10s IN KOSOVO

A-10s first flew over the Balkans in 1993 when NATO aircraft began conducting air operations over Bosnia. The 81st Fighter Squadron, based at Spangdahlem Air Base, Germany continually deployed to Aviano Air Base until 1997.[27] The A-10s were the only Night Vision Goggle (NVG) fighter aircraft capable of providing both day and night CAS and airborne FAC coverage for UN and NATO ground forces. Only the U.S. had specially trained and combat ready airborne FACs. The other countries had only trained with NATO ground FACs or U.S. airborne FACs for their CAS missions. Eventually, F-16CG squadrons of the 31st Fighter Wing at Aviano were trained to use NVGs and assumed most of the FAC duties over Bosnia. With the continual presence of A-10s in the Balkans no longer required, the 81st needed only to conduct yearly deployments to Aviano, thus remaining familiar with Balkan operations and providing FAC coverage when the 31st FW was deployed elsewhere.

In January, 1999 the 81st deployed 6 A-10s to replace an Aviano F-16CG squadron on a stateside deployment. With tensions rising in Kosovo following the Racak massacre, the A-10s were ordered to remain at Aviano and the squadron increased the number of aircraft to 15 by the commencement of NATO air strikes on 24 March.[28]

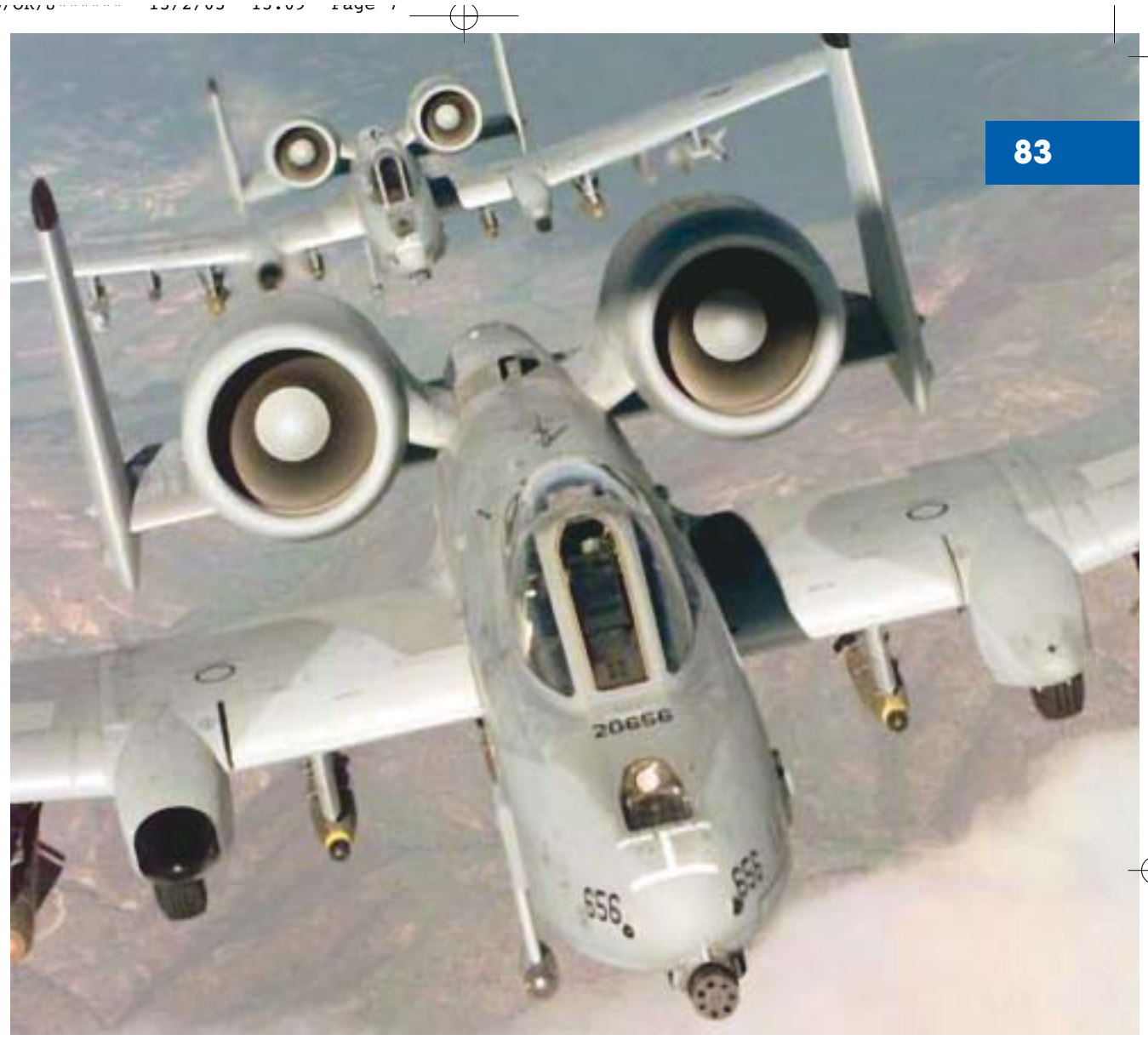
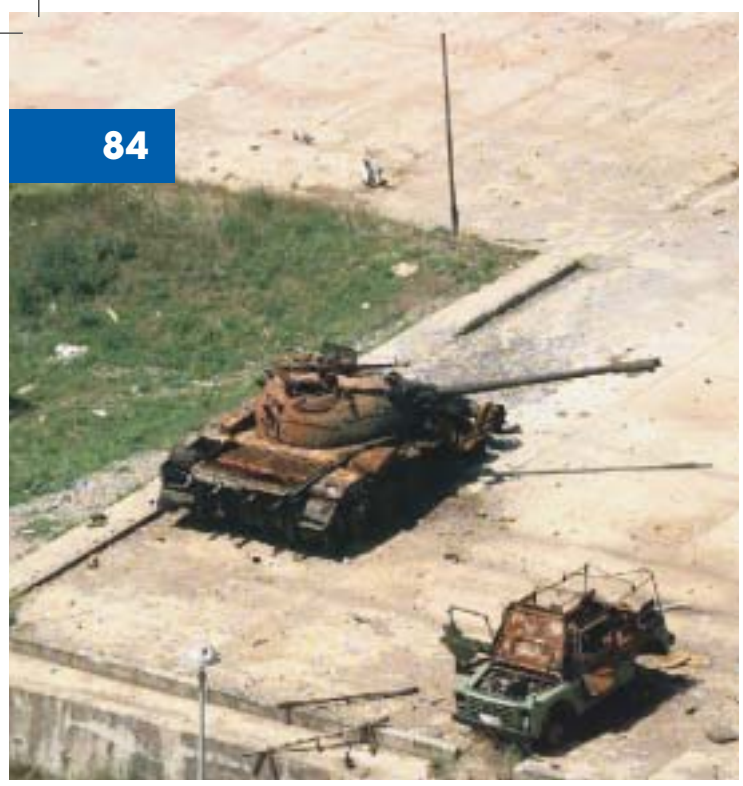


Photo of combat loaded 81st A-10s refuelling over Macedonia[29]

A-10s were initially tasked only with providing Combat Search and Rescue (CSAR) for NATO aircrews. An A-10 pilot from the 81st Fighter Squadron was the mission commander for the dramatic rescue of an F-117 pilot shot down near Belgrade on the fourth night of strikes.[30] A-10s provided on-scene command, tracked the survivor's location, co-ordinated the rescue effort, and provided cover for rescue helicopters during the ingress, survivor pick-up, and egress of enemy territory.[31] A-10s went on to provide CSAR coverage for all NATO aircraft flying over Kosovo and Serbia, both day and night, throughout the war.

On 26 March, the 81st was notified by the Combined Air Operations Centre (CAOC) at Vicenza, Italy to commence FAC missions on 30 March. While all NATO airstrikes to this point had taken place at night, a shortage of EA-6B Jammers and F-16CJ SEAD aircraft prevented adding FAC missions to the number of strike missions they were already supporting.[32] Although initially short of airframes, NATO had sufficient aircrew to double turn SEAD aircraft in support of FAC missions during the day and strike missions at night. Launching from Aviano, A-10s began flying sorties of six to seven hours down the Adriatic, across Albania and up into Kosovo. Low level clouds over Kosovo prevented aerial attacks until 6 April, when A-10 FACs located and struck a Serbian truck park, followed by two more successful days of attacks against convoys of Serbian tanks and APCs.



Serbian T-55 destroyed by A-10 with AGM-65 Maverick

A-10S MOVE TO GIOIA DEL COLLE

The lengthy enroute time from Aviano to Kosovo reduced time on station and prevented double turning the jets for two daylight missions per day. Fifteen days into the war, the CAOC ordered the 81st FS to further deploy to an Italian Air Force base at Gioia Del Colle in southern Italy. Sortie duration could thus be cut by over one hour per sortie, increasing on-station time, allowing the jets to fly two daylight missions per day, and giving a much needed respite to pilots. On 11 April, 1999 the jets in Aviano were joined in the move to Gioia Del Colle by an additional three aircraft from Spangdahlem.[33] Other NATO squadrons deployed to Gioia Del Colle included British Harriers GR7s, Italian Tornados and F-104 Starfighters. The Harriers flew as strike aircraft for A-10 FACs on a daily basis and the proximity of operations made for a close working relationship.

A-10 FAC operations at Gioia commenced on 12 April within 24 hours of arrival. With the growing success of strikes against its 3rd Army, the Serbs increased their active air defences. A-10 FACs began reporting barrage-fired AAA and surface-to-air missile launches. On 2 May, an A-10 lost an engine to an SA-14 infrared-guided surface-to-air missile and was forced to recover at Skopje Air Base, Macedonia. On 11 May, another A-10 was struck beneath the cockpit by a mobile surface-to-air missile. The missile failed to fuse, however, allowing the jet to recover to Gioia.

FAC operations over Kosovo grew to include most of the day and half of the night. A-10s covered two four-hour daylight windows over Kosovo while maintaining four aircraft on CSAR alert for night operations. F-16 CGs provided some day FACing, as well as a 2-3 hour night window. The US Navy provided additional day FAC coverage, flying F-14s

Map of deployed A-10 locations during Allied Force

Photo of Harrier returned from Kosovo mission

off the USS Theodore Roosevelt.[34] Even more FACs were needed, however, to provide full 24/7 coverage over Kosovo. It was the Air National Guard that stepped in to create the 104th Expeditionary Operations Group. This rainbowed Expeditionary Operations Group from three different A-10 ANG units in Michigan, Massachusetts, and Idaho totalled 18 aircraft. By early May, the 104th had deployed to Trapani Air Base in western Sicily. While the lengthy trip from Trapani to the Area of Operations precluded the 104th from being able to double turn for day missions, they were able to cover a midday FAC window and then turn for late night missions. Additionally, the 104th deployed 3 of their aircraft to Taszar, Hungary in mid-May to perform CSAR alert.[35] This improved the response time for A-10s in the event of a shootdown over northern Serbia. The final aircraft to join the FAC mission was the US Marine F/A-18D, when a full squadron joined the 104th CSAR detachment at Taszar, Hungary and began flying over Kosovo by late May.

Late May also ushered in the apex for air attacks against Serb ground forces. Improved weather and a KLA offensive in western Kosovo forced the Serbian 3rd Army out hiding and made the Serbs especially vulnerable to NATO air attacks. NATO increased the number of FACs and strikers for near continuous daylight operations until combat operations ceased on 10 June, 1999. A-10s then remained on airborne and ground CAS alert until the end of June as Serbian forces departed and NATO occupation ground forces entered Kosovo.

A-10 FAC TACTICS

The decision to use A-10 forward air controllers as mission commanders for daytime strike missions over Kosovo was based on the need to locate and attack

Photo of damaged A-10 at Skopje, Macedonia

the Serbian 3rd Army without the aid of a friendly ground force. Along with over 40,000 troops, the Serbians deployed a sophisticated Integrated Air Defence System (IADS), including a squadron of MiG 21s, mobile SA-6 radar-guided missiles, hundreds of shoulder-launched Man Portable Air Defence Systems (MANPADS) and AAA.[36] In response, NATO manned continuous air-to-air CAPs (Combat Air Patrol) to keep the MiGs in their underground bunkers, while Suppression of Enemy Air Defence (SEAD) fighters carrying HARMs (High Speed Anti-Radiation Missiles) and Marine and Navy EA-6B radar jammers kept the SA-6s silent.[37] Restrictions to flight operations below 15,000 feet further decreased the threat from MANPADS and AAA. A-10 FACs led up to 40-ship packages into Kosovo, comprised of aircraft from ten NATO countries. The A-10 FACs searched and located targets from medium altitude, then attacked and controlled strikes by NATO fighters onto the Serbian armour, artillery, trucks and AAA.[38]

This section depicts an actual A-10 FAC mission in late April, 1999. It includes the essential mission elements of visual reconnaissance, strike control, and strike, all conducted with extraordinary effort to minimise collateral damage to the hundreds of thousands of Kosovar refugees.

The first flight of the day, Cub 31, is scheduled to arrive on station in the eastern half of Kosovo, codenamed NBA, an hour after dawn.[39] The A-10 FACs fly single-seat in two-ship formations for additional mutual support and firepower. The mission commander, Cub 31, is a qualified forward air controller accompanied by his wingman, Cub 32. A total of four A-10 FAC 2-ships are required, two in the east and two in the west, to cover Kosovo for this three-hour vulnerability window. The Air Tasking Order (ATO) calls for three FAC packages during the day, followed by a single night vulnerability period to be controlled by F-16 FACs.[40]

In addition to being the FAC package mission commander, Cub 31 is assigned the duties of embedded Sandy.[41] Should one of the aircraft in the package be shot down, Cub 31 will assume Combat Search and Rescue (CSAR) mission command. These duties include locating and authenticating the survivor and suppressing any threat to the survivor or rescue helicopter. Other Sandys also escort the helicopter in and out of enemy territory. The insertion of Sandys into the FAC package reduces the response time by as much as two hours over the alternative of maintaining A-10 Sandys on strip alert.

Intel has spent the night surfing classified websites in search of potential targets.[42] They have prepared the daily 'Hog Menu du Jour,' a folder which today is composed of five photographs of Serbian armour and artillery taken by U-2s and national satellites.[43] An additional source of imagery comes from Tactical Reconnaissance (TACRECCE) photographs taken by Harrier GR7s collocated with the A-10s at Gioia del Colle Air base in south-eastern Italy.[44] The physical proximity of the two units allows for promising photos to be expedited to the next A-10 before launch. Unfortunately, only one photo of the five is less than 12 hours old and none have been taken within the last 6 hours.[45] Six hours is the threshold beyond which most FACs consider it unlikely the target will remain in place. While the Serbs tend to keep their vehicles stationary on a clear day, they will relocate them on overcast days and at night.

Cub 31 spends several minutes reviewing the frag order, including the SPINS (Special instructions) and the banners that accompany the ATO. Of particular interest are any changes to the Rules of Engagement (ROE). Altitude restrictions have remained fairly constant since the 14 April bombing of a refugee column. That incident has reduced to 5,000 feet the minimum altitude FACs may fly to positively identify targets.[46] What has changed are the restrictions to targets and the process for target approval. No-attack zones within 10 miles of the Macedonian border have created a sanctuary that Serbian armour has quickly taken advantage of.[47] Although strikers are still free to attack armour,

artillery, and AAA, concern over NATO cohesion in the face of another collateral damage incident means Cub must now get approval from the CAOC to attack any trucks.

Informed of the latest changes, Cub heads for the mass briefing room, an entire wall of which is dominated by a 1:50,000 scale map of Kosovo. On it are marked the latest updates on Serbian activity and NATO strikes from yesterday's missions. After the weather and intelligence briefings, Cub 31 quickly gives the other FACs the plan for the mission. Most of the information is already on the line-up cards, courtesy of the squadron's Mission Planning Cell (MPC). Co-ordination with other aircraft for this mission comes from Aviano Air Base in northern Italy, where the wing MPC has generated a mission data card. This includes all the aircraft callsigns, frequencies, tanker times and tracks, and a plethora of deconfliction information required to co-ordinate so many aircraft within such a confined airspace.

An hour prior to takeoff, Cub 31 dons his flight gear and checks out a pair of 12-power space-stabilised binoculars.[48] These binoculars are his primary means of positively identifying Serbian armour. Meeting his wingman at the duty desk, Cub 31 gets the tail number for his aircraft, and a final brief from the squadron supervisor before stepping to the jet.

A-10 AND A-10 FAC MUNITIONS LOAD

The A-10 'Warthog' is a great choice for a FAC aircraft for several reasons. The greatest advantage lies in its pilots, specifically trained in FAC, CAS, and CSAR missions. Most A-10 FACs have over one thousand hours in the airframe and have spent that time training to kill armies. The pilot is afforded

A-10 FAC flying over Macedonia with full combat load

exceptional visibility and an extensive communications suite of radios which provide UHF (including Have Quick II), VHF AM, and FM frequencies.[49] The jet has excellent self-protection capabilities: an ALR-69 Radar Warning Receiver (RWR), the ALQ-131 Electronic Combat Measures (ECM) pod, 120 bundles of chaff, and 180 flares. In addition, the rugged, twin-engine jet was designed to take hits; it comes equipped with a redundant flight control system and a titanium armoured cockpit.

The A-10 is a large fighter aircraft built around a 30mm, tank-killing Gatling Gun. With a total of eleven hardpoints on its wing, it can carry a wide variety of munitions. It also carries the Pave Penny Pod, a laser spot tracker that indicates in the Heads Up Display (HUD) the position on which a striker has trained its laser. This enables the FAC to confirm the target before strikers release their bombs. Although the A-10 is assigned primarily to daytime FACing over Kosovo, the jet is the first USAF fighter with a Night Vision Goggle (NVG) compatible cockpit. Its slow speed, for which it is often maligned, is a tremendous asset in the FAC role, allowing for longer, more accurate looks at targets than can be gained from faster aircraft.[50] Also, the fuel efficiency of its bypass fan engines gives the jet up to 1 hour of loiter time between refuellings. Such features have been critical to the success of A-10 FACs in locating Serbian positions.

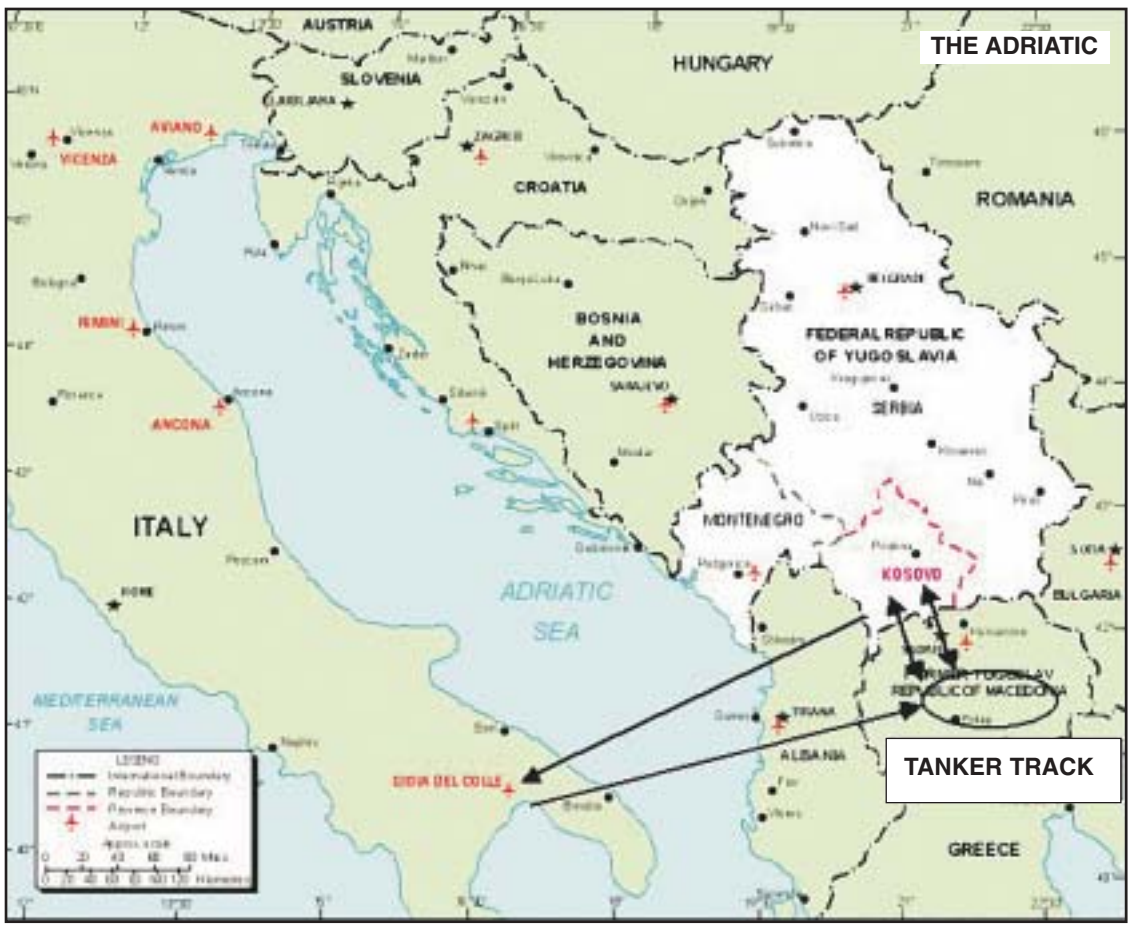
The A-10's weapon load-out is custom built for the FAC mission. On the outside stations, stations 1 and 11, hang two AIM-9 (Air Interceptor Missile) heat-seeking missiles and the ALQ-131 ECM pod. The next inboard stations, 2 and 10, carry two rocket pods for a total of fourteen 2.75-inch Willie Pete (White Phosphorous) rockets.[51] Willie Petes are the primary method of marking targets as their smoke is easily seen by the naked eye or through a targeting pod.[52] Stations 3 and 9 boast two 500-lb., precision-guided AGM-65D (Air to Ground Missile) Maverick missiles. This infrared version of the missile locks onto the heat contrast between the target and its background. The long stand-off range and the 125-lb., shaped warhead make this fire-and-forget munition ideal against armour.[53] The centre stations 4, 5, 7, and 8 hold Mk-82 low drag, 500-lb. general purpose bombs configured with FMU-113 radar proximity fuses.[54] Detonation of the bomb at 10-25 feet above the ground enhances the fragmentation pattern and is more effective against mobile targets than an impact fuse. Internally, the seven-barrel GAU-8A Gatling Gun carries over 1,100 armour-piercing and high explosive rounds.

Though an exceptionally well-constructed Close Air Support aircraft, the A-10 has its weaknesses. Designed for low altitude flight, the aircraft is underpowered at medium altitude. It also lacks the technical sophistication of a radar, a GPS navigational system, a datalink, and a targeting pod.[55] The jet has a high radar cross section that makes it easily detectable by enemy radars and its slow speed makes it susceptible to AAA and MANPADS at low altitude.

A-10 FAC FLIGHT PROFILE

Upon takeoff from Gioia del Colle, Cub begins a turn to the east and climbs to Flight Level 190 (19,000 feet). The flight then contacts Magic, the NATO Airborne Early Warning (NAEW) aircraft responsible for airspace control over the Area of Responsibility (AOR).[56] It takes 45 minutes to cross the Adriatic and reach the tanker track over central Macedonia where a KC-135 is already waiting. After topping off the jets, Cub turns north and contacts Moonbeam for the first of their two vulnerability windows.

Moonbeam relays the CAOC's top two target priorities and confirms that both the required F-16 CJ HARM shooters and EA-6B jammers are on station. Cub 31 plots a course to these targets and updates his search plan. The sky over the southern half of the border is clear, but low clouds to the north threaten to blanket the entire valley. Cub 31 arms his weapons, his flares, and his electronic self-protection systems as he approaches the border. He begins searching the foothills along the major LOCs as he proceeds to the two CAOC target areas. Finding nothing at these locations, he moves on to check out his preplanned targets, comparing the terrain with the target photographs. When these do



A-10 FAC Flight Profile

not pan out, Cub continues to expand his search for the remainder of his 45-minute vulnerability window, looking for any unusual signs which might indicate enemy activity.

Bear 11, another two-ship of A-10 FACs, checks in on frequency, taking over control of NBA as Cub heads for the second tanker. After refuelling, the flight will return for a second vulnerability window. This sortie is scheduled for a total of 4.0 hours, of which 1:45 will be spent in Visual Reconnaissance/Strike Control (see Table 1 for an A-10 FAC mission profile).

A-10 FAC Mission Profile
April 1999

Reference Time (T Hour)	Takeoff Time
T minus 2:00	Premission Briefing
T	Takeoff
T – T+:45	Enroute to Macedonia tanker track
T+:45 – T+1:00	Refuelling (4-5,000 lb offload)
T+1:00 – T+1:45	Visual Reconnaissance/Strike Control
T+1:45 – T+2:15	Refuelling (4-5,000 lb offload)
T+2:15 – T+3:15	Visual Reconnaissance/Strike Control
T+3:15 – T+4:00	Return to base
Total Area Time	1:45
Total Flight Time	4:00

Table 1: A-10 Flight Profile

THREAT AVOIDANCE

The primary threat to the A-10 comes from heat-seeking MANPADS. Cub 31 limits this threat by remaining at 15,000 feet above ground level (AGL) to the maximum extent possible. When conducting lower altitude passes (5,000 – 10,000 feet) for target identification, he limits himself to one pass only and uses a combination of jinks and flares when climbing back up to altitude. Cub 32 trails a mile behind slightly above and offset from Cub 31. As a wingman, Cub 32's purpose in life is to provide mutual support by covering the lead and calling out all SAM launches.[57] This is a difficult task in the case of MANPADS launches, as the missiles are extremely fast and their pencil-thin smoke trail hard to see. Wingmen barely have time to call for flares before the missile zips through the flight.

As indicated before, one key to avoiding the hundreds of MANPADS spread throughout the Kosovo countryside is to limit the number of passes made on any given target. While this may seem commonsensical, the less obvious reason lies in the limitations of the aircraft. For the underpowered A-10, each pass bleeds off energy in terms of both altitude and airspeed. Diving attacks performed back-to-back leave the jet low and slow, vulnerable to attack during the climb back to altitude.

For SA-6 operators to get a kill they must to lock up the aircraft with the tracking radar and then launch a missile, which homes in on the reflected radar energy bouncing off the aircraft. However, the threat from the SA-6 is greatly diminished by the presence of HARM shooters. An F-16CJ or German ECR Tornado SEAD aircraft can launch HARMs at the SA-6 radar while it is illuminating its target. So the dilemma for the operators becomes whether or not to target strikers and run the risk of being killed. For the most part, the SA-6s in Kosovo have remained silent.

SA-6 operators have been even more reluctant to fire missiles during the day, when the huge, white smoke plume from the launch and rocket motor creates a prominent trail straight back to the operator's location. One A-10 FAC, tongue in cheek, believes the biggest threat from an SA-6 launch is the potential for a mid-air collision of fighters in pursuit of the smoke trail, all vying for the kill. This has hardly been the case at night, however. Although an SA-6 launch is easy to see, its precise whereabouts have proven difficult to locate, even with targeting pods and NVGs.

Remains of a destroyed SA-6 launcher abandoned in Kosovo

AAA is in abundance but easily avoided by staying above 5,000 feet. Most of the AAA is 37 mm or less, with only a few 57mm pieces and no radar-guided AAA in Kosovo. The only visible signs of AAA fire during the day are the small, white clouds that appear as shells explode below the jets. Given that, it is still difficult to locate the gun positions. Unlike night-time operations, when tracers and muzzle flashes are evident, the use of muzzle flash guards on AAA barrels prevents the daytime sighting of all but the small, brown dust clouds generated as the rounds are fired. Even then, the A-10 FAC must be looking directly at the AAA pit when it is firing in order to see the dust kick up. Small arms, on the other hand, have a distinct red muzzle flash which is easily identifiable, particularly if the they are fired from a shaded area. More than one Serbian infantry company has highlighted its position by recklessly firing at A-10s circling overhead.

VISUAL RECONNAISSANCE AND TARGET IDENTIFICATION

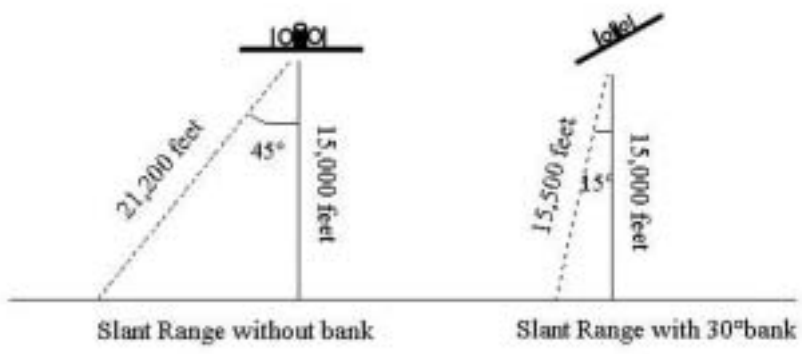
The most important quality of a good FAC is the ability to locate targets. A saying among the A-10 FACs is, '95% of tactics is simply finding the target.' First, it takes hours of visual reconnaissance to get sufficiently familiar with the area to begin to discern Serbian armour and artillery. Although Kosovo is 60 x 60 miles, the Serbian army operates in a relatively small area in and around the larger towns, along the major LOCs, and near the border. Learning where not to look streamlines the VR effort. Pre-mission study of the reported Serbian positions helps determine where the focus of the day will be. If unsuccessful, the scope can then be increased to widen the search area.

The key to locating targets is knowing what indicators to look for. The first rule is to note anything unusual or out of place. Clues are as subtle as knowing that Kosovo farmers, when harvesting hay, produce several large bales of hay per field. A field with only one or two large, rectangular hay bales warrants closer inspection and may reveal a tank's main gun barrel protruding through the straw.[58] As the spring rains begin to subside and the ground begins to dry, the night-time movement of the heavy military vehicles produces tracks in the grass. The soil is tan in colour, leaving visible tracks in a tank's path. The tracks leading from an empty berm may be used to locate Serb armour hidden in a nearby barn or tree line. In forests, any shape with a 90-degree angle is suspicious. In addition, the Serbs, knowing A-10 FACs will not strike civilian vehicles, have begun using white buses for transporting troops. A bus parked near a stand of trees is a neon billboard to a smart FAC to begin a search of those woods. Though a trail leading to berms inside a stand of trees may seem well concealed, it actually stands out when viewed from directly overhead. Even Serbian Army barracks already destroyed by NATO bombs can be a lucrative location to start a search. The area may still be home to some of the Serbian soldiers and stray vehicles can be found in and near the compounds. Such insights and trade secrets are often exchanged between FACs at the squadron after a mission or at a restaurant over the evening meal.

Second, a disciplined scan pattern has to be developed, along with a proficiency in the use of binoculars. While aircraft vibration makes it difficult to focus high power binoculars, the introduction of commercially available, space-stabilised binoculars has alleviated this problem. From 15,000 feet it is now possible for a skilled FAC to identify armour and even distinguish between tanks, APCs and self-propelled artillery. With the naked eye, he first selects an area of interest, then concentrates on a specific point for 3-4 seconds before moving to the next.[59] The binoculars are not used until a potential target has been located. Due to the narrow field of view of the binoculars, it takes practice for the FAC to be able to relocate the target while looking through the binoculars. He must first note a nearby prominent landmark to ease the transition before peering through the lens. Likewise, once a target is

identified and before the binoculars are put down, the relationship between the target and the landmark is noted. More than one Serbian tank has escaped because the failure of a FAC to relocate it after lowering his binoculars.

One flight technique for reducing the slant range when viewing targets is to keep the jet in a 30-degree bank, this allows the pilot to search almost directly underneath the jet's flight path. As seen in the figure below, this reduces the slant range by over a mile in comparison to a level flight path.[6]



Decreasing VR slant range with bank angle[61]

Finally, some FACs are simply better at finding targets than others. Good mission prep, a positive attitude, and keen vision seem to be common denominators of exceptional FACs. Even a highly skilled FAC can use the help of other assets, though, the most important of which are the Joint Surveillance Target Attack Radar System (JSTARS) and the USAF Predator Unmanned Aerial Vehicle (UAV).

JSTARS

JSTARS is a long range, air-to-ground surveillance system on board an E-8C, a modified Boeing 707. It consists of a Synthetic Aperture Radar (SAR), capable of producing a radar image of a selected area, and a Moving Target Indicator (MTI), designed to locate slow-moving ground targets. JSTARS has the unique capability of tracking hundreds of vehicles throughout Kosovo with its MTI, but lacks a viable onboard target identification system.[62] While JSTARS can see all the vehicles moving around Kosovo, it cannot distinguish a T-72 tank from a tractor pulling a trailer loaded with refugees.[63] Collateral damage concerns, which dictate a visual target identification criterion, greatly reduce the potential utility of JSTARS in this conflict. To overcome this challenge, JSTARS has developed tactics to correlate its tracking data with positive target identification from UAVs and has, on occasion, been able to provide real time targeting information to FACs.

While UAVs such as the Predator have been used in the past for surveillance, they also show great promise in locating and identifying targets from low altitude without risk to pilots. Over Kosovo, Predators conduct surveillance and for the first time provide real time targeting information to the A-10 FACs flying overhead. The effectiveness of the tactics is somewhat limited by the lack of previous Predator experience with FAC procedures, making tasks such as altitude deconfliction and target talk-ons difficult.[64] Although UAVs have never been fully integrated into the ATO with strike packages before, operational techniques have quickly been patched together to test their capabilities. Qualified ground FACs at the CAOC can now monitor the Predator's video and conduct target talk-ons directly with A-10 FACs overflying the target area.[65]

The occasions when such efforts have proven successful provide a glimpse into the real time use of UAV platforms with conventional strike aircraft. On one occasion, Moonbeam directed Uzi 11, an A-10 FAC flight, to a specific set of co-ordinates.[66] Once there, they received a target talk-on from the CAOC's ground FAC to an L-shaped building. Given immediate permission to attack the building, they struck it with three 500-lb. bombs. Later, when Predator detected Serbian soldiers walking next to the building, the flight was directed to re-attack the site.

RQ-1 Predator

Despite the aid of JSTARS and the Predator, the efforts of Serbian 3rd Army at concealment and deception continue to complicate target identification. The Serbs have placed their armour in such politically sensitive locations as next to churches and inside houses. They have also placed dozens of artillery and armour decoys throughout Kosovo to draw off NATO bombers. Although it is very difficult to tell the difference between real armour and decoys from altitude, the A-10 FACs have developed a few tactics to compensate. The simplest way to determine if a target is a decoy is to blow it up; if there is nothing left of the target afterwards, then it was a decoy.[67] Still other decoys are conspicuous because of their location. If a tank is sitting out in the middle of a field in broad daylight, it is likely a decoy. Another telltale sign is the lack of any fresh track marks or other indications of recent vehicle movement in the area. Again, the only way to know for sure is to blow it up. The thought of wasting munitions, particularly expensive precision-guided weapons is disconcerting to most FACs. No one wants to make the mission report that they have just killed an inflatable tank decoy with a $100,000 Maverick missile. Still, to pass up on a target simply because it looks too good to be true is self-defeating. There have been many instances of FACs taking a target for a decoy, only to be pleasantly surprised when it sends up a secondary explosion.

The FAC mission of Swine 01, ended in just such a discovery.[68] Locating an incredible ten artillery pieces, Swine directed British Harriers to drop a single Mk 83, 1,000-lb. bomb onto one of the 'decoys.' When a massive explosion rose up from ammunition stored nearby the pit, Swine moved in for more kills, attacking and controlling the Harriers and some F-15Es for strikes on all the remaining pits.[69]

Artillery Decoy

Artillery Destroyed by Swine 01

A-10 STRIKE CONTROL

Once Cub 31 has identified a target as valid, he must determine what aircraft and weapons can best be used to attack it. Along with the weapons carried by his flight, there are also NATO fighters scheduled throughout the vulnerability window. These strikers have been given secondary targets on which to drop their bombs if the FAC does not find fresh targets.[70] NATO strikers potentially available to Cub come from 9 different nations (see table 2).[71] The arsenal varies greatly from F-15E Strike Eagles carrying laser-guided bombs to Italian AMX fighters with neither precision munitions nor a computing weapons delivery system for the Mk-82s they do carry. Although B-2 and F-18 aircraft carry the newest GPS munitions, these weapons are not made available to the FAC missions. Still, the majority of strikers are fully capable of hitting the targets assigned them. Once an A-10 FAC identifies a target, it can be destroyed.

U.S.	A-10, F-16CG, F-15E, F-14, F-18, AV-8B, F/A-18D
France	Super Etendard, Jaguar
U.K.	Harrier GR7
Netherlands	F-16AM
Belgium	F-16A
Canada	CF-18
Spain	EF-18
Italy	Tornado IDS, AMX
Turkey	TF-16

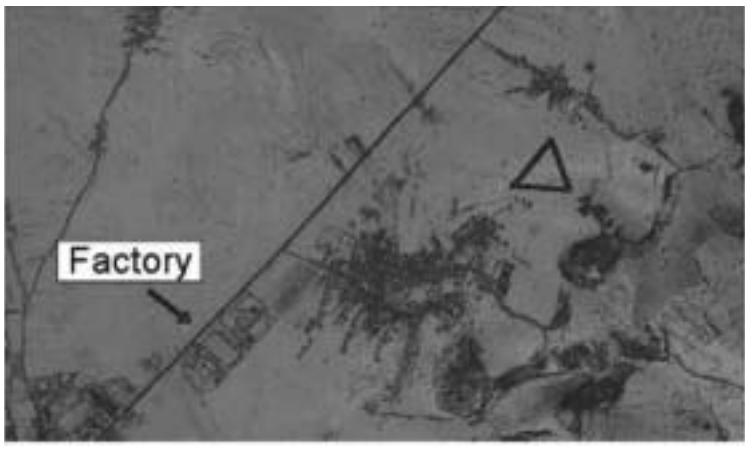
NATO Strike Aircraft[72]

The weapons to be used, then, depend upon the nature of the target found. Precision weapons, such as laser-guided bombs or the Maverick, are required against tanks, artillery, and AAA. These targets are either armoured or protected by earthen berms and require a direct hit to be taken out. CBU and general purpose bombs are best used against soft-skinned vehicles and dispersed targets, such as troops in a tree line.

Returning for the second vulnerability window, Cub 31 finds that clouds have moved in, leaving only the south-eastern part of NBA visible. Cub heads to the city of Gnjilane to begin a search of the surrounding foothills where there has been previous enemy activity. Locating a row of 8 freshly occupied artillery pits, he calls up Moonbeam, who quickly lines up a 2-ship of CF-18s, callsign Merc 11.[73] The CF-18s are carrying 500-lb laser-guided bombs (LGBs). Cub passes co-ordinates, gives them a target area update and begins a talk-on. 'Call visual the factory that is just east of the huge town that is on the east-west hardball.' G-town (Gnjilane) is the only large town in eastern Kosovo. On the east side of G-town is an enormous factory complex next to the highway, leading east out of the town.

Target area near Gnjilane

Merc 11 replies, 'Copy. I see one factory. Large structure has a blue roof building to the west.' Merc 11 not only responds that he sees the factory, but he confirms it by giving a positive description of a distinct feature.



1:5 metre imagery of target area

'That's affirmative, let's use that factory east-west one unit. From the eastern edge of factory go two… let's make that three units east on hardball. Then use factory from hard-ball. You'll see a pull-off on the north side of the hardball. Go one unit to the south off the hardball. In between two small towns you'll see some light revetments.' Cub continues the talk-on by setting the length of the factory complex east to west as a unit. He treats that unit as a yardstick and measures the distance along the road to another feature (a pull-off). He talks Merc 11 down between two towns where the artillery is lying.

Merc 11 responds, 'Copy light revetments, there appears to be 4 to the south and 4-5 to the north.' Merc 11 has the revetments in sight and again gives a description of what he sees. The revetments appear light due to the light sandy soil in this region of Kosovo in contrast to the darker green grass of the field where the revetments have been dug.

'Copy. That is affirmative. Say your laser code.' Cub wants the laser code to enter in his Pave Penny Pod to ensure Merc's laser is actually pointed at the right target.

'Laser code is 1633.'

Merc is ready to attack and extends to the south-east some ten miles from the target for his run in. Cub clears Merc to drop when he calls inbound. Merc shacks (directly hits) the artillery piece. He sets up for a subsequent attack and takes out another piece before running low on fuel and departing.

In the meantime, Dragon 61, a 2-ship of F-15Es checks in carrying 500-lb. LGBs as well. Dragon locks up Cub with his air-to-air radar. Dragon is to call when he is visual Cub, a fairly easy task, as a 2-ship of A-10s circling a target looks like a pair of large Xs in the sky. Dragon calls visual and Cub rolls in to mark, this time with Willy Pete rockets. He shoots three rockets, expecting to get them to blossom into small white phosphorus clouds near the target. As long as Dragon is watching the general target area he will easily see the smoke generated by the rockets.

With the A-10's computing weapons delivery system, an accurate rocket can be shot from as far off as 4 miles slant range. This allows Cub to recover well above 10,000 feet. He shoots multiple rockets in case one is a dud. He can also refer to the distance between the rockets as an additional unit of measure, if necessary. In this case, though, the rockets land next to the arty pits.

Dragon 61 confirms the smokes, '61 is contact two smokes.'

'Copy. Look at the further north-east smoke. It's sitting just on the east side of four arty pits south of a

road.' Even though the smokes are visible, the arty pits are so small that Cub has to ensure Dragon has them in sight.

Dragon calls contact the target area. Cub is starting to run low on fuel and wants to get the F-15Es dropping as soon as possible. Dragon is not a FAC and therefore not authorised to pick his own target to drop on. He can, however, continue an attack once Cub gives him permission. Cub passes Dragon control of the targets. 'You have flight lead control on that target area. I'd like [you] to take out as many of the arty sites [as you can] at that position. Two have already been struck. Those are two just north of the east-west road.'

Cub 31 departs for the tanker and Dragon continues his attack, destroying an additional three artillery pieces. Heading home, Cub 31 contacts Moonbeam and passes on the BDA for his flight and the fighters he has controlled.

Serbian Artillery Piece destroyed by F-15E controlled by A-10 FAC[74]

Not all attacks run so smoothly. In this case, these artillery pits were found in an open field with little risk of collateral damage. Also, there were no AAA or MANPADS launches seen, although the area is known for having active air defences. Likewise, two sets of precision bomb dropping strikers were readily available, both of which were manned by native English speakers. Though the official language for NATO is English, there is a considerable range of language skills among pilots, with particular difficulties for those from nations such as Turkey and France.[75]

A-10 STRIKE

An advantage that Cub 31 has is the large number of munitions that he and his wingman carry. This gives Cub the option of destroying targets without having to call in strikers, a capability especially useful against fleeting targets. Although, for the most part, the Serbs do not move their vehicles under clear skies, an occasional mobile APC or tank will be spotted. Other fleeting targets include those in areas where cloud cover is beginning to form. The weather over Kosovo for much of April has been chronically disruptive to strikes. In this case, there may not be time to bring in other fighters before the hole in the clouds closes up. This added flexibility for A-10 FACs has proven a great asset.

Against armour, the weapon of choice is the AGM-65 Maverick. As long as there is good heat contrast, Cub can fire this 500-lb. air-to-surface missile from 3-4 miles out.[76] The Maverick, while good at killing armour, does not make for a good mark. Too often, Cub has to come off target dry (without firing) because of inadequate contrast. Also, unless the strike produces secondary explosions, the fighters will not be able to see the impact. Cub therefore reserves his Mavericks for armour and other precision deliveries, such as those against dug-in artillery pieces.

A-10 firing an AGM-65 Maverick

The four Mk-82 airburst bombs that Cub carries are excellent against soft targets. With the computing sight on board, the bombs can be delivered very accurately, even against individual vehicles. They can also be used as marks, adding killing power beyond that of a rocket.[77] However, the cloud generated from a Mk-82 dissipates rapidly and, unless a fighter is looking directly at the target area at impact, he will likely miss the mark. Also, the bomb cloud is darker, providing less contrast than that of a Willie Pete mark.

The last weapon available to Cub is the 30mm gun, which he uses as his tertiary weapon. As an embedded Sandy, he must reserve half of the rounds for use in case a rescue is required. Also, the extreme slant ranges required at medium altitude greatly reduce the gun's armor killing potential.[78] To enhance its effectiveness, Cub must descend to below 10,000 feet. Given the shortage of targets and the wide availability of other weapons, he rarely resorts to the gun.

RETURN TO BASE

Cub lands at Gioia del Colle 4.0 hours after departure. Upon landing, the pilots head straight to intelligence. Cub 31 goes to the briefing map and points out all the target areas identified and those attacked. The next set of A-10 FACs are just arriving for their briefing, allowing Cub 31 to take the mission commander aside for an update on the weather in Kosovo and likely target areas.[79] Next, Cub 31 and 32 must review their HUD videotapes and answer any additional questions for the intelligence mission report. Cub 31 then debriefs his wingman over a sandwich before heading to the hotel for their 12-hour crew rest for tomorrow's mission.

A-10 FAC EFFECTIVENESS

Measuring the effectiveness of A-10 FAC operations is difficult. Clearly, NATO strikes failed to prevent Serbian ground forces from conducting widespread ethnic cleansing operations against Kosovar Albanians. In fact, the majority of Serbian atrocities occurred prior to the start of A-10 FAC operations.[80] Other critics claim the attacks against the Serbian 3rd Army had only a marginal impact on Slobodan Milosevic's decision to capitulate. They point instead to other factors, such as strategic strikes on Belgrade, the withdrawal of Russian political support, and even the remote threat of a NATO ground invasion.[81] Still others assess the direct attacks as inefficient. One senior Air Force officer estimated that as many as 15 sorties were required to kill a single Serbian tank.[82] However, others have pointed to desertions by Serbian soldiers and to civilian demonstrations against the deployment of further army reserve units to Kosovo as evidence of the influence the attacks against the Serb 3rd army was having on Serbia.[83]

Yet, A-10 FACs were indeed successful in keeping the Serbian 3rd Army from using its armor to conduct ethnic cleansing operations. In order to empty a village, the standard operating procedure of the Serbian Army had been to take a company of tanks and form a wide horseshoe around the village, with the opening of the horseshoe pointed toward the nearest border.[84] Serbian para-military police would then enter the village and grant the villagers as little as 30 minutes to leave their homes with whatever possessions they could manage to take with them. The introduction of A-10 FACs stopped the use of these tactics. The Serbs had to hide during the day and disperse their equipment to avoid detection. The threat from A-10s circling overhead forced the Serbs into a defensive posture, slowing their daytime movements and reducing the effectiveness of subsequent attacks on Kosovar civilians.

Unfortunately, the Serbs adapted by using civilian vehicles to continue their attacks. While A-10 FACs had the ability to keep the roads clear of all vehicle movement, NATO's concern over collateral damage prevented such strikes. The 14 April attack on a Kosovar refugee column by NATO fighters made the situation particularly tense. Serbian soldiers were free to jump out of their APCs and into Kosovar Albanian's abandoned Yugos to continue their operations. The requirement for positive identification of all vehicles severely restricted the use of JSTARS, as well as all nocturnal FAC operations. While FACs using NVGs and targeting pods could locate moving vehicles, these night devices lacked the clarity required for positive target identification. While U.S. fighters over Kosovo had the capability to destroy targets they lacked the permission to do so.

In addition to target ID requirements, theatre ROE also restricted most NATO aircraft to above 15,000 feet. This meant that cloud decks over Kosovo could be no lower than 20,000 feet for A-10 FACs to operate.[85] As the campaign progressed, the poor weather of late March and early April gave way to

blue skies in late April and May. This granted A-10 FACs more coverage time, greatly increasing the number of targets identified and attacked. Likewise, the number of Serbian claims of collateral damage began to rise. In response the CAOC systematically wrested control authority away from the FACs. By June, FACs were forced to seek clearance for attack on each target acquired.

The refusal of U.S. political leadership to deploy ground forces further complicated matters. This freed Serbian forces to defend almost exclusively against attack from the air. Serbian armor, which would have been lined up to protect entry routes from Albania and Macedonia, was instead dispersed throughout Kosovo. This lack of a ground threat greatly vexed the air campaign, making the A-10 FAC mission all the harder. A-10 FACs did take advantage of the Kosovo Liberation Army's offensive in Western Kosovo which forced Serbian forces out of hiding. Though the KLA was soundly defeated, the Serbs suffered mounting losses from NATO strikes just days before Milosevic capitulated.

The final critique of A-10 FAC operations lies in the assessment of attrition to the Serbian 3rd Army during the 78-day air campaign. However, producing an accurate assessment proved just as problematic as locating and identifying Serbian armour. Unlike Desert Storm mission objectives, which called for a 50% attrition of Iraqi armour, no such quantitative objective was ever set for Kosovo. Furthermore, the total number of Serbian armoured vehicles in Kosovo was never well tracked, leaving no way for NATO intelligence to adequately assess attrition rates, even if that had been an objective.

The question of BDA count was not raised until after the war when the press filmed the Serbian 3rd Army as it withdrew from Kosovo. The measure of effectiveness of the air attacks was then reduced to the question of how much armour was destroyed. In a September, 1999 NATO news conference, General Clark was asked how much of the 3rd Army was destroyed, to which he simply replied, 'Enough.'[86] This alludes to the fact that NATO air strikes against the Serbs in Kosovo were designed for coercion, not attrition. Two of NATO's objectives were those of deterring Serbian action against the Kosovar Albanians and of reducing the ability of the Serbian military to continue offensive operations. The success in meeting these objectives was measured not by the number of vehicles destroyed, but by the action of the Serbs. In the end, the Serbs conceded to NATO demands and withdrew from Kosovo.

Nonetheless, the fact remains that the primary target of NATO warplanes over Kosovo was the 3rd Army's armour and artillery. It seems reasonable that an accurate BDA would shed light upon the effectiveness of attacking fielded forces at the tactical level. Unfortunately, BDA has been clouded by controversy since the final day of strikes. Table 3 reflects the BDA reported from several sources. Regardless of which set of numbers are closest to being accurate, having an accurate number/percentage of vehicles destroyed is meaningless without a yardstick to measure overall effectiveness.

BDA Source	Tanks	APCs	Artillery
Shelton, 10 June 99	120	220	450
Serbian, 16 June 99	13	6	27
Newsweek 15 May 00	14	18	20
NATO, 16 Sep 99	93	153	389

Table 3: Allied Force Tactical BDA estimates[87]

CONCLUSION

The intent of this article has been to depict a typical A-10 FAC sortie from briefing to debrief. The tactics used by A-10 FACs have been followed from visual reconnaissance to strike control to target attack. Though fewer than forty A-10 aircraft were flown over Kosovo, they became the focal point of NATO attacks against the Serbian 3rd Army. With limited imagery, JSTARS hampered by ROE, and Predator integration in its infancy, A-10 FACs were forced to rely on their own skill and cunning at finding targets. U.S. ground forces were prevented from entering Kosovo to assist in locating and identifying the enemy. The difficulty of positively identifying camouflaged military equipment from 15,000 feet, along with the restrictions on which the targets could be struck, further complicated this already complex mission. Though helpless in keeping the Serbs from systematically expelling Kosovars from their homes, A-10 FACs did stop the Serbs from using their military equipment to do so and ate away at the 3rd Army's combat capability, as well as the Army's political support for Milosevic's ethnic cleansing campaign.

The A-10 proved an excellent platform for conducting daylight FAC operations over Kosovo. Trained in the use of space-stabilised binoculars, A-10 pilots could reliably distinguish civilian from military vehicles, isolate valid targets, and control a plethora of NATO strikers.[88] The large quantity and variety of weapons aboard the airframe itself insured that targets meeting the stringent ROE were attacked and destroyed.

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[1] Christopher Haave and Phil Haun, *A-10s over Kosovo,* (Maxwell Air Base, Alabama: Air University Press, 2002), 303.

[2] Noel Malcolm, *Kosovo: A Short History.* (New York: New York University Press, 1998), 341.

[3] Tim Judah, *Kosovo: War and Revenge.* (New Haven, CT.: Yale University Press, 2000), 62.

[4] For purposes of this discussion, Kosovar refers to Kosovar Albanians.

[5] William Buckley (ed.), *Kosovo: Contending Voices on Balkan Interventions.* (Grand Rapids, M.I.: William B. Eerdmans Publishing Co., 2000), 100. For purposes of this discussion Serbia and Serbian will be used to refer to those forces from the Federal Republic of Yugoslav. Likewise, Macedonia will be used to refer to the Former Yugoslav Republic of Macedonia.

[6] Judah, 171.

[7] Unites States Central Intelligence Agency Map, Available on line: www.lib.utexas.edu/maps/europe/serbia_montenegro_pol_97.jpg, accessed 18 Nov, 2001.

[8] United Nations, Security Council Resolution 1160 (1998), Available on-line: www.un.org/Docs/scres/1998/sres1160.htm. Accessed 15 Nov, 2001. United Nations, Security Council Resolution 1199(1998), Available on-line: www.un.org/Docs/scres/1998/sres1199.htm. Accessed 15 Nov, 2001.

[9] Dick Leurdijk and Dick Zandee, *Kosovo: From Crisis to Crisis.* (Burlington, VT: Ashgate Publishing Co, 2001), 34. Though the insertion of 2,000 Organization for Security and Cooperation in Europe (OSCE) observers were agreed to, OSCE was never able to get that many into country before their withdrawal in March, 1999. U.S. State Department, *Erasing History: Ethnic Cleansing in Kosovo.* 6.

[10] Albert Schnabel and Ramesh Thakur (ed.), *Kosovo and the Challenge of Humanitarian Intervention: Selective Indignation, Collective Action, and International Citizenship.* (New York: United Nations University Press, 2000), 35.

[11] Judah, 195. While Serbia was threatened by the air strikes if they did not come to an agreement, Kosovars were threatened by the possibility of NATO leaving them to the mercy of the Serbs if they did not sign.

[12] Ibid., 206.

[13] Ministry of Defence, *Kosovo: Lessons from the Crisis,* (London: The Stationery Office, 2000), 9.

[14] Paul Strickland, 'USAF Aerospace-Power Doctrine: Decisive or Coercive?' *Aerospace Power Journal,* (Maxwell Air Force Base, AL, Fall 2000), 16.

[15] Ministry of Defence, *Kosovo: Lessons from the Crisis,* 34.

[16] Wesley Clark, *Waging Modern War.* (New York: PublicAffairs, 2001), 176.

17 Strickland, 21.

18 HQ/USAFE Initial Report. *The Air War over Serbia: Aerospace Power in Operation Allied Force*. 25 April, 2000, 9.

19 Unites States Central Intelligence Agency Map, Available on line: www.lib.utexas.edu/maps/europe/kosovo_93.jpg, accessed 18 November 2001.

20 United States Department of State, *Erasing History: Ethnic Cleansing in Kosovo*. May 1999, 6.

21 *AWOS Initial Report*, 15.

22 Ministry of Defence, *Kosovo: Lessons from the Crisis,* 34.

23 *AWOS Initial Report* , 16. By the end of the war the number of USAF aircraft alone would rise to over 500.

24 R. Jeffrey Smith and William Drozdiak, *Anatomy of a Purge*, Washington Post, April 11, 1999, A1.

25 Lt Col Phil M. Haun, A-10 unpublished war diary. F-16CG (Block 40) FACs with LANTIRN targeting pods were also used primarily as night FACs. FAC duties eventually expanded to include US Navy F-14s and Marine F/A-18D Hornets.

26 Steven Lee Myers, 'Serb Forces Under Attack as Weather Clears,' *The New York Times,* 6 April, 1999. By this time, over 400,000 Kosovar Albanians had crossed over into Albania and Macedonia. Christopher Haave and Phil Haun (ed.), *A-10s over Kosovo*, (Maxwell Air Base, Ala: Air University Press, 2002), 23.

27 The 81st Fighter Squadron was relieved to some degree from the continual deployment to Aviano by other active, reserve, and guard A-10 units from 1993-97.

28 Haave, 15. The total number of A-10s continued to grow during the War reaching 23 aircraft with the 81st at Gioia Del Colle, Italy and an additional 18 Air Force Reserve aircraft at Trapani, Sicily.

29 USAF Official photograph accessed online at www.af.mil/photos/fighters2.shtml, 9 Jan 02.

30 Ibid., 42.

31 SANDY was the callsign for A-1D Skyraiders that performed on-scene command of CSARs during Vietnam. A-10s continue to use the SANDY callsign to this day to signify the type mission being conducted.

32 Though there was a shortage of aircraft, there were enough aircrew available to turn the EA-6Bs and F-16CJs for day and night operations. All conventional fighter and bomber aircraft operating in Serbia or Kosovo were required to operate with jamming and SEAD support.

33 An additional 5 aircraft from the 74th FS at Pope AFB, North Carolina arrived in late April with 5 aircraft, 9 pilots and 65 maintenance personnel to augment 81st FS operations.

34 Haave, 22.

35 Ibid., 43.

36 *AWOS, Initial Report*, 9.

37 Phil Haun, 'Airpower Versus a Fielded Army: A Construct for Air Operations in the 21st Century', *The Royal Air Force Air Power Review,* Winter 2001, 74.

38 Haave, 39.

39 The western half of Kosovo was codenamed NFL.

40 Haave, 40. The length and number of vulnerability periods increased as additional FACs, including Navy F-14s and Marine F/A-18Ds, arrived in theater.

41 Only Sandy qualified A-10 FACs were designated as embedded Sandys.

42 Captain Larry Card, A-10 FAC 74th Fighter Squadron, Weapon Questionnaire Gioia Del Colle, Italy, June 1999.

43 Haave, 146.

44 Captain Chris Short, A-10 FAC 81st Fighter Squadron, Weapons Questionnaire Gioia Del Colle, Italy June 1999.

45 Captain 'Itch' Callich, A-10 FAC, Weapons Questionnaire Gioia Del Colle, Italy June 1999.

46 Ibid., 149.

47 Haave 151.

48 The squadron also had Canon 15-power, space-stabilized binoculars, slightly larger than the 12-power binoculars. The squadron A-10 FACs were split down the middle on which they preferred to carry.

49 Have Quick II is a jam-resistant, frequency hopping UHF radio. In addition, the A-10 has a KY-58 secure radio for its UHF and FM radios.

50 The A-10 has a top speed of 350 KIAS, compared to the more common 450 – 550 KIAS flown by other fighters.

51 Haave, 50.

52 Captain Richard Johnson, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

53 *Weapons File 1999,* 2-2.

54 Station 6 is the center line station, but cannot be used if 5 and 7 are loaded.

55 The A-10 has now been upgraded with a GPS inertial navigational system.

[56] NAEW looks similar to a U.S. AWACS, however NAEW does not have the manning, communications suite, or train to control mass strike packages as does AWACS.

[57] Captain 'Boo' Bullard, A-10 pilot 74th Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[58] Dave Gross, 'This Time It's Real,' *A-10s over Kosovo,* Chris Haave (ed.), 71.

[59] Major Wade Thompson, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[60] Captain James Meger, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[61] The A-10's cockpit visibility allows for a downward 45÷ view angle in level flight.

[62] Major Pete Brotherton, A-10 FAC 81st Fighter Squadron, Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[63] Phil Haun, *RAF Air Power Review,* 77.

[64] Captain John Cherrey, A-10 AFAC 81st Fighter Squadron, Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[65] Haave, 214.

[66] 11 May, 1999. Mark Koechle, 'Big Brother' *A-10s over Kosovo,* Chris Haave (ed.), 249.

[67] The Serbs also placed some antiquated tanks out in the open.. Since these were real tanks, it was impossible to distinguish them from more modern tanks from altitude.

[68] 7 June, 1999, 2 days prior to cease-fire.

[69] The validity of the artillery pits was confirmed by the NATO Mission Effectiveness Assessment (MEA) team, which went to the location after the war and found the destroyed artillery. It was suggested by the team that the late date of the attack did not allow the Serbs enough time to remove the artillery before their departure from Kosovo.

[70] These secondary targets, commonly called dump targets, include Serbian Army barracks, weapons storage bunkers, and other fixed Serbian military targets. By the end of the conflict, these targets had been obliterated.

[71] Germany did not provide strike aircraft but did send ECR Tornados for SEAD support.

[72] Haave, 41.

[73] Haun, 'A-10s over Kosovo', *Flight Journal Magazine,* August 2001, 41. The following strike was flown by the author on 15 April, 1999.

[74] This artillery piece was destroyed on 7 June 99, by an F-15E's laser-guided bomb. The target was located and the F-15Es controlled by an A-10 FAC.

[75] Pilots from Germany, Belgium, and the Netherlands have little difficulty with English since most already have excellent English skills and many have been through pilot training in the United States.

[76] Captain James Meger, A-10 FAC 81st Fighter Squadron Weapons Questionnaire, Gioia Del Colle, Italy, June 1999.

[77] Captain John Cherrey, A-10 FAC 81st Fighter Squadron Weapons Questionnaire, Gioia Del Colle, Italy, June 1999.

[78] Captain Michael Shenk, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[79] Captain Joseph Brosious, A-10 FAC 81st Fighter Squadron Weapons Questionnaire Gioia Del Colle, Italy, June 1999.

[80] *Air War Over Serbia, Initial Report*, 15.

[81] Daniel Byman, 'Kosovo and the Great Air Power Debate,' (International Security, Vol. 24, Spring 2000), 5.

[82] U.S. General Accounting Office, *Kosovo Air Operations: Need to Maintain Alliance Cohesion Resulted in Doctrinal Departures,* July, 2001, GAO-01-784, 11.

[83] 'Kosovo and Around It: Bargaining Goes On,' *Belgrade BETA,* 20 May 1999.

[84] The Serbian ethnic cleansing operations of January, 1999, Operation Horseshoe, was so called because of the characteristic formation of Serbian armor.

[85] Although A-10 FACs could operate below lower clouds, the necessity for SEAD and Jammers on station increased the minimum weather ceiling.

[86] Wesley Clark, General (USA) and John Corley, Brig General (USAF) at NATO press conference, Brussels, 16 Sep 1999. www.eucom.mil/operations/af/nato/1999/meabriefing.html, accessed 24 Feb, 2002.

[87] Secretary of Defense, William Cohen, and Chairman of the Joint Chiefs of Staff, General Henry Shelton, provided an initial BDA assessment in a 10 June, 1999 briefing. Henry H. Shelton, Chairman Joint Chief of Staff briefing, Washington, DC: www.defenselink.mil/news/Jun1999/t06101999_t0610asd.html. 10 June, 1999. These numbers were refuted by a much lower total given on 16 June, 1999 by Serb Army Lieutenant General Nebojsa Pavkovic. Rebecca Grant, 'True Blue: The Real Story Behind the Kosovo Numbers Game,' AFA Issue Brief, 1 June, 2000. www.afa.org/library/issues/trueblue.html. · By mid-July, General Clark ordered an Air Force Mission Effectiveness Analysis (MEA) team to go see what was on the ground. General Clark then gave NATO's BDA assessment on 16 Sep, which was similar to Cohen and Shelton's assessment. The numbers are slightly lower because of multiple strikes, which had previously been double counted. Wesley Clark, General (USA), and John Corley, Brig General (USAF), at NATO press conference, Brussels, Belgium, 16 Sep, 1999.

[88] Marty McDonough, 'The Call Sign was Cub 31,' *A-10s over Kosovo,* Chris Haave (ed.,), 180. This is evidenced by the 14 April attack on the Kosovar refugee column by F-16CJ FACs. The CAOC called upon A-10 FACs to verify the targets as military. Upon finding tractors and refugees near the destroyed vehicles, the FACs promptly called off the attack.

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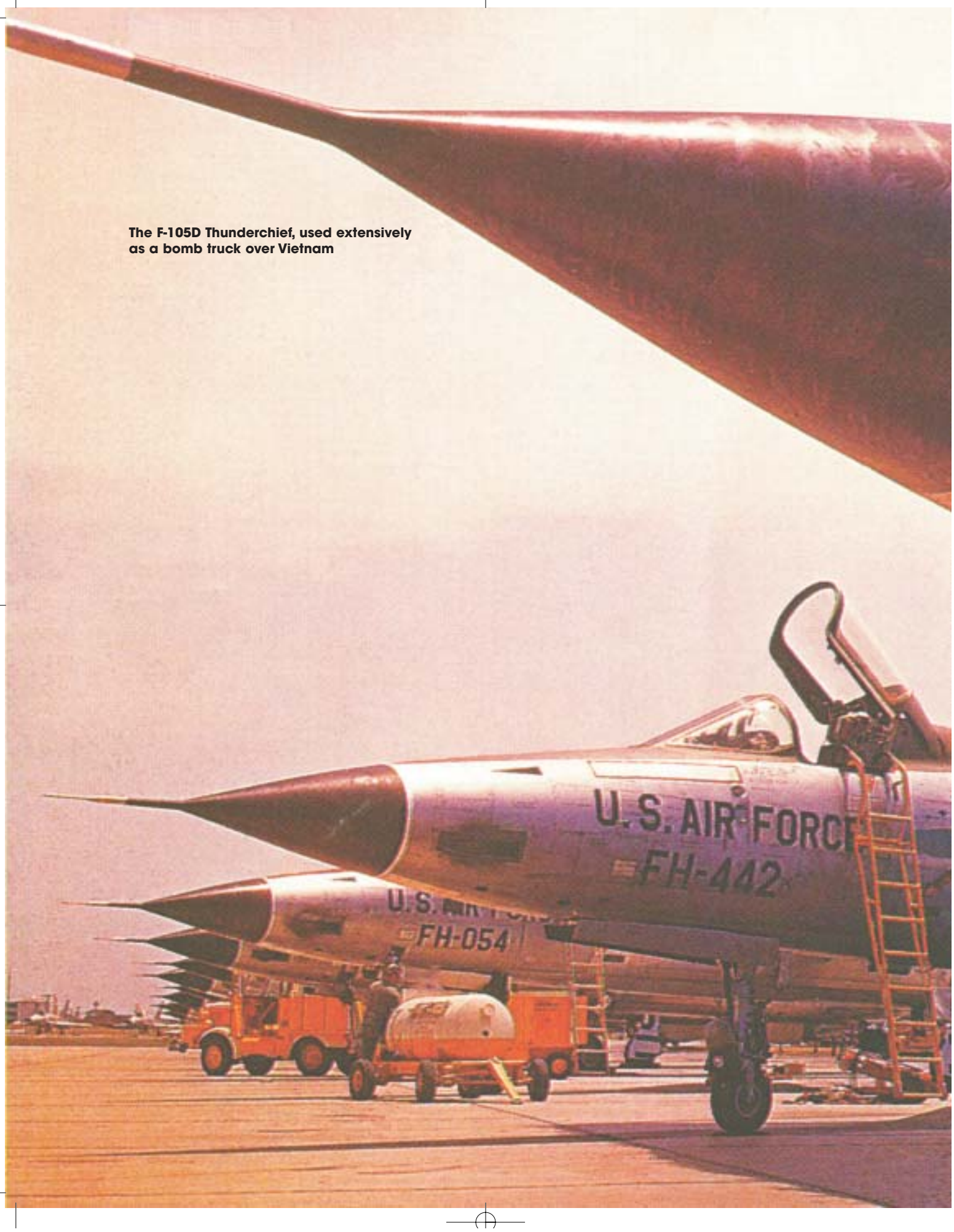

The F-105D Thunderchief, used extensively as a bomb truck over Vietnam

Prejudicial counsel:

Part one of

A Multidimensional Study of Tactical Air Power between the Vietnam and Korean Wars

By Major R L Banks USAF

CHAPTER 1

The Vietnam War was expensive in both human and material terms, and the USAF's failure to 'win' in Vietnam left a legacy unaltered until the Persian Gulf War almost twenty years later. Much of the criticism levelled at the Air Force since Vietnam has focused on decisions of senior leaders in the aftermath of World War Two, which allegedly left the Air Force unprepared for a limited war using tactical aviation. Is this an accurate assessment? Did the Air Force consciously and deliberately degrade its tactical airpower between World War Two and Vietnam? I shall examine decisions made between 1953 and 1961, determining whether and to what extent the US Air Force indeed neglected tactical airpower between Korea and Vietnam.

A wrecked US Skyraider in Vietnam

The United States lost over 58,000 personnel and i nvested over 150 billion dollars in the Vietnam War, but failed to achieve the objectives of countering communist aggression and ensuring the sovereignty of the South Vietnamese government

Carl von Clausewitz's often-repeated axiom 'war is nothing but the continuation of policy with other means' is as true today as two centuries ago.[1] Political objectives have governed military campaigns and have often set the stage for success or failure. America has experienced both competent and inferior policy to influence the outcome of military campaigns, and Vietnam remains the most recent example of the latter.

Poor policy is but one reason why Vietnam represents the nadir of military (and specifically, US airpower) effectiveness. Inadequate command and control, fighter aircraft, munitions, and tactics at the onset of Operation ROLLING THUNDER, all degraded the effective application of airpower in this limited conflict.

In November 1961, the USAF deployed 154 men and sixteen aircraft to Bien Hoa Air Base in South Vietnam to support and train the South Vietnamese Air Force (VNAF).[2] This was the beginning of a gradual five-year increase in deployment and intensity of operations in the Southeast Asian conflict. This 'gradualism' was partly instrumental in ultimate US military withdrawal and the fall of Saigon in June 1975. The United States lost over 58,000 personnel and invested over 150 billion dollars in the Vietnam War, but failed to achieve the objectives of countering communist aggression and ensuring the sovereignty of the South Vietnamese government.[3]

The USAF employed an impressive number of munitions and aircraft, but the outcome was far from ideal. Eight million tons of munitions fell on Southeast Asia between 1962 and 1972, over half on South Vietnam. Over two million were dropped on Laos,[4] and fewer than one million over North Vietnam. Of those eight million tons, 80 percent were dropped by the Air Force. Most of those bombs were general purpose or 'dumb' bombs that fell on jungle targets and failed to prevent both the 'Tet' offensive in 1968 and the 'Easter' offensive in 1972.

That failure was not due to a lack of tactical airpower or conventional munitions. At the peak of Vietnam, the Air Force had one half of all its existing fighters in Southeast Asia.[5] The immense USAF effort in this 'limited' war suffered substantial loss. The Air Force lost 383 of its total F-105 inventory (833)[6] and, overall, lost 2,257 aircraft and more than 2,700 men. From the 625 aircraft lost in combat over North Vietnam, the Air Force rescued 358 men, had 49 men die, had 293 remain prisoners of war (POW), and listed 364 men as missing in action.[7] The Vietnam War was also the first war in which American pilots did not possess a decisive advantage in ratio of air-to-air kills.

The USAF's actions from 1953 to 1961 contributed to its preparedness to employ tactical airpower in Vietnam. In peacetime, military institutions speculate on future possible threats and conflicts. Fog and friction exist in peacetime as in war. To paraphrase Clausewitz: fog is the inability to perceive the essence of a situation and friction is the force that makes what appears 'easy' so difficult. The inability to pierce the fog of determining future threats and to overcome the friction in peacetime force procurement decisions limits the military capability to prepare for war. Adequate preparations in peacetime are as critical to reducing the loss of treasure and lives in wartime, as is the proper employment of military forces in wartime.

Therefore, in peacetime, USAF leadership must strive to correctly anticipate threat and potential conflict. They must develop and procure capabilities to contend with the widest possible spectrum of conflict: an evidently difficult process, but essential. It is also imperative that the Air Force implement a coherent policy from its analysis to mold airpower to meet the anticipated challenges. If incorrect analysis or overemphasis on one strategy occurs, they may be inadequately prepared for war.

Did the Air Force lack the tactical aircraft, conventional munitions, and training required to conduct a limited war?

Since the commencement of the Vietnam War, military historians and senior USAF leaders have lamented the unpreparedness of the Air Force in the early 1960s to wage a limited war employing tactical airpower (limited by the amount of force applied based on political restrictions imposed, number of assets and nations involved, and ends sought).[8] Is this accurate? Did the Air Force lack the tactical aircraft, conventional munitions, and training required to conduct a limited war? Moreover, did the United States Air Force impede the development and employment of tactical airpower during the years leading up to the Vietnam? To answer these questions, I will conduct a detailed examination of the USAF decision-making process used from 1953 to 1961.

I will answer the question: did the USAF properly develop and employ tactical airpower between the Korean and Vietnam Wars? In so doing, I will analyse the USAF decision-making process at three different, but overlapping levels.[9] The following chapter describes the strategic factors that shaped the years leading to up 'Pre-Vietnam' period. Chapter Three describes the first level of the analysis, Model I—systemic level examination of the Air Force decision-making process as it applied to satisfying United States political and military strategy and their impact on tactical airpower. Chapter Four focuses on the second level of analysis, Model II—the organisational level decision-making process within the Air Force regarding tactical airpower. Chapter Five describes the third level of inquisition, Model III—the senior Air Force leaders who influenced the direction of the Air Force programs and who advised the national command authorities. The final chapter concludes with a summary of the areas where the Air Force either advanced or impeded tactical airpower.

QUALIFICATIONS AND SIGNIFICANCE

I do not intend to discuss airpower as a coercive tool of diplomacy, nor its theory, nor even the political and military leadership's conduct in the Vietnam War about which much has been written.[10] Without a doubt, many restrictions on the application of airpower were in place during the war (primarily from the Gulf of Tonkin incident in August 1964 to the Tet Offensive in 1968). Rather, my intention is to analyse

An F-100 unleashes a bomb over Vietnam

Tactical Airpower is defined as the conventional (non-nuclear) combat capability that could contribute to defeat of an adversary's military strategy

the decision-making process within the United States Air Force as it related to the development and procurement of tactical, conventional airpower.

For my purposes, Tactical Airpower is defined as the conventional (non-nuclear) combat capability that could contribute to defeat of an adversary's military strategy. This conventional capability includes air superiority, aerial interdiction, close air support, tactical reconnaissance, but purposely not tactical airlift. Furthermore, I specifically avoid strategic (i.e., nuclear) bombers of the time. The terms 'tactical' and 'strategic' actually refer to a level of warfare, but in the 1950s 'tactical' referred to fighter and 'strategic' to nuclear long-range bombers. My purpose is to focus on 'tactical airpower' as it was considered then.

Proper peacetime planning is vital. First, we should understand the facts that led to 'America's Longest War' and the nadir of tactical airpower employment. Second, officers helping the development of military strategy or the procurement of airpower assets should understand both the strengths and weaknesses in the Air Force's 1950s decision-making process, learning lessons from mistakes made prior to Vietnam. Those lessons should be understood within their context, so that they are not misapplied. Third, historical questions can best be answered only by fully analysing the problem at multiple levels.

I have used a simple measurement to determine whether, during this period, USAF decision-making advanced or impeded the development and employment of tactical airpower. If an Air Force decision contributed to additions in or improvements to (1) tactical aircraft employed in a conventional mission, (2) conventional munitions (air-to-ground and air-to-air), or (3) tactics to deliver conventional munitions, then that decision would indicate that the Air Force was advancing tactical airpower, and vice versa.

In either case, the effects of the decision must be significant enough to apply to a majority of at least one particular tactical airpower mission. For example, the decision to switch from 50-caliber to 20 mm ammunition had only a minor impact overall and therefore would not be considered as an advancement. However, the decision to develop more and better precision-guided munitions for missions 'fragged' to destroy hard targets such as bridges would be considered an advancement in conventional tactical airpower. The context must always be kept in mind in determining just how an Air Force decision impacted on tactical airpower at the beginning of Vietnam.

CHAPTER 2

STRATEGIC CONTEXT

Events post-World War Two directly affected Air Force senior decision-making. This chapter describes strategic contextual post-War factors and the primary events in the Korean War[11] that influenced airpower's development during the 1950s. My purpose is to provide a general understanding of the dynamics that shaped the USAF decision-making process of the 1950s.

STRATEGIC CONTEXTUAL FACTORS PRE-KOREA

From the Japanese surrender in World War Two, the atomic bomb acquired extremely important strategic implications. For the USAF, the lesson learned from Hiroshima and Nagasaki was that a well-planned and well-executed strategic bombardment strike could force surrender. During World War Two, airpower theory was piloted by advocates of strategic bombardment who professed that the principal way for airpower to achieve critical effects was through strategic attack of a nation's vital industrial centres. These advocates opined that tactical airpower should support ground forces in times of dire need and that the bulk of airpower should be devoted to the strategic endeavour. Strategic bombardment could produce the quick and decisive results advocated by many of the early airpower theorists, such as Giulio Douhet and William 'Billy' Mitchell. Moreover, atomic weapons delivered by USAF 'strategic' bombers fit nicely into a post-World War Two American airpower theory and national security policy.

After German and Japanese defeat, US military drawdown occurred quickly as the populace was eager to return to normal. Rapid demobilisation shattered the Air Force. The Army Air Forces stood at 2,253,000 on V-J Day (14 August 1945), but only 303,000 by May 1947. Similarly, flying units fell from 218 combat-ready groups to two by December 1946.[12] The 1947 Department of Defense budget was a meager $14.4 billion compared to the 1945 World War Two budget of over $79.8 billion.[13] The Air Force received slightly more than one-third of the 1947 DoD budget (approximately $5.025 billion).[14] President Truman was adamant about maintaining the diminutive defense budget, his priority being to contend with US domestic issues anticipating no immediate military threat. That would soon change.

On 24 June 1948, Soviet forces blocked all surface access to Berlin from the Western zones of Germany, in an effort to force the allied powers out of the city. The Allied response was an aerial supply effort to ensure that Berlin would not starve. The Berlin Airlift succeeded in supplying over 2,325 million tons of food, fuel, and supplies into Berlin over fifteen months. The blockade of Berlin airlift also portended future US/USSR confrontations.[15]
By 1948, the Soviet Union had become the principal threat to the United States. It had not drawn down its forces in Eastern Europe, maintaining 175 divisions poised to attack.[16] The new NATO countries of

Large numbers of IL-28 Beagles served in Eastern Europe during the Cold war

By 1948, the Soviet Union had become the principal threat to the United States. It had not drawn down its forces in Eastern Europe, maintaining 175 divisions poised to attack

Western Europe and the United States possessed neither the financial nor political will to match this threat. The growing US atomic arsenal was thought to counterbalance Soviet conventional military power in Europe, and deemed less expensive than a matching conventional force. Additionally, atomic weapons fitted nicely into current airpower theory and doctrine. To Air Force leaders, the atomic bomb's destructive potential supported the theory that a strategic attack at the commencement of hostilities could decide a war's outcome prior to mobilisation of surface forces. USAF war plans continued to envisage the striking of 'essential' elements of an enemy's economy similarly to World War Two. It was understood that, although atomic destruction would inevitably be wider, population centers would not be primary targets.[17]

Limited by a $14.4 billion defense budget, the USAF sought to define a decisive mission. In December 1948, it established Continental Air Command (ConAC), to include Air Defense Command (ADC) and Tactical Air Command (TAC). In conjunction with Strategic Air Command's (SAC) forces, the Air Force believed it was ready for any external threat. Its mission was:

'(a) initially, to launch a powerful air offensive designed to exploit the destructive and psychological power of atomic weapons against the vital elements of the Soviet war-making capacity.
(b) To provide on an austerity basis for the air defense of the United States and selected base areas.
(c) To provide the components necessary for the advancement, intensification, and/or diversification of our initial offensive until forces generated from inadequate mobilisation bases have become available.'[18]

The USAF used the 'atomic' mission to fight for a larger share of the DoD budget and the procurement of the B-36 Bomber. In 1947, it only had 27 B-29 bombers capable of delivering atomic weapons,

The B-36 force could be ‘capable of attacking any target in Eurasia from bases in the United States and returning to points of take-off’

which were larger and heavier than non-atomic munitions. According to the Commander of SAC, General Curtis LeMay, the B-36 force could be ‘capable of attacking any target in Eurasia from bases in the United States and returning to points of take-off.’[19] Development of the B-36 would obviate the need for overseas bases.

A heated debate ensued between Navy and Air Force about the B-36. The Navy detected an opportunity to acquire a piece of the atomic ‘pie’ by developing the first flush-top 65,000-ton carrier to launch and recover heavy, multi-engine atomic bombers. The Air Force viewed this as an infringement on its mission of strategic bombardment. In 1949, Secretary of Defense Louis Johnson cut the USS United States, five days after its keel was laid.[20] A ‘revolt of the admirals’ followed, in which the Navy charged senior Air Force leadership with conflict of interest in the procurement of the B-36. Secretary of the Navy Sullivan resigned in protest. The Navy’s charge was ultimately found baseless by the House Armed Services Committee and caused the removal of the Chief of Naval Operations, Admiral Denfeld.[21]

SOVIETS, ATOMIC WEAPONS, AND THE USAF

In 1949, the United States’ monopoly on atomic weapons was broken. High levels of radio-activity over the North Pacific[22] revealed that the Soviet Union had detonated its first atomic bomb and had joined the arms race. US atomic weapons were now not only a conventional deterrent, but essential to destroying Soviet atomic capability. A robust atomic capability was now needed to deter potential Soviet atomic

Soviet possession of atomic weapons now furthered the USAF's push for more bombers and atomic weapons

attack, and the Air Force's strategic bomber force would quickly fill that role.
Despite its strategic mission, the USAF remained aware that strategic bombardment might not win wars alone. USAF Chief of Staff General Vandenberg testified:

'Lest this statement be again tortured into a declaration that strategic bombardment can win war alone, let me restate my belief that if a future war comes ultimately it must be concluded on the ground, like most of the wars of the past. But it is the objective of the strategic bombardment program—an objective which has been proved in battle—so to weaken the sustaining sources of enemy troops that they can be defeated in less time at less cost.'[23]

General Vandenberg understood that, although strategic atomic bombardment was the mainstay of deterrence, tactical airpower was also necessary for success once hostilities commenced. Unfortunately, the DoD budget could not allow sufficient numbers of both strategic bombers and tactical fighters. The Air Force made the choice based on the 'worst case' threat scenario—a Soviet attack into Western Europe for which US atomic weapons were necessary to offset the perceived military imbalance. Soviet possession of atomic weapons now furthered the USAF's push for more bombers and atomic weapons.

THE IMPACT OF A DECLINING DEFENSE BUDGET

In 1949, a proposed 70 groups were cut back to 48, seriously degrading USAF capability to support ground forces. F-80, F-84, and F-86 fighter aircraft were to be the primary US tactical jet fighters, and cancellation occurred of 51 B-45 light bombers, 118 F-93 fighters, and 30 C-125B assault transports, freeing-up approximately $270 million[24] for the purchase of 32 additional B-36s and 7 RB-36s and to modifying existing B-36s with jet engines. Also, senior Air Force leaders accepted the B-52 as the follow-on replacement for the B-36. The F-86 would remain the best interim fighter for the foreseeable future.

In 1950, President Truman ordered a review of political and military strategy in light of the new Soviet atomic threat. The National Security Council (NSC) recommended (NSC68) an immediate build-up of military strength to deter Soviet aggression and general war,[25] estimated at $50 billion per year for the next several years. Truman disagreed, and attempted to limit the military budget to $15 billion (1951) and $13 billion (1952). Assessing the threat, General Vandenberg ensured priority of funding for the strategic bombers to the detriment of tactical airpower. The budgetary dilemma became a moot point when North Korea invaded South Korea: much more than $15 billion would be needed. By 1953, the DoD budget would swell to $43 billion, with the Air Force share $15 billion.[26]

The United States were unprepared for the Korean invasion of June 1950, declaring that the Republic of Korea (ROK) lay outside their sphere of military influence

American tactical airpower was crucial during the Korean War. Close air support (CAS) was provided to retreating US and ROK ground forces, and the Pusan perimeter was held

THE STRATEGIC CONTEXTUAL FACTORS: THE KOREAN WAR

The United States were unprepared for the Korean invasion of June 1950, declaring that the Republic of Korea (ROK) lay outside their sphere of military influence. The Air Force possessed forty-eight aircraft wings and 411,000 personnel.[27] With no DoD war plans for Korea, the USAF scrambled to rush fighters (F-51 and F-80) from Japan to support the US and ROK ground forces that were retreating to Pusan. Many Americans were unsure of US interests in Korea, but at the senior US government level and within the Joint Chiefs of Staff (JCS), most felt that the North Koreans had to be stopped.

To fight the North Korean act of aggression, America was forced to exceed the NSC recommendations. In July, Secretary of Defense Johnson approved an increase of ten more combat wings and 50,000 additional personnel for the Air Force.[28] The President next agreed an increase to seventy-one wings by June 1951,[29] and shortly afterwards the JCS agreed an expansion to 143 wings, with over half directed to the strategic air offensive.

Many senior US State and Defense officials believed that Korea was a distraction and that the real war – the Soviet invasion of Europe – was imminent. The Air Force therefore conserved its vital assets (atomic-capable B-29s and B-36s) for Europe, which limited its forces in Korea. Likewise, US strategy was also limited in that the only politically acceptable targets for airpower were in Korea. Concerned about escalation to a global war, President Truman restricted the use of airpower to the Korean peninsula and prohibited attacks into China.[30] For the Koreans, the war was not limited—it was an all-out, total war for Korean unification, and the United States' war objective was to halt communist aggression and re-establish the status quo ante border. During this struggle, US and NATO forces were on alert for Soviet aggression in Europe.

TACTICAL AIRPOWER USE

American tactical airpower was crucial during the Korean War. Close air support (CAS) was provided to retreating US and ROK ground forces, and the Pusan perimeter was held. Tactical fighters and B-29 bombers prepared the area surrounding Seoul for General MacArthur's amphibious assault at Inchon. They bombed Seoul's airfield, and cut North Korean supply-lines. Tactical airpower was essential in securing Seoul and assisting the offensive drive north of the 38th parallel. After Inchon, US war objectives changed to pushing North Korean communist forces out of Korea and reunifying the peninsula. Chinese counter attacks across the Yalu River drove the allies back south across the 38th parallel. Again, tactical aircraft proved invaluable to the retreating ground forces. The US war objectives changed again to now containing the Chinese forces and re-establishing the original border at the 38th parallel.

US Far East Air Forces (FEAF) tactical aircraft such as the F-51, F-80, F-84, and the B-26 initially flew CAS sorties from bases in Japan until secure airfields were established on the Korean peninsula. Aided by slow-moving target-spotting T-6 'Mosquito' aircraft, they were directed in for the attack. Being air defenders, the FEAF fighter pilots were untrained in the CAS role[31] and, by the end of 1950, 18 aircraft had been lost.[32] This lack of training significantly impeded the success of CAS operations. The US Marine Corps achieved dramatically better results in CAS missions: 70 percent of them were World War Two CAS veterans. Poor Air Force performance led Major General Weyland, a tactical air expert who had supported Patton's Third Army in Europe during World War Two, to institute changes in CAS procedures that resembled doctrinal procedures established in World War Two. Improvements resulted, and by the war's end, FEAF aircraft had flown 57,665 CAS sorties with results resembling thos of the Marines.[33]

Next, Weyland shifted Air Force emphasis to interdicting North Korean and later Chinese supply lines. With few air assets in theatre, it was difficult for the FEAF Commander, Lt General Stratemeyer, to achieve meaningful results without consolidation of all United States air assets to ensure unity of effort of available forces. There were three different services operating aircraft independently in Korea: FEAF (USAF), a Marine Air Wing (USMC), and Task Force 77 (USN).[34] Each service demanded control of its own air assets, preventing unified command (one of the central tenets of airpower doctrine). Regardless of command and control problems, the Air Force focused on stopping the flow of enemy and their supplies to the front. Drawing on World War Two experience, Air Force leadership was again trying to find a decisive application of airpower to quickly bring the war to an end with less loss of treasure and men. Having already attacked all the strategic targets in North Korea, the FEAF sought to cut the enemy's logistical lines of communications from China. Interdiction proved invaluable during the strategic retreat from the Yalu, providing much assistance to the outnumbered allies, but after stagnation along the 38th parallel was less so, because North Korean and Chinese ground forces needed little support from the northern supply lines. The US had wrongly supposed that the enemy needed war-sustaining materials comparable with their own, and interdiction failed to overcome a redundant Chinese supply system reliant on terrain, camouflage, and seemingly endless reserves of personnel to repair damage and transport supplies.[35] The operation failed to cut the enemy's supply line, and failed to end the war. This incorrect perception would haunt the United States more than a decade later in Vietnam with similar results.

The arrival of Soviet MiG-15s contested USAF air superiority without which surface forces were vulnerable, and contributed to the failure of the interdiction campaign. USAF air defense F-84s and Navy F9Fs were no match for the MiG-15, but US air superiority was largely regained with the arrival of the F-86.

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The MiG-15s operated by North Korea were supplied by the USSR and flown by Soviet pilots

As it was, the MiG's poor range posed little threat to allied ground forces, but US bomber missions deep into North Korean 'MiG Alley' told another story. The F-86 was designed, not as a day air superiority fighter, but a multi-purpose fighter-bomber. Although similar in performance to the MiG-15s, the F-86s achieved an impressive kill-ratio of 10:1 over the MiGs[36] owing to better training, more experienced and aggressive pilots, better tactics, and hydraulic assisted flight controls to assist maneuverability. Unfortunately for the American airmen, the MiGs arrived in much larger numbers, overwhelming the air superiority aircraft assigned to protect the bombers.[37] US air superiority over the front and in South Korea was absolute (supremacy), but over the northern part of North Korea where the interdiction campaigns were conducted it was questionable.

Many of the classic 'counterair' targets, such as airfields, were beyond the Yalu River in China and were off limits to the FEAF pilots. US pilots wanted to attack the MiGs on the ground in order to eliminate the air threat once and for all. Fearful of escalating the war further and involving the Soviet Union, President Truman restricted the employment of airpower across the Yalu River and on such lucrative targets, permitting an environment in which the Soviet Union continued to provide MiGs to the Chinese without interference. With more MiGs, the Chinese exacted a tremendous toll on FEAF bombers. The FEAF lost 57 B-29s—a figure so high that Air Force leaders curtailed B-29 operations in or near MiG Alley.[38]

The Korean War witnessed technological innovation for air combat. First used in World War Two, chaff (tiny strips of aluminium cut to interfere with radar waves) was employed extensively: large bundles (chaff clouds) masked both fighters and bombers from surface radars that directed anti-air artillery. Unfortunately, restrictions prohibited the FEAF aircraft from employing chaff until 1951, limiting its overall effectiveness.[39] Second, SHORAN (Short Range Radio Navigation) was successfully used to

Unfortunately for the American airmen, the MiGs arrived in much larger numbers, overwhelming the air superiority aircraft assigned to protect the bombers

aid aircraft to attack invisible ground targets. Both at night and in poor weather, SHORAN assisted FEAF fighters and bombers in interdicting Chinese and North Korean surface targets.[40] Third, American aircraft began carrying IFF (Identification: Friend or Foe) transponders, enabling them to distinguish hostile aircraft. Fourth, ECM (electronic counter measures) were available and sparingly used against enemy radars. Their use was limited in case Soviets learned about them and developed counter-measures to them (ECCM), which might negate the American strategic bombers' capability to penetrate Soviet airspace if such a need arose.[41] Technological innovation gave the USAF the edge in a complex, limited war.

NUCLEAR OPTIONS

When the Chinese pushed south in mass, the President Truman contemplated the use of atomic bombs, prompting a visit by British Prime Minister Clement Attlee to the White House.[42] Attlee echoed the views of many world leaders that atomic weapons might provoke the Soviets into war on the side of the Chinese: a similar atomic response from the Soviets could launch World War Three. President Truman responded to Attlee's visit by announcing that only the President could authorise the use of atomic weapons, thus comforting the world with the belief that this limited war would not escalate into total war.

The stalemate at the 38th parallel and the Korean War in general were contentious issues in the 1952 presidential race. Dwight D. Eisenhower won with the promise of a balanced budget and an end to the Korean War. Frustrated with fruitless negotiations, and seeing mounting casualties, Eisenhower secretly threatened China with atomic attack;[43] unlike many military leaders, he did not believe an atomic war with the Soviets likely. Stalin died in March 1953, and Eisenhower persuaded China to sign an armistice in July.

LESSONS LEARNED FROM THE WAR

On cessation of hostilities, the USAF began to analyse the war for lessons learned. America had over 34,000 personnel killed in action and 105,000 wounded. FEAF had flown 720,980 sorties delivering 476,000 tons of ordnance against the enemy, losing 1,466 aircraft and suffering 1,729 casualties: dead, wounded, and POWs.[44] Unprepared, unequipped, and untrained for a massive air support operation, the Air Force had relied on World War Two experience and helped to stop communist aggression on the peninsula. Despite political constraints, airpower had contributed significantly to the outcome.

Air superiority was shown to be absolutely necessary: military success could not be achieved without it. Unfortunately, the Air Force walked away from Korea believing that its multi-role fighter was an adequate platform for air superiority, if employed in sufficient numbers. The F-86, even though not designed as an air superiority fighter, proved highly effective against Soviet air threats.

On the air-to-ground side, strategic bombardment, interdiction, and close air support produced mixed lessons. Political restrictions on bombing meant that truly lucrative targets escaped attack and no real lessons emerged. Many USAF leaders believed Korea was an aberration of the kind unlikely to occur again;[45] nevertheless, close air support provided lessons to be learned no matter where the next war would be. Anytime ground forces were employed against an enemy, tactical airpower would be required to support the Army. In Korea, CAS proved highly effective and essential to ground commanders, although the Army believed the support inadequate. Later CAS exercises confirmed this—lack of adequate numbers, timeliness of strikes, and poor communications. The Army wanted Air Force pilots as

FACs, but the Air Force needed them to fly, even cancelling the Mosquito system of air direction in order to focus on strategic missions.[46]

Several interdiction lessons emerged. First, SHORAN could get aircraft to the general target area, but at night and in adverse weather was insufficiently accurate to allow the precision found in visual attack. Second, ECM technology could not prevent optically fired surface-to-air guns from hitting FEAF aircraft. Moreover, US tactics forced them into the heart of the anti-aircraft artillery (AAA) engagement envelope. Precision-guided bombs delivered from outside the AAA threat envelope were far from accurate, and their use unpopular. Third, a pilot's experience was crucial to success. Near the end of the war, experience levels dropped because of rotation of pilots back to the States and a lack of a training program to replace them.

Despite the restrictions imposed, the Air Force believed overall that it had accomplished its mission. Some USAF leaders believed that those restrictions prevented the proper application of airpower,[47] and that the US should avoid future limited conflict with restrictions. Other USAF leaders were satisfied with airpower's achievement in Korea, with F-86s for air superiority and F-80s, F-84s, and T-6s for close air support, although success of the interdiction campaign was contested. USAF leaders were content that FEAF had held the Chinese to the 38th parallel, and did not feel compelled to change anything. Historians have pointed out though, that the Air Force had failed to achieve its primary goal of evicting the communists from the peninsula or its subordinate goal of preventing a Chinese offensive at the 38th parallel. USAF leaders failed to realise was that the armistice was due less to airpower, and more to strategic events (Eisenhower's nuclear threat and Stalin's death). In all probability, Chinese agreement to the armistice was due to the achievement of a political objective—preservation of North Korea.[48]

THE STRATEGIC CONTEXTUAL FACTORS: POST KOREAN WAR

After Korea, President Eisenhower stated that the US would never again be tied down in such a war;[49] there would be no future restrictions. He believed that nuclear weapons were now the weapons of choice. In 1953, he told the NSC, *'Our only chance of victory, would be to paralyse the enemy at the outset of the war…If war comes, the other fellow must have started it. Otherwise we would not be in a position to use nuclear weapons, and we have got to be in a position to use that weapon…'*[50] The Korean War had forced him to take a 'new look' at US military strategy and requirements, re-evaluating mission and force posture.

After Korea, the USAF possessed 106 active wings, but only 93 were considered operational.[51] While the JCS studied the world situation, they were given an interim level of 120 wings to replace the 143-wing objective. As they studied the Korean War and contemplated the next conflict, many USAF leaders believed that a future war would not have the Korean luxuries of air superiority, strategic bombers conducting interdiction missions, and the freedom of the seas: Korea had been an anomaly. The USAF Secretary wrote in 1955, 'The Korean War was a special case, and airpower can learn little from there about the future role in United States foreign policy.'[52] Again the US military establishment focused largely on a single Soviet threat and nuclear weapons to contain that threat.
As the US military made post-war preparations, the Eisenhower administration was already looking at the limited conflict in French Indochina, a conflict that would plague the United States a decade later as Vietnam. The 1950s would see confrontations in Lebanon, Formosa, and Berlin. We can now see that Korea was less of an aberration than was thought. Tactical airpower achieved mediocre success in Korea and would be underemphasized in the decade that followed. Just how underemphasized and to what extent is the focus of the remainder of this study.

CHAPTER 3

MODEL I ANALYSIS: US TACTICAL AIRPOWER FROM 'NEW LOOK' TO 'FLEXIBLE RESPONSE'

Taking office in 1953, President Eisenhower, a former Army general, changed the national security policy drastically. Striving for a balanced federal budget and 'no more Koreas', he halted the growth of the Department of Defense (DoD) spending.[53] Tactical airpower would be severely cutback over the next eight years for reasons I shall explain using Allison's 'Model I' framework. Areas of examination include the national security policy, national military strategy, and decision-making process in the development and procurement of tactical airpower during the 1950s.

MODEL I DECISION-MAKING

What determines force structure? Historians have linked objectives to doctrine. If a state has an objective, then a particular doctrine will lead to a quantifiable force structure necessary to achieve that objective. If the Soviet Union desired to conquer the world or Europe, then given its established military doctrine, a large and specific type of military force would be necessary to defeat its foes and occupy the land sought. Oftentimes it appears logical to proceed in this fashion in an effort to explain why a country possesses the forces it does. Many historians have stated that a country makes its decisions as if it were a unitary (that is a single entity with one voice), rational actor. According to Allison, the rational actor (the state in this example) is faced with alternatives or courses of action and tends to choose the alternative that maximises value within specified constraints. 'In economics, to choose rationally is to select the most efficient alternative, that is, the alternative that maximises the output for a given input or minimises input for a given output.'[54] In the Soviet example, the force posture selected would be based on a value-maximising decision-making process to achieve its strategic objectives, which would fall within Soviet doctrine.

According to Allison, the concepts of the rational actor model include: 'Goals and Objectives,' 'Alternatives,' 'Consequences,' and 'Choice.'[55] When facing a decision or problem, the rational actor will place some 'value' or 'utility' on the outcome of the goals and objectives it desires. Through the decision-making process, the actor will accumulate alternative courses of actions and rank them according to their value or consequence. Rational choice consists of simply choosing the best alternative. If a nation decides upon a particular course of action, then it must have had some desired end toward which the decision constituted a maximising means. If the Soviet Union's objective was to conquer Western Europe, then in keeping with Soviet doctrine, the USSR might wish to position a massive ground force in Eastern Europe. If the Soviets were concerned about United States intervention, then some additional force structure may be required (strategic nuclear weapons) in order to deter the Americans from interfering with Soviet objectives. From a Model I perspective, only the most efficient alternative (from the Soviet point of view) would be chosen to meet its objectives. Other alternatives that did not appear to be as efficient would be discarded.

I will now apply Allison's Model I approach to analysing America's decision-making process to establish why the US force structure, as it pertained to tactical airpower, was postured the way it was at the start

of the Vietnam War (1961). A Model I analysis assumes that the United States was a unitary rational actor that possessed a specific national security policy, which drove its national military strategy selection. This, in turn, dictated a variety of alternative courses of action, which led to a value-maximising choice. From this military strategy choice, a Model I analysis may explain why tactical airpower evolved as it did.

US NATIONAL SECURITY POLICY DURING THE '50S

In September 1950, the NATO Military Committee requested a conventional force build-up to counter the extensive Soviet conventional forces positioned in Eastern Europe (175 divisions). The desired NATO goal was 96 divisions and over 4,000 aircraft, with United States Air Forces Europe (USAFE), at the time possessing 2,100 aircraft and 16 wings, expanding to 28 wings.[56] However, when Stalin died in 1953, several European countries backed away from the ambitious goal and focused their attentions on internal economic affairs.

As previously noted, President Eisenhower likewise favoured a smaller military to alleviate some of the US economic burdens arising from the Korean War. In the President's first State of the Union address to the Congress in 1953, Eisenhower stated that his foreign policy recognised that no single country alone, even the United States, could defend the world against communist aggression. He intimated that the United States and its allies should rely on 'mutual security' and 'mutual co-operation' to overcome the financial burden of this tremendous task.[57] Eisenhower thus posited that fewer US forces would be needed overseas, reducing the strain on the military force structure. Less military spending meant more domestic spending. There must also be a balance between a strong military and economic growth. He went on to state:

> *Our labor for peace in Korea and in the world imperatively demands the maintenance by the United States of a strong fighting service ready for any contingency. Our problem is to achieve adequate military strength within the limits of endurable strain upon our economy. To amass military power without regard to our economic capacity would be to defend ourselves against one kind of disaster by inviting another.*[58]

In April 1953, Eisenhower presented to Congress his plan concerning the reorganisation of the Department of Defense, stating that the United States was not a 'military-minded' nation and had not been properly prepared for the outbreak of war (both World Wars and Korea).[59] He went on to say:

> *We in the United States have, therefore, recently embarked upon the definition of a new, positive foreign policy. One of our basic aims is to gain again for the free world the initiative in shaping the international conditions under which freedom can thrive. Essential to this endeavor is the assurance of an alert, efficient, ever-prepared defense establishment…These simple facts make imperative the maintenance of a defense commanding the most modern technological instruments in our arsenal of weapons*[60] *(emphasis added).*

The 'most modern technological instruments' referred to were nuclear weapons. Unlike Truman, Eisenhower considered them an integral part of the military arsenal. His reliance on nuclear weapons to justify cutbacks in expensive conventional military capability was the foundation of his international policy, the 'New Look.'

The basic planning document for the New Look was titled National Security Council (NSC) 162/2, which the president approved in October 1953. 'NSC 162/2 began by defining a twofold central national

security problem: (a) to meet the Soviet threat to U.S. security; and (b) in doing so, avoid seriously weakening the U.S. economy or undermining its fundamental values and institutions.'[61] NSC 162/2 focused on the Soviet Union as the primary threat, although potentially 'other communist' countries (e.g., China) were not excluded. NSC 162/2 capitalised on Eisenhower's desire to rely on nuclear weapons for deterring the communist threat. It stated, 'in the event of hostilities the United States will consider nuclear weapons to be as available for use as other weapons.'[62]

In short, nuclear weapons were to be the primary means of deterring communism. Furthermore, by greater reliance on its allies, the US could continue to divert its precious dollars on domestic issues and not on a larger military infrastructure. Procuring nuclear weapons and their delivery platforms (strategic bombers) would be significantly less expensive than the large conventional force NATO had requested in 1950. NSC 162/2 accurately predicted that both super powers would engage in a nuclear arms race, but the US had to maintain its lead to deter the Soviets from general war. If the worst happened, the United States would win with a 'massive retaliation.' Furthermore, it was postulated that if massive retaliation could deter nuclear war, then nuclear weapons would also deter forms of war less than total nuclear war.[63]

US MILITARY STRATEGY

In January 1954, US Secretary of State Dulles presented 'Massive Retaliation' as the new military strategy for the United States, becoming synonymous with New Look. Dulles indicated that instant, massive, nuclear retaliation would be applied to the existing strategy of deterrence. Massive Retaliation would give the United States the initiative in any future conflict by allowing America to choose the means, the time, and the place of retaliation.[64]

As in World War Two, the United States' focus internationally remained a 'Europe first' strategy. US leaders believed that, short of a direct attack on the continental United States, an invasion of Europe was the worst threat to American security. Holding the permanent position of Supreme Allied Commander Europe (SACEUR), America would always be extremely influential in NATO affairs. Unsurprisingly, NATO followed in America's footsteps. In December 1954, the NATO Military Committee (MC) formulated its equivalent to NSC 162/2—MC 48, which encapsulated NATO's nuclear doctrine, stating that NATO would use nuclear weapons at the commencement of hostilities with the Soviet Union whether or not the USSR used them first.[65] If and when future minor border skirmishes with the Soviet Union escalated, then NATO was to retaliate with the full weight of its nuclear arsenal. There was no concept of 'limited war' with the Soviet Union. NATO's conventional force, therefore, was a 'trip-wire' to compel the start of a general nuclear war should the Soviets launch an offensive in Europe.

'DROPSHOT'

Plan 'DROPSHOT' was the United States' secret war plan against the Soviet Union, evolved from the Truman Administration in 1949. Designed by the JCS, DROPSHOT assumed for planning purposes that nuclear war would break out in January 1957 and that America's first course of action would be to deter Soviet aggression.[66] According to the plan, it was vital that the Soviets understood that any attack against the US or its allies would require an immediate nuclear response. They should expect the risk of general nuclear war if the slightest infringement upon friendly nations occurred. If war did occur, then in co-operation with its allies, a solidly postured US military would defeat the 'Communist-dominated armed rebellions.'[67] The plan did not specify if 'rebellions' included USSR support for wars of liberation, but the wording of the plan suggests that the authors intended to contain Soviet aggression at all levels of conflict with nuclear weapons.

Bombing missions were intended to be a one-time mission (sometimes a one-way trip) that relied on electronic means to distract Soviet air defenses

DROPSHOT called first for the defense of the Western Hemisphere and European Allies. If war broke out, the allies were to destroy the Soviet Union's will and capacity to resist by launching a powerful nuclear air offensive in Western Eurasia.[68] Next, friendly forces were to launch a discriminate containment plan totally encircling the Soviet Union, secure strategic areas and bases, secure sea lines of communications, and wage political, economic, psychological, and underground or guerrilla warfare. Lastly, the plan called for launching 'co-ordinated offensive operations of all arms against the USSR as required.'[69]

A preventive nuclear attack was preferred, but regardless of which country attacked first, the nuclear air offensive was designed to simultaneously strike varying parts of the Soviets' war-making capability. Target selection was similar in philosophy to that of World War Two air planners except that enemy's nuclear capability was now targeted. According to the DROPSHOT's planners, the most important targets for strategic airpower were:

> (a) Stockpiles of weapons of mass destruction, and facilities for their production; (b) Key government and control facilities; (c) Urban industrial areas (d) Petroleum industry; (e) Aerial mining against sub marines; (f) Submarine bases; (g) Transportation system; (h) Aircraft industry; (i) Coke, iron, and steel industry; and (j) the electric power system.[70]

Tactical Airpower's Role

With the emphasis on nuclear weapons in national security and military strategy, DROPSHOT planners gave only a minor part to conventional tactical airpower. It would be needed for air superiority in the defense of both the US and Western Europe, and it was critical to DROPSHOT's success that Soviet strategic airpower did not penetrate US and NATO air defense. Within Europe, there was a limited role for ground attack missions in the event of Soviet invasion. The planners saw little point in planning for such occurrences since the initial air offensive was to be nuclear. There would be little for tactical airpower to attack after a nuclear strike.

Despite the lessons learned from World War Two and Korea, escort of long-range bombers was discounted as a mission for fighters.[71] Bombing missions were intended to be a one-time mission (sometimes a one-way trip) that relied on electronic means to distract Soviet air defenses. Besides, to be effective as a war strategy, nuclear bombardment did not need the 100 percent success of its bombers. During war gaming, DROPSHOT planners concluded that approximately 70 percent of the bombers would get through Soviet defenses.[72] This figure was acceptable to guarantee success of DROPSHOT. More importantly, fighter escorts lacked the range to escort bombers great distances.

Despite this, tactical airpower did flourish as a means of delivering tactical nuclear munitions. Perfected in the early 1950s, tactical nuclear munitions were smaller and less destructive than the nuclear bombs employed by strategic airpower, consisting of the development of tactical nuclear artillery, rockets, and missiles for battlefield use.[73] US tactical airpower could now contribute to the New Look strategy through the employment of tactical nuclear munitions in Europe.

As a result, tactical nuclear airpower grew while tactical conventional airpower remained virtually unchanged since Korea. During the 1950s, the Air Force developed several fighters that contributed to America's military strategy. The F-84 and F-100, along with the F-86, were the only multi-role fighter-bombers designed for the conventional role throughout the 1950s (and the early 1960s for the F-100).74 Others were developed for nuclear or nuclear-related missions: fighter-bombers such as the F-101C, F-104C and G, and the F-105 were developed, and envisioned to augment the war plan's use of strategic bombers, delivering a tactical nuclear payload and returning at high speed. Thenceforward,

F104Cs

Fighter-bombers such as the F-101C, F-104C and G, and the F-105 were developed, and envisioned to augment the war plan's use of strategic bombers, delivering a tactical nuclear payload and returning at high speed

the Air Force's Tactical Air Command (TAC) came to be known as a 'junior Strategic Air Command.'[75] To defend the United States against Soviet strategic bombers, aircraft such as the F-102, F-104A, and F-106 were created, without excessive agility. For reconnaissance, the F-100 and F-101 were modified to carry intelligence-gathering equipment.[76] Two remaining tactical fighters employed in Vietnam, the F-4 (navy-developed) and the F-111, were either modified or developed for USAF use after 1961.[77]

The Air Force posited that its tactical airpower, delivering tactical nuclear munitions, was instrumental in the achievement of national political objectives in Europe, finding favor within Eisenhower's approach of using the military efficiently to reduce military spending. Furthermore, the President and his military planners believed that tactical nuclear airpower 'represented both a psychological and physical contribution to the deterrence of Soviet aggression in Western Europe.'[78] This added mission would give the Air Force a larger share of the defense budget.

SPUTNIK AND THE RISE OF ICBMS

On 4 October 1957, the Soviet Union launched Sputnik I, the first man-made satellite in history. Chairman of the JCS, Air Force General Twining, stated the launching of Sputnik I was 'a shot fired which was both seen and heard around the world.'[79] A month later came Sputnik II, a 1,120-pound rocket that safely delivered a dog into orbit and back to Earth. The Soviets' success with missile technology 'created dismay everywhere outside the Iron Curtain.'[80]

The Soviets' success with missile technology ' created dismay everywhere outside the Iron Curtain

The launching of Sputnik proved the Soviets' lead in missile technology, raising fears of a nuclear delivery to America or Western Europe through space. Eisenhower and Congress increased funding to DoD and its intercontinental ballistic missile (ICBM) programs, which fell under both the Air Force and the Army. Missiles such as Atlas, Thor, Jupiter, and Titan evolved during this period. The net result in the Air Force was a greater emphasis on the strategic nuclear missions and a diminished concern for conventional tactical airpower. Throughout most of the 1950s and early 1960s, the Air Force possessed the largest percentage of the DoD budget (see Table 1). Tactical airpower's share of the Air Force budget dropped to its lowest level since 1948 (See Table 2), meaning that, on a systemic level, it could not advance compared to strategic airpower. Not until the early 1960s did the Air Force begin to increase funding to tactical airpower, primarily because of the doctrine of 'flexible response.'

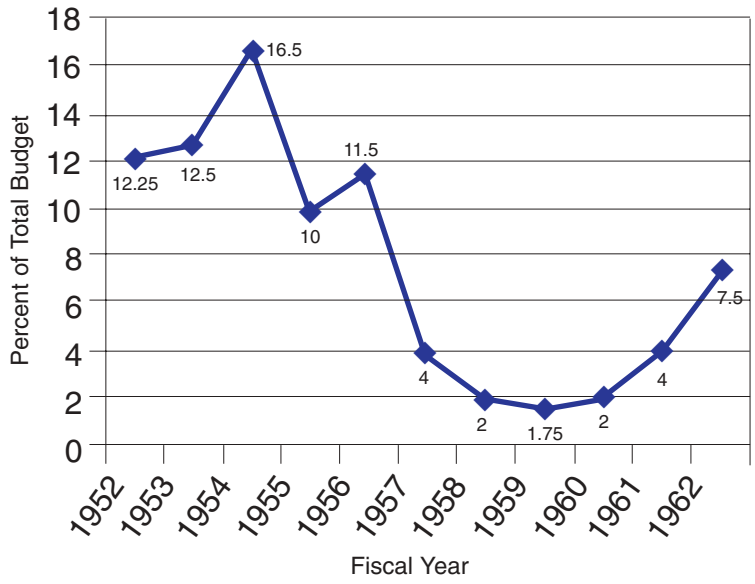
OBJECTIONS TO MASSIVE RETALIATION

In 1953, the United States possessed 1,000 nuclear weapons; by 1960 18,000, with megatonnage increasing more than twenty-fold.[81] Intelligence reports showed that the Soviets were reaching parity. During the 1950s, many notable figures discussed deterrence theory, credible second-strike capability, and mutual assured destruction (MAD). The critics' main objection to massive retaliation was its perceived lack of credibility. In 1954, Bernard Brodie questioned America's national security policy, doubting whether US would indeed launch a nuclear attack over a minor conflict.[82] Similarly, Henry Kissinger warned of the incompatibility of the New Look and limited war. Moreover, limited conflict around the world might increase. Even NSC 162/2 and DROPSHOT acknowledged that limited war was more likely with the Soviet Union. In the United Kingdom, Marshal of the Royal Air Force Sir John Slessor stated, 'We can take it as a foregone conclusion that our opponents, having decided that it will be too costly to overwhelm us by direct assault, will take every opportunity to turn or undermine our defenses by other means.'[83]

Fiscal Year	Army	Navy	Air Force	Defense Agencies	Total DoD	USAF Percent of Total DoD
1953	16,337	11,878	15,087	409	43,711	34.5%
1954	12,910	11,293	15,668	464	40,336	38.8%
1955	8,899	9,733	16,407	494	35,532	46.1%
1956	8,702	9,744	16,749	596	35,791	46.7%
1957	9,063	10,398	18,363	615	38,439	47.7%
1958	9,051	10,906	18,435	669	39,062	47.1%
1959	9,468	11,728	19,084	953	41,233	46.2%
1960	9,392	11,642	19,066	1,115	41,215	46.2%
1961	10,131	12,215	19,778	1,105	43,228	45.7%

Figures are in millions of dollars. Source: 'Expenditures, Summary by Service' *Department of Defense Fact Book, 1947 – 1978* (Washington D.C.: United States Government Printing Office,1978), 27).

TABLE 1. Department of Defense Budgetary Summaries:1953 - 1961



Source: 'A Study of Aviation Responsibilities: Air Force – Army, June 1962' United States Air Force Study located at United States Air Force Historical Agency, call number K143.043 - 5.

TABLE 2. Tactical Aircraft Production as a Percentage of Total Air Force Budget

Widespread doubts arose over the superpowers' intent to wage total nuclear war over minor national interests. Would one nation risk nuclear suicide over the invasion of one of its allies? French political leaders questioned whether the US would 'trade Lyons for New York' if the Soviets were to strike France with nuclear weapons. French General Gallois, and later French Presidents Mollet and de Gaulle, believed not,[84] and there was a lack of confidence in the United States' deterrence policy. America was betting that nuclear deterrence would discourage enemy military action (nuclear or conventional) by indicating that the risks and costs of nuclear war would outweigh territorial gains. If, however, a limited conventional confrontation was perceived by the Soviets as unlikely to evoke a US nuclear response, then massive retaliation would fail as a viable military deterrent strategy for the entire spectrum of conflict. The United States attempted to bolster confidence by placing intermediate range ballistic missiles (IRBM) in Europe to deter communist invasion.[85]

In 1955, senior US and NATO military leaders pressed for a greater number of conventional military forces to re-establish NATO's credibility of deterring non-nuclear aggression. In 1956, US Army Chief of Staff General Taylor presented an alternative strategy that provided for a flexible response based on varying degrees of confrontations along the spectrum of conflict, relying more on conventional forces to deter general war, defeat local aggression, and win a 'general war conducive to viable peace.'[86] General Taylor asserted that his concept applied to the entire Defense Department, not only the Army. His 'National Military Program, the title of a Strategy of Flexible Response' was envisioned to:

> *be flexible enough for ready adaptation to presently unforeseen and unforeseeable situations. would avoid dependence upon a single weapons system and upon a single strategic concept—the capital fault of the strategy of Massive Retaliation…Massive Retaliation offers only unlimited destruction with nothing beyond.*[87]

In the time of 'nuclear plenty,' General Taylor's strategy was not accepted and the New Look remained the United States' national security policy until 1961. Not until President John F. Kennedy's

Administration in 1961 did the strategy of Flexible Response supplement the strategy of Massive Retaliation.[88] One reason for continued reliance on Massive Retaliation was a perception of US leaders that the threat of nuclear response had a beneficial effect on limited confrontations that occurred in the mid-1950s. American involvement in the crises of the Suez Canal, Lebanon, and the Straits of Formosa all concluded with no major war with the Soviet Union and an outcome favorable for the United States. Had conflict erupted, USAF tactical airpower might not have been adequate or appropriate.

WAS TACTICAL AIRPOWER IMPEDED? A MODEL I ANSWER

To answer the question whether or not tactical airpower was impeded at a systemic level and why, Allison's Model I construct will serve as a guide to comprehending the United States' decision-making process. To recap, as a result of the decision-making process during the 1950s, the United States accumulated alternative courses of actions and ranked then according to their value or consequence. First, (preferably with their allies) they could adopt a strategy of Massive Retaliation with nuclear munitions (strategic and tactical) to deter both general and limited war. If deterrence failed, the communist aggressors would suffer nuclear devastation. Second, they could build a substantial conventional military force to augment a minimal nuclear force in order to counter Soviet belligerence across the entire spectrum of conflict. Third, they could develop a balanced force structure of credible nuclear and conventional capabilities to counter Soviet aggression likewise.

Each alternative had consequences, influencing America's decision to make a value-maximizing choice. The first alternative provided the United States with the greatest force possible (nuclear weapons) as a deterrent to Soviet hostilities and with the least financial burden to the US economy. Eisenhower's public statement of nuclear employment even in a limited war scenario may have deterred conflict. Regardless, his policy did balance the Federal budget.

The second alternative, in providing US decision-makers with a more credible conventional force against the 175 Soviet divisions on the East European border, resembled what NATO leaders were requesting in 1950 prior to Stalin's death. The absolute minimal nuclear force structure would offer some deterrence against the growing Soviet nuclear threat, but may not have represented enough weapons for a second strike in the event of a Soviet pre-emptive first-strike. The conventional part was costly, the nuclear less so. Sizeable conventional forces could certainly be based around the world to cope with flare-ups, but a war-weary American public would not favor having its sons and daughters stationed away from home.

The third alternative, proposed by General Taylor, was a compromise, presenting a balanced force structure to contend with the entire spectrum of conflict: sufficient nuclear weapons for a limited second-strike capability, and a conventional build-up to provide some level of credible conventional deterrence. This third alternative was more expensive than the first, but less so than the second. It offered the widest credibility of deterrence and war-fighting capability at a medium price, relying on credible force structures at both the nuclear and conventional levels to deter war and, if war erupted, to win quickly (whatever the level). History shows that the 'value-maximising' rational alternative chosen by US decision-makers was nuclear deterrence. President Eisenhower was determined to spend on domestic issues, and relying on nuclear weapons was financially responsible. Despite his statement of intent to use nuclear weapons in any conflict, it is much debated today whether American and NATO leaders would have actually employed nuclear munitions in a limited war scenario in the decade prior to

All USAF tactical aircraft were developed at the time for nuclear or nuclear-related missions...to the detriment of conventional tactical airpower

Vietnam. The Cold War over, it is impossible to prove that nuclear weapons deterred a nuclear war (it is difficult to prove a negative). Nuclear weapons likely contributed in some fashion to deterring nuclear war, but they did not prevent the escalation of hostilities that took place in Southeast Asia in the 1960s.

A Model I approach indicates that conventional airpower had only a minor role in US national political and military strategy during the Eisenhower administration. All USAF tactical aircraft were developed at the time for nuclear or nuclear-related missions…to the detriment of conventional tactical airpower. Although capable of delivering conventional weapons, these aircraft were not designed to be employed in a conventional war. Furthermore, munitions procurement was similarly steered toward tactical nuclear weapons. This disregard for conventional, tactical air missions (along with poor political guidance) contributed to the Air Force's poor performance early in Vietnam. Writing about Massive Retaliation, John English called the result of the United States' strategy a 'dangerous military legacy.'[89] His Model I view notes that America's reliance on nuclear weapons proved to be detrimental to conventional forces:

> *Essentially a cheap, quick, technological solution to a military problem, nuclear deterrence has itself become so encumbered with theoretical twists and esoteric spins that attempts to apply them in their various forms might actually do more harm than good. Instead of reflecting the essential unity of war fighting, deterrent theory focused military attention on the grand strategic plane to the neglect of operational and tactical dimensions. At the same time, it exerted a malign effect on traditional defense posture akin to that of a crutch, which encouraged maldeployments and the erosion of traditional military skills.*[90]

English presents the most common view of 1950s tactical airpower development. Further examination will provide alternative insights into the decision-making process for tactical airpower development prior to Vietnam.

CHAPTER 4

MODEL II ANALYSIS: AN ORGANIZATIONAL PERSPECTIVE

The previous Model I analysis indicated that conventional tactical combat airpower was neglected at the broad, upper echelon or systemic level within the USAF as a result of national security policy and military strategy. However, was it ignored below the systemic level? Most of its budget was devoted to the strategic nuclear mission during the 1950s, but did the Air Force, at various organisational levels, continue to develop and promote conventional tactical airpower post-Korea?

From World War Two through Vietnam, entities such as the National Advisory Committee on Aeronautics (NACA), the United States Air Force Scientific Advisory Board, the Air Materiel Command,

and the USAF Fighter Gunnery School, were responsible for developing and/or improving tactical combat airpower. Although poorly funded, tactical conventional airpower between the Korean and Vietnam Wars was not entirely neglected by these organisations, nor by Tactical Air Command (TAC) and Air Research and Development Command (ARDC). Using Allison's Model II decision-making construct, I will show how emphasis on it continued, although with mixed results. I will use Model II to explain USAF organisational decision-making, showing how tactical conventional airpower was advanced during the Eisenhower Administration. A summary of results and analysis will follow.

MODEL II DECISION-MAKING

The model explains the decision-making process of governments by understanding how their organisations and sub-organisations routinely work. The model postulates that, far from being a unitary rational actor, the government is a actually a *'conglomerate of semi-feudal, loosely allied organisations, each with a substantial life of its own . . . Governmental behaviour can therefore be understood… less as deliberate choices and more as outputs of large organisations functioning according to standard operating procedures' (emphasis in original).*[91]

Large organisations consist of complex units and smaller sub-units, all directed by humans with limited capacity to generate alternative courses of action, process information, and solve problems (described as bounded rationality).[92] Organisational problems can be so complex that organisations will split up or 'factor' problems into smaller parts in order to deal with them independently.[93] Often, an organisation's structure reflects how a unit factors its problems. The Department of Defense, for example, is structured by services, each with specific methods of warfare (land, sea, and air). Although each service is independent, their areas of expertise can overlap (e.g. each service has some airpower). Nevertheless, each contributes differently to the defense of the United States and the achievement of national security objectives. Then, as now, the Air Force was sub-divided to contend with its functional missions.

When each organisation or sub-organisation proceeds through the decision-making process, the units, being led by humans, tend not to conduct an all-inclusive search for the best alternative. Rather, individuals within the unit are inclined to search for an alternative that is 'good enough' to meet its objective(s) and conclude their search when the first alternative is found that will 'satisfy' the organisation's problem.[94] That is not to say that establishments are unstructured in their search process, but rather, simply restrictive in the number of alternatives sought for consideration. Moreover, organisations often consider past decisions to find answers for current problems (especially if they are reoccurring). They use solutions that worked in the past and limit their 'repertoire' of choice. Additionally, leaders in the units hesitate to base decisions on uncertain futures and will choose options that emphasize 'short-run feedback.'[95] For example, the Air Force may determine its pilot training capacity by simply estimating the number of pilots leaving the service in the upcoming year, failing to allow for other factors such as a change in demand for pilots in wartime, as happened during the Korean War. Preferring not to base decisions on an uncertain future, organisations may often make decisions that appear short-sighted.

Although an organisation's behavior tends to remain fairly steady, units do have the capacity to learn from past mistakes and may change incrementally over time. When change is determined to be in its best interest, an organisation may alter its goals, rules, and procedures. Furthermore, when faced with decisions, it tends to view the decision-making process with a unit bias. Parochial priorities and perceptions will prejudice an organisation's search for alternatives for a particular course of action.[96] For instance, in Korea the Army considered close air support (CAS) vital to its success. The Air Force, conversely, perceived CAS as a diversion from airpower's best use—influencing the enemy behind the front through strategic bombardment or aerial interdiction. Organisational bias caused the Air Force to

de-emphasise CAS at various times in favour of aerial interdiction. By comprehending an organisation's priorities, perceptions, and issues, a unit's decision-making process and its propensity to change/improve over time may be better understood.

One final factor that influences decision-making is called 'imperialism.' According to Allison, many organisations state their principal goal as improving the health of the unit. Health or imperialism can be defined as 'growth in budget, manpower, and territory.'[97] When 'New Look' became the United States' national security policy, nuclear weapons were the primary means of fulfilling national security objectives. The Navy and Air Force then fought for a piece of the nuclear pie. After the 'revolt of the Admirals', the USAF's imperialism over the strategic nuclear mission ensured its health for the immediate future. From a Model II perspective, the Air Force's decision to favor nuclear weapons can be explained as the principal way the organization would increase its stature and power in a time of defense down-sizing (not to mention that strategic nuclear attack fitted nicely into contemporary airpower doctrine).

By applying Allison's Model II analysis to multiple subordinate unit-level decisions, a better understanding is possible of the advancement of tactical airpower within the USAF. There are four areas of interest: the Tactical Air Command's decision-making process, the development and procurement of tactical aircraft, conventional munitions, and the progress of training that furthered conventional tactical airpower.

In Korea the Army considered close air support (CAS) vital to its success. The Air Force, conversely, perceived CAS as a diversion from airpower's best use

TACTICAL AIR COMMAND

The Air Force, like all large organisations, consists of several smaller organisations. Between Korea and Vietnam, many of these organisations contributed to the development of airpower differently. In January 1946, General Eisenhower (then Army Chief of Staff) and Chief of the Army Air Forces General Spaatz agreed to functionally reorganise the Army Air Force for the post-war environment.[98] The commands included Strategic Air Command, Air Defense Command, Tactical Air Command, Air Training Command, Air Materiel Command (March 1946), and the Air Transport Service. Strategic Air Command (SAC) was 'charged to conduct long-range operations in any part of the world at any time; to perform maximum long-range reconnaissance over land or sea; and to provide combat operations in any part of the globe, employing the latest and most advanced weapons.'[99] Air Defense Command's mission was defense of the continental United States while the Tactical Air Command (TAC) was to work closely with ground forces. Although fighter aircraft were placed in each of these three commands, TAC had the job of preparing for conventional warfare. TAC was required to 'cooperate with land and sea forces in ground and amphibious operations and to train and equip tactical air units for operations anywhere in the world. It was also charged to promote 'progressive development of air-ground co-ordination techniques and doctrines."[100] By factoring airpower into separate organisations, General Spaatz and the United States Air Force (after its establishment in 1947) were better able to contend with the complex problems associated with the decision-making of the varying airpower missions.

TAC was the Air Force's primary tactical airpower organisation, led by noteworthy individuals from the start. Generals Quesada, Lee, Barcus, Cannon, Weyland, and Everest endeavored to advance the organisation along its established path. General Weyland is remembered as the foremost advocate of tactical airpower during the 1950s. His career was predominantly in the tactical fighter realm. During World War Two, he commanded the famed XIX Tactical Air Command, supporting General Patton's Third Army push through Germany. Weyland went on to serve as Ninth Air Force Commander, Assistant Commandant of the Command and General Staff School (CGSS), Chief of Staff of the Air Staff for Plans and Operations, Far East Air Force Commander in Korea, and then Commander of TAC from April 1954 to July 1959.[101]

Weyland remarked, 'I did get to know the Army forwards and backwards, which helped me later on going through various schools. So I picked up a lot of information and knowledge and appreciation of what they have to do and what their problems were.'[102] From his experiences, General Weyland understood that a well-balanced tactical air force would be required to contend with war contingencies of the 1950s. He understood the possibility of 'periphery' or 'brush-fire' wars and the necessity of a viable conventional force to win those limited wars.[103] To ignore limited war, Weyland warned, would be an invitation to disaster.

Parochial priorities and perceptions of General Weyland and his Tactical Air Command staff greatly influenced how grand strategic airpower problems and decisions were viewed. The larger Air Force organisation (and SAC) approached US national security problems with the narrow view that strategic bombardment was the principal means of waging war, while TAC members viewed America's problems from a tactical airpower perspective. From co-operating and co-ordinating with surface forces, TAC members approached airpower problems from a viewpoint consistent with past tactical employment practices, and the application of limited force in Korea was a guide. They searched for ways of completing America's national security policy of assisting allies without escalating a conflict to a general nuclear war. At one level, Air Force leadership advocated preparation for a worst-case nuclear war which would ensure the continued growth of the Air Force budget and territory, and on a lower level General Weyland argued at a 1954 commanders' conference that brush-fire war, in an area where America was least prepared, was the most probable form of future conflict.[104] Weyland proposed the advancement of tactical airpower capabilities, which would provide for growth of TAC. Differing parochial views, at different organisational levels presented diverging recommendations to the national security problems facing the United States.

Despite Weyland's unique insights into future conflict, he realised that there was money available only for nuclear expansion. The foundations were laid for tactical airpower to employ tactical nuclear weapons,[105] and on assuming command Weyland postulated that it would provide the flexibility and versatility in limited wars that strategic bombers lacked. By arguing that tactical nuclear and conventional munitions could contribute to both general and peripheral war, Weyland perceived a way to advance tactical airpower.[106] If TAC was to improve its health, then tactical nuclear weapons were necessary to future advancement.

To further increase the 'territory' or spectrum of influence of tactical airpower, Weyland originated an idea to develop a mobile tactical air force as a deterrent to local brush-fire wars. Initiated by Weyland and developed in an Air War College thesis by Col Richard Klocko, Ready Air Fleets were envisioned to be state-side tactical airpower units readily deployable anywhere in the world.[107] Klocko described a fleet-in-being that could deter local aggression. The Ready Air Fleet could include:

1 Medium Bomb Wing with 1 Squadron Medium Strategic Recon attached
1 Fighter Interceptor Wing (All Weather)

1 Light Bomber Wing (Night and All Weather)
2 Fighter Bomber Wings
1 Tactical Recon Wing
1 Medium Troop Carrier Wing
2 Squadrons Medium Transport
4 Squadrons Aerial Refuelling (capable of refuelling all types of combat aircraft in the command)
1 Aerial Resupply and Communication Group
1 Ground Defense Task Force composed of 6 Defense Flights and 1 Support Flight.[108]

Subsequently, the Ready Air Fleet was adopted and renamed the Composite Air Strike Force (CASF), contributing to national security objectives by being the nation's first line of defense in limited war and augmenting Strategic Air Command's capability to deter general war.
In July 1955, TAC established Nineteenth Air Force, which was to develop the CASF concept. Nineteenth Air Force Commander, Brig Gen Viccellio, fulfilled Weyland's idea. By September 1956, Viccellio was able to deploy a token Composite Air Strike Force to Europe. The CASF included 'one squadron of F-100C day-fighters, one squadron of F-84F fighter-bombers, a flight of B-66 tactical bombers, and a flight of RF-84F reconnaissance aircraft.'[109] Although the concept did not increase the size of TAC, CASF did provide a tool to project tactical airpower quickly to confront a limited war. Finally, TAC had a limited capability (reliant upon, but not confined by nuclear weapons) to project tactical airpower around the world. Tactical Air Command's imperialism would grow in stature within the Air Force and help ensure its survival in a nuclear dominated military.

From a Model II perspective, General Weyland and TAC may have instituted the CASF based on former deployments and procedures from World War Two and the Korean War, when fighters were deployed overseas. Past fighter deployments may well have led to the development of CASF, which became part of contemporary standard operating procedure for TAC. Furthermore, by establishing CASF, Weyland attempted to improve the health of TAC by increasing the spectrum of influence to overseas locations. Once established, further funding would likely follow.

Tactical Air Command's imperialism would grow in stature within the Air Force and help ensure its survival in a nuclear dominated military

Douglas B-66

USAF and TAC's efforts to advance tactical airpower were not limited to the creation of the Composite Air Strike Force. Aircraft, munitions, and training were also developed.

TACTICAL AIRPOWER RESEARCH AND DEVELOPMENT

Following World War Two, research and development and procurement and production of new aircraft systems were the responsibility of Air Materiel Command (AMC), but in 1950 research and development went to Air Research and Development Command (ARDC).[110] The Deputy Chief of Staff, Development, in HQ USAF, was also created to guide all research and development efforts within the Air Force. In 1951, USAF Chief of Staff General Vandenberg assembled the Air Force Council to handle all senior level decisions. Working with the Headquarters Air Staff and the Aircraft and Weapons Board, the Air Force Council determined the final Air Force policy regarding what weapons systems to develop.[111]

These new arrangements depended on the speed and the quality of new developments. Proper planning for new weapons systems would ensure that the Air Force would remain at the cutting-edge of aircraft technology. A weapons system included every aspect of the aircraft: airframe, propulsion, avionics, and munitions. All aspects had to be compatible and meet the specifications set by Headquarters.

The normal programmed flow from concept to actual weapon system followed a specified course. Senior Air Staff planners decided the need, Air Staff and the Aircraft and Weapons Board would make recommendations to the Air Force Council, which would in turn inform the Air Research and Development Command what system to develop, why it was necessary, and how it should perform. ARDC designed the specifications and evaluated the contractors' proposals. After Air Force Council approval, ARDC would work with the contractor to construct an experimental model, which would undergo tests to see if it met the standards and could withstand combat conditions. If so, production would commence, with a typical development-to-production timeframe of four to eight years.[112] Final aircraft production decisions were made on Air Force Council direction.
The Air Force relied on civilian research and development guidance to stay abreast of current technology. The USAF Scientific Advisory Board (SAB), established in 1944 by General Arnold, was charged with 'providing scientific-technical advice aimed at insuring aero-space supremacy.'[113] SAB worked closely with civilian aircraft industry experts, universities, and the Rand Corporation to provide the Air Force with recommendations for future development to remain the world's aviation leader. The SAB recommended development or improvement in such programs as vertical take-off, air-to-air fire control, infrared search and track, conical scanning radars, electronic combat measures, and airborne gun sights.[114] The Air Force would adopt the board's recommendations, incorporating them into current designs or upgrading existing systems. The SAB was instrumental in improving the capabilities of tactical airpower throughout the 1950s.

Air Force research and development funding grew rapidly from $62.3 million in 1950 to $720.5 million by 1957.[115] By 1960, over half of the total research and development budget was directed toward intercontinental and intermediate range ballistic missiles and electronics,[116] whereas tactical airpower received a minute portion ($20 million out of $1.043 billion) in that year.[117]

ARDC consisted of ten centers that watched the scientific research and development of civilian industries and universities, and supervised the development of most weapons systems.[118] Of these, the

Wright Air Development Center and Flight Test Center conducted the development and evaluation of new weapons systems, which contributed to tactical aircraft production. The Armament Center and the Air Proving Ground Command worked to advance tactical conventional munitions. Although the emphasis at the time was nuclear, research and development of conventional airpower remained part of the standard operating procedures of these organisations, ensuring that conventional capabilities were included in future aircraft designs.

TACTICAL AIRCRAFT

At the Department of Defense level, aircraft research and development began under the direction of the Research Airplane Program (RAP), a joint research effort by the NACA and the military services.[119] Conceived near the end of World War Two, the RAP performed flight studies using a series of specially designed research aircraft. From the late 1940s through the 1960s, research aimed to improve manned flight in aircraft at speeds up to about 4,500 miles per hour and at altitudes up to about 350,000 feet. Two general categories of aircraft were developed: first to improve jet aircraft performance, including such designs as the X-1, D-558 I, X-1A, X-2, and the X-15 and second to investigate the effects of different aircraft configurations, including such designs as the X-3, X-4, and X-5.[120] The entire aviation industry contributed and benefited from the testing, and the effect for the Air Force was the incorporation of research results into the supersonic fighter aircraft developed in the 1950s.

From the late 1940s through the 1960s, research aimed to improve manned flight in aircraft at speeds up to about 4,500 miles per hour and at altitudes up to about 350,000 feet

Bell X-1

RAP was the foundation for the aeronautical engineering theory that the Air Force relied upon to construct its fighter designs. Using this foundation, the Air Force incorporated SAB recommendations together with ARDC suggestions to formulate aircraft designs that could meet near-term fighter aircraft requirements as determined by Air Force objectives. For instance, the Air Force Council directed the development of the F-100 based on the supersonic testing of the RAP, the recommendations of the Scientific Advisory Board, the evaluation and suggestions for improvements from the Air Proving Ground Command (among other centers), and the Air Force's need to replace the obsolescent F-86.

Decision-making and final procurement were influenced by the several organisations involved. Each had standard operating procedures governing the research, development, and procurement of fighter aircraft. Prior to Korea, tactical aircraft designs were based on a non-nuclear mission. As a result, many organisations had established procedures for aircraft design with a non-nuclear mission. Following Korea, the nuclear mission grew in importance within tactical airpower design. However, the conventional (non-nuclear) role of tactical airpower did not cease to exist. By examining four fighter aircraft in particular (the F-100, F-101, F-104, and F-105), I will show how tactical aircraft development decision-making within the Air Force impacted the tactical conventional mission.

F-100 SUPER SABRE

The North American F-100 Super Sabre was the first of the Air Force's 'Century Series' fighters and the first supersonic fighter. Intent on quickly developing a replacement fighter, the Air Force Council agreed with the Aircraft and Weapons Board's recommendation to begin production on the F-100 prior to flight-testing in 1953.[121] It was to be a clear weather, air superiority fighter, but ultimately was designed and employed as a fighter-bomber.[122] Design modifications and procurement of the F-100 continued simultaneously from 1951 through 1955. Several organisations recommended modifications and improvements to design in order to increase its air-to-air and air-to-ground kill potential. In December 1953, 'black boxes' were added, and a larger tail fin to improve handling. Larger internal fuel tanks and 450-pound external fuel tanks were added to increase range. Although a conventional fighter, TAC asked that the F-100 be modified to allow for tactical nuclear munitions.[123] To improve nuclear munitions delivery, the F-100 was to incorporate the low-altitude bombing systems (LABS).

The F-100 possessed the latest conventional weapons set-up. It utilised the AB/APG-30 radar and could employ the AIM-9B air-to-air missile. Later models were modified to carry the GAM-83 Bullpup command guided bomb, one of the first precision-guided munitions. It carried 2.75-inch forward-firing aerial rockets, four 20mm M-39 machine guns, and up to 5,000 pounds of general-purpose bombs. External stores, both munitions and external fuel tanks, were designed to be carried beneath the wings and on the centerline of the aircraft. With the J-57-P-7 jet engine and state-of-the-art aircraft design, the F-100 was designed to be a highly maneuverable fighter that rivalled the latest Soviet fighters (MiG-19 Farmer).[124] Additional modifications to convert it into reconnaissance and 'Wild Weasel' surface-to-air missile (SAM) suppression platforms would make it one of the Air Force's most versatile conventional tactical fighters during the 1950s and 1960s. In all, 2,294 F-100s of all types were produced for the Air Force.

The F-100 was one of the first USAF jets to be employed in Vietnam, but with employment limitations. First, its accident rate was very poor, due primarily to an under-powered engine with afterburner nozzle problems, and control problems associated with design characteristics.[125] Second, some conventional weapons could not be supported by all F-100s, while others could only carry a limited number if

F-100 Super Sabre

The F-100 was designed to be a highly maneuverable fighter that rivalled the latest Soviet fighters (MiG-19 Farmer)

properly modified.[126] Similarly, only the F-100F possessed 375 rounds of gun ammunition, while the rest only had 200. Third, only the D and F models had a radar-warning receiver (RWR), a device which proved invaluable in North Vietnam in one of the world's most heavily defended air spaces.

F-101 VOODOO

Developed from lessons learned in Korea, McDonnell's F-101 Voodoo was originally conceived as a long-range escort, penetrating Soviet air defenses in order to protect SAC's nuclear bombers.[127] The Air Force Council in 1952 approved the alteration of design that would change the mission of the F-101 from an interceptor to a nuclear fighter-bomber. The F-101A and C models were designed for the tactical nuclear role and possessed no conventional capability. TAC reluctantly received its first Voodoo in 1957, finding it was not constructed to operate on short, unprepared runways, a requirement of all TAC's deployable jets.[128] The Voodoo was transformed into a reconnaissance platform and continuously updated with improvements developed by electronics industry. The RF-101 became TAC's reconnaissance workhorse.[129] The McDonnell Aircraft Corporation finally built an interceptor version (F-101C) to be used by the ADC, but the Voodoo's greatest contribution to tactical airpower was in the form of tactical reconnaissance.

RF-101 Voodoo

The Voodoo's greatest contribution to tactical airpower was in the form of tactical reconnaissance

The F-104 killed many pilots. It was removed from service in1968

F-104 STARFIGHTER

From lessons learned in Korea, the Lockheed F-104 Starfighter was originally designed to be a light-weight, day only air-superiority fighter, to fly higher and faster than any Soviet aircraft. First flown in 1956, the F-104 suffered engine problems on its way to become the first production aircraft capable of flying faster than Mach two.[130] The Air Defense Command received its first Starfighter in 1958 and employed it as an interceptor (F-104A). The heart of the F-104's fire control system was NASARR (North American search and range radar), which was capable of air-to-air (look down, shoot down) and air-to-ground modes,[131] representing state-of-the-art technology for tactical conventional airpower. Augmenting the F-104's radar was a newly designed infrared sight conceived to detect enemy heat signatures at short to medium distances.

Additionally, the Starfighter could employ all the latest conventional munitions: AIM-9B air-to-air missiles, 2.75-inch rockets, and 930 pounds of conventional bombs. The Vulcan M-61 20mm cannon was unreliable and removed from the jet,[132] later to be retrofitted when deficiencies had been resolved. The F-104 was also originally designed with a downward firing ejection seat, which proved highly unsatisfactory. Due to design problems, both versions of the Starfighter interceptor (F-104 A and B) were as quickly phased out of ADC as they were accepted.

TAC received its first fighter-bomber version of the F-104 in 1958. The F-104 C/D/G were modified based on recommendations of ARDC to include a more powerful engine, a new ejection seat, an external probe-drogue air refuelling system, and external nuclear munitions.[133] The final version of the Starfighter was capable of all-weather fighter-bomber operations with a capacity to carry 2,510 pounds of conventional munitions, AIM-9Bs, 2.75-inch rockets, and the retrofitted M-61 20mm internal cannon. Although not originally developed as an all-weather fighter-bomber, the amazingly quick F-104G possessed a respectable conventional capability.

The F-104 had several serious deficiencies. First, its stubby little wings failed to provide maneuverability for close-in dog fighting. (During a dogfight in 1965, a Pakistani F-104 was outmanoeuvred by an Indian Mystere.) Similarly, the USAF its use in Southeast Asia to high altitude patrols far away from enemy MiGs and to screening B-52s bombing jungle targets over South Vietnam.[134] Second, its combat radius was poor. Third, although able to carry the latest conventional and tactical nuclear munitions, its pilots did not consider it a viable weapon system for air defense against Soviet bombers. With only two seconds of gun employment possible and two air-to-air missiles, it would quickly be out of ordnance, with ramming the only remaining option.[135] Fourth, the F-104 killed many pilots. It was removed from service in 1968.

F-105 THUNDERCHIEF

Developed from Korean War experience, Republic's F-105 Thunderchief ('Thud' for short) was conceived by company designers working with TAC and the USAF Special Weapons Center, Kirtland. Designed as a low-level tactical bomber capable of delivering one nuclear weapon, the F-105 evolved into a fighter-bomber witnessing seven years of combat in Vietnam employed in roles it was not designed for.[136] Agreed by the Air Force Council in 1952, production and testing of the new supersonic tactical bomber began in 1955. Design problems occurred, and modifications done. By 1958, eleven different F-105s were being tested at five different test facilities around the United States.[137] Concurrently, the Air Force issued a GOR (General Operational Requirement – defines aircraft mission and other performances and capabilities) requiring the addition of new J75 engines, an advanced fire-control system, and an in-flight refueling capability.[138]

Evolution of the F-105 continued. In May 1957, the Air Force Council decided it wanted the Thunderchief to be an all-weather attack aircraft, and improvements to flight instrumentation and navigation equipment occurred. In 1959, TAC accepted the F-105 as its newest fighter-bomber due to its short take-off capability.[139] Its delivery system was modified to accept conventional munitions. A new engine, the J-75-P-19, and a new fire-control system (MA-8) were added, improving its speed, and ability to bomb visually or blind.[140] Later modifications allowed the F-105 to be employed as a Wild Weasel.

Later Thunderchiefs were the Air Force's principal fighter-bombers during the early years of the Vietnam War capable of delivering the greatest conventional air-to-ground munitions loads while employing air-to-air ordnance for self-defense. The Thud could carry up to sixteen 750-pound conventional bombs supersonically at low-level, and could carry every conventional munition then available, including the GAM 83 Bullpup (F-105D and later models). Moreover, it had the internal M-61 20mm cannon with enough ammunition for eleven seconds. For longer-range shots, the Thud could shoot the AIM-9B heat-seeking missile.[141]

The Thunderchief did have faults. First, it was deployed to Southeast Asia without RWR, getting it later in the war. Second, designed as a low altitude bomber, it suffered severe battle damage in combat. Significant limitations were the non-self-sealing internal fuel tanks and the dual hydraulic lines placed close together. Third, poor maneuverability and poor rearward visibility lessened its value as a dogfighter. In all, F-105s shot down 27 and one half MiGs during the Vietnam War, but lost 383 of the Air Force's total inventory (833) during the seven years of combat in Southeast Asia.[142]

Comparing USAF and Soviet fighters, it is apparent that the Air Force did not devote enough effort to aerial maneuverability. In 1965, the USAF Fighter Weapons School at Nellis conducted a series of performance tests to rate current USAF fighters against the MiG-15/17 type of aircraft. They evaluated the F-100, F-104, F-105, and F-4C (none of them designed as dogfighters). In no case could Air Force jets adequately compete with the Soviet-made fighters[143] either offensively or defensively. Given the emphasis on nuclear missions within the Air Force, USAF fighters were not developed to be highly manoeuvrable or capable of defeating an enemy fighter in a dogfight. Aerial combat of past wars was not envisioned for future conflicts, and the lessons of both World Wars and Korea were disregarded.

From a Model II perspective, conventional fighter developments were heavily influenced by previous fighter development procedures. Since World War Two, fighters were developed with both air-to-air and air-to-ground capabilities. Despite the emphasis on nuclear weapons, those past procedures guided contemporary fighter design and as a result conventional weapons remained part of the Century Series fighters. Established standard operating procedures allowed for continued tactical airpower improvements, but not all the aircraft designs and conventional weapons capabilities were optimised for

Thunderchiefs were the Air Force's principal fighter-bombers during the early years of the Vietnam War capable of delivering the greatest conventional air-to-ground munitions loads while employing air-to-air ordnance for self defense

the warfare witnessed during Korea. Design decisions were satisficed* (compromised by competing interests) and consequently led to degradation in fighter performance during Vietnam.

Further tactical aircraft research and development was severely restricted with the launching of the Soviet satellite Sputnik in 1957. From 1945 to 1954, the Air Force requested and received funding for the development of 23 different fighter aircraft. From 1955 to 1965, it would only ask for and receive funding for one.[144] Senior USAF leaders directed research and development funding almost entirely to strategic missions.

TACTICAL CONVENTIONAL MUNITIONS

As with aircraft, the development of conventional munitions was similarly constrained during the period between Korea and Vietnam. After the USAF's independence in 1947, the Department of Defense did not want to see duplication of effort in munitions development. The Air Force retained control of nuclear weapons development and the Army continued its responsibility for developing and producing all high explosive, fragmentation, and semi-armour piercing bombs.[145] The Air Force was allowed to develop equipment that stayed with the plane (bombsights, fire control systems, guns, bomb racks, and rocket launchers). Incendiary bombs belonged to the Army's Chemical Service, and armour-piercing bombs were given to the Navy.[146] For air-to-air weapons, the unguided rockets of World War Two became the guided infrared (IR) and radar-guided missiles of the 1950s. No organisation seemed to have responsibility for missiles, so both the Air Force and Navy embarked on the quest to develop aerial missiles. During New Look, nuclear weapons were predominant, but conventional munitions not entirely neglected.

*satisfice=to accept the first acceptable, but not necessarily optimal, solution presented.

If the Air Force was to improve its health, nuclear weapon development was vital to match national security strategy

CONVENTIONAL AIR-TO-GROUND MUNITIONS

Aerial bombing originated in World War One when pilots dropped munitions by hand over the side of their planes. The general-purpose bombs used in Korea were those designed for World War Two, to include 100, 500, 1,500, 2,000, 3,000, and 4,000-pounders.[147] The aim was maximum bomb-load for internal carriage, resulting in a stubby, non-aerodynamic shape rendering them fairly imprecise. There was 'little co-ordination between aircraft designers and bomb developers, and insufficient co-ordination even between the bomb and fuse designers.'[148] During the mid-1950s, the Navy developed the newer Mark-80 series bombs, but with fin and fuse problems, they were not much of an improvement. The older M-117 and M-118 bombs were improved in shape, but bomb guidance remained little improved.[149] From a Model II perspective, the Air Force was satisfied with its general-purpose bombs and directed research and development funding on nuclear munitions. If the Air Force was to improve its health, nuclear weapon development was vital to match national security strategy.

Development of cluster bomb units (CBU) and anti-tank munitions also stagnated during the 1950s. This was not surprising, given that there would be 'no more Koreas.' If nuclear weapons could destroy a tank, why spend time and money on developing conventional weapons?

Nevertheless, the Air Proving Ground Command at Eglin AFB in Florida was established in 1949 to focus on conventional weapons development for the Air Force. One project was the US Navy's guided aerial bomb (GAB-83) Bullpup. Guidance had begun with the Germans in World War Two, evolving through the Korean War.[150] Bombs such as AZON, RAZON and TARZON, although lacking some accuracy, were now in the USAF inventory.

Development of Bullpup guided bomb was approved in 1954, in two versions: 250 and 1,000 pounds warhead weight. The Navy received its first Bullpup in 1958, and the Air Force in 1960.[151] The Air Force wanted to incorporate this munition into current fighter designs, but by the start of Vietnam, only the F-100D and F-105 were capable of employing it. Bullpup required radio guidance from the pilot who had to watch it to its target. If he lost sight of it (cloud, dust, need to maneuver etc) it became unguided and would probably miss the target.

With Dulles's New Look in 1954, scientific and weapons specialists reallocated effort to developing larger and more accurate nuclear weapons, affecting Air Force, Army and Navy. The Navy Ordnance Test Center at China Lake fitted nuclear warheads to just about everything that could fly or could be dropped.[152] Nuclear munitions such as Snark, Rascal, Crossbow, Longbow, and Corvus evolved during the 1950s at China Lake.[153] One conventional Naval munition handed on to the Air Force was Shrike, a high-speed, anti-radiation missile designed in 1958 as a passive receiver attached to a missile body, which would kill a radar-emitting antenna on air defense systems that included SAMs. The Air Force's Wild Weasel aircraft (F-100 and F-105) employed Shrike during Vietnam.

By 1959, specialists in the Navy's Weapons Planning Group stated a need for non-nuclear munitions, believing that the United States would not employ nuclear weapons during a future conflict. They also noted that conventional weapons throughout the defense establishment were severely lacking in capability,[154] prompting a shift in emphasis away from nuclear weapons. The Air Force would follow suit years later.[155] During this time, laser technology steered the development of precision-guided munitions (PGM) that eventually matured into the lethal weapons employed in Linebacker I (1972) and DESERT STORM (1991). Unfortunately for the Air Force, it did not take responsibility for bomb development from the Army until the commencement of the Vietnam War,[156] at which time tactical airpower would rely predominantly upon general-purpose bombs and marginally effective Bullpups.

F-22 Raptor

During Vietnam, the M-61 performed well in air-to-air combat and is still in use today in the F-15, F-16, and F-22

Between Korea and Vietnam, the Air Force focused primarily on nuclear weapons and failed to ask for more conventional bombs from the Army Ordnance Division. It is not surprising then, that they had shortage of conventional general-purpose bombs during the first two years of Vietnam; thus several combat sorties flew 'with less-than-full bomb loads and less-than-optimum kinds of weapons.'[157]

CONVENTIONAL AIR-TO-AIR MUNITIONS

Conventional air-to-air weapons, on the other hand, fared better. During Korea, only the 50-caliber machine gun and 2.75-inch folding fin rocket were available. Following the war, the M-39 20mm machine gun evolved, with a greater rate of fire. Employed by the F-86 and F-100, the M-39 was only an incremental advancement in air-to-air capability.[158]

The Vulcan M-61 20mm Gatling gun, however, was a significant advance. The six-barrel cannon was capable of firing 6,000 rounds per minute at high muzzle velocity,[159] a dramatic improvement in aircraft machine guns. With fewer sudden starts and stops when firing, it was also more reliable. The F-104 and F-105 were the first aircraft designed to utilise this weapon. Even though other US fighters (air defenders such as the F-101, F-102 and the Navy's F-4) were not modified for the gun, the M-61 would be modified, corrected, and then later used extensively during Vietnam. An external pod was also designed to house the gun on aircraft that did not possess one. During Vietnam, the M-61 performed well in air-to-air combat and is still in use today in the F-15, F-16, and F-22. During Operation LINEBACKER, the M-61 was credited with seven aerial victories, and the heat-seeking AIM-9 ten.[160]

After Korea, rockets continued to receive research and development emphasis. The USAF worked to develop the T2-14 2.0-inch folding-fin rocket, a concept developed to shoot between 50 and 52 high-speed rockets in rapid succession at enemy aircraft,[161] employed first by the F-94. The US Navy also developed a pod to shoot a large number of 2.75-inch rockets, and the Zuni was incorporated by the Air Force.

An F-100 fires a AIM-9 Sidewinder missile

Falcon, Sidewinder, and Sparrow were shot from an aft position during the Vietnam War and therefore did not represent a revolutionary increase in air-to-air employment doctrine over Korea tactics

Folding-fin rocket pods were the precursor to air-to-air missiles. Rockets were unguided projectiles fired in large numbers shotgun fashion. Air-to-air missiles were guided either by a heat source or from commands from the shooter's radar. In 1956 the Air Force developed and procured the AIM-4 Falcon missile, both in the infrared and radar-guided versions. It remained in service for 25 years.[162] Designed to shoot down large, non-manoeuvring Soviet bombers, Falcon proved only marginally effective against smaller, highly manoeuvrable fighters. The Air Force would eventually abandon the AIM-4 in favour of Navy air-to-air missiles developed during the 1950s. The Air Force put less effort into advancing the Falcon, but more into nuclear-tipped air-to-air missiles. Genie was the product of extensive USAF work for air defenders such as the F-102, becoming operational in 1957.[163]

The Navy's Ordnance Test Center at China Lake developed two air-to-air missiles still employed by fighters today. The first was the GAR-8, later re-designated the AIM-9 Sidewinder IR heat-seeking missile. This Mach 2.5 missile relied on the heat generated from exhaust of an enemy jet for guidance.[164] Early versions had to be fired from an aft position in order for the seeker to 'see' its target.[165] The Air Force adopted the Navy's missile into several of its fighters. During Vietnam, the AIM-9 achieved only 14% effectiveness, largely due to inexperienced pilots not understanding the correct firing position. AIM-9 shot opportunities were further reduced by the changing 'cone' behind a manoeuvring enemy. Other problems were missiles guiding on the sun, reflections on clouds, and being easily decoyed by enemy flares.[166]

The second Navy missile later bought by the Air Force was the AIM-7 Sparrow radar guided missile,[167] entering service in 1956.[168] Sparrow was larger and more expensive than Sidewinder, due partly to the solid rocket motor, which would burn longer and provide greater range. The Air Force integrated this missile in the 1960s after receiving the F-4 Phantom. Similarly to the AIM-9, Sparrow was employed with marginal effectiveness. It achieved most kills in Vietnam, but rules of engagement required prior visual identification of a target. By having to manoeuvre astern of the adversary, the Sparrow's increased range was negated. All three missiles (Falcon, Sidewinder, and Sparrow) were shot from an aft position during the Vietnam War and therefore did not represent a revolutionary increase in air-to-air employment doctrine over Korea tactics.[169]

From a Model II point of view, however, air-to-air developments within the Air Force were a substantial advancement for tactical conventional airpower. Standard operating procedures ensured that air-to-air missiles were evolved and adopted into fighter aircraft designs. Although missiles had weaknesses, the 1950s set the foundation for a level of air-to-air weapons capability equal to or greater than any other country in the world. Developments contributed to increasing tactical conventional airpower that ultimately led to the success of DESERT STORM.

TACTICAL AIRPOWER TRAINING

Tactical Air Command's greatest contribution to the advancement of tactical airpower was training. Periodic training was laid down to further the efficiency of its units. Between Korea and Vietnam, exercises were instigated to improve skills and inter-service co-operation, together with tactical airpower concepts and effectiveness of weapons system platforms. Along with the Composite Air Strike Force (CASF), TAC participated in European rotation plans, joint tactical exercises, and advanced tactical airpower training.

With the advent of CASF came the concept of rotating tactical airpower units from the United States to Europe where many of them were envisioned to operate if war ever broke out with the Soviet Union. In 1954, TAC sent the 389th Fighter Bomber Squadron to Toul-Rosiere Air Base in France as part of the first 'ROT' (rotational duty).[170] These six-month ROTs were conceived to augment tactical airpower already in Europe. By, July 1960, 110 ROTs had been conducted.[171] ROTs and CASF deployments to other countries around the world were also designed to 'show the US flag' and prepare USAF squadrons for quick deployments to any place in the world. Within eight hours of notification, a CASF could be sent anywhere, and TAC successfully deployed airpower to Lebanon (Operation Double Trouble) and Formosa (Operation Mobile Zebra in November 1957),[172] both in 1957. Although not employed in combat, tactical airpower's presence was credited with quelling the conflict with communist forces.

Tactical units also participated in joint and combined exercises around the world. The first major joint Air Force/Army Air-Ground tactical exercise after Korea, Sage Brush, occurred in 1955, with General Weyland as the TAC co-ordinator. Sage Brush was the first and only large-scale test of tactical nuclear war tactics and included the most realistic conditions possible short of war.[173] 30,000 airmen, 850 aircraft, tactical missiles, and 110,000 Army troops were spread over seven southern states.[174] The principal lesson learned was that whoever launched the first tactical nuclear weapon ultimately destroyed the adversary's tactical airpower. Even if a nation possessed a second-strike capability, there would be destruction of tactical forces and the situation would inevitably escalate into a general nuclear holocaust.[175] Following Sage Brush, all tactical exercises were conducted with non-nuclear weapons.

TAC continued to exercise, both singly and jointly with Army and Navy forces, and by 1961, had participated in operations such as Jack High, Cross Feed, Flash Back, Bright Star, Pine Cone I/II/III, Solidarity, and Long Pass.[176] These exercises highlighted both strong and weak points of tactical airpower, and units would return home to improve on weak areas and perfect strengths. Use of weapons systems was much improved. Inter-service weaknesses were highlighted, such as close air support for the Army. To overcome this, the Air Force devoted ten to fifteen of its tactical airpower squadrons scheduled for deactivation to the Army and the CAS mission,[177] a move agreed by the Chiefs of Staff and JCS in 1961. Improvements were made to the Air Force's Air-Ground Operations School (AGOS) in Florida and TAC Manual for 'Joint Air-Ground Operations (TACM 55-3).[178] In its first four years, AGOS graduated 15,000 airmen trained to support ground forces with CAS.

Following World War Two, fighter experience was passed on to young pilots at the Fighter Gunnery School at Nellis AFB. After Korea, in 1954 the school was renamed the USAF Fighter Weapons School,[179] whose primary mission was to train instructors in aerial gunnery. During the 1950s, the F-51, F-80, F-84, and F-100 were the primary fighter aircraft used for instruction. In 1957, another gunnery school opened in Phoenix, Arizona: the 3525th Combat Crew Training Wing. This school also trained instructors, but now in the F-86F.[180] During the Eisenhower Administration, both schools primarily focused on advancing tactical airpower missions, although some tactical nuclear instruction emerged late in the 1950s.

The shoot-down in 1960 over the Soviet Union of Gary Powers in a U-2 spy plane caused great consternation for the United States

In 1951, The Fighter Weapons School began the classified Fighter Gunnery Newsletter to draw lessons from Korea. It grew to include up-to-date information on procedures, tactics, weapons, and more.[181] Becoming the primary source of information on tactical airpower, the Newsletter provided a forum for new ideas by writers throughout the Air Force. It has grown substantially and is still in print under a new name.

TAC's training methods appear impressive. Much was done to quickly deploy tactical combat airpower anywhere in the world, but the tactical training provided through exercises and the Weapons Schools was primarily to prepare for a large war in Europe against the Soviet Union. Given the Air Force's position that another Korea was unlikely, there was little preparation for limited combat in other environments or locations. Many tactical combat procedures would transfer directly to Vietnam, but inexperienced aircrews were not prepared for combat in Southeast Asia. Only the veterans from Korea had some preparation for North Vietnam. By 1965, most Korean War veterans were either retired or too senior to be serving full time in fighter cockpits. Aircrew training, one of the Air Force's strongest qualities during the Korean War, suffered during the latter half of the 1950s.

The low-level tactics developed for Europe would prove impractical in Vietnam. More than 80 percent of all US aircraft shot down were engaged below 3,000 feet.[182] Furthermore, tactics had not yet been developed to counter the growing SAM threat. The shoot-down in 1960 over the Soviet Union of Gary Powers in a U-2 spy plane caused great consternation for the United States. Electronic warfare research and development organisations worked to counter this new threat with anything other than low-level attacks. The hope was that low-level attacks would reduce the detection ranges and time for attack of the SAMs. After Vietnam, the USAF followed the Navy's lead in developing a large-force training exercise to prepare aircrews for the robust combat environments expected against a formidable air defense system.

Only when they purchased the Navy-designed F-4 did the USAF possess a fighter that could deliver all types of bomb loads and successfully engage in air-to-air combat

WAS TACTICAL AIRPOWER IMPEDED? A MODEL II ANSWER

Several agencies were concerned in the development and improvement of conventional tactical combat airpower. Senior-level guidance came from the Air Force Council, which received recommendations from Air Staff, Aircraft and Weapons Board, TAC, NACA, and the ARDC. Although Massive Retaliation had an inordinate influence on the directions of the Air Force Council during the 1950s, lower-level organisations had standard operating procedures that positively impacted conventional tactical airpower. These procedures steered several organisations to continue managing conventional tactical airpower issues beneficially. The contributions of TAC and General Weyland ensured tactical airpower's capability to deploy forces to locations spanning the globe. With brush-fire wars in mind, Weyland compelled the Air Force and several of its organisations to consider how their programs dealt with the spectrum of conflict below nuclear war.

For tactical aircraft development and procurement, a Model II analysis reveals that the plethora of agencies involved tended to satisfice their search for solutions. Although standard operating procedures existed to ensure conventional weapons were incorporated into fighter designs, those designs of the 1950s were largely created for delivery of tactical nuclear munitions, except for the F-100 and the F-104, which were modified later. Tactical nuclear airpower grew in importance, but the ability to deliver non-nuclear ordnance either marginally improved or declined. Aircraft such as the F-101 and the F-104 would see little use in Vietnam except in reconnaissance or alert air defense missions. Of the aircraft that could drop conventional bombs, only a handful were properly configured to employ Bullpup or other 'guided' munitions. Most aircraft were relegated to delivering general-purpose bombs and in less than full loads. None of the fighters were developed to be a formidable and agile dogfighting platforms that could contend with the aerial fights witnessed during Korea or World War Two. Perhaps research and development would have overcome these deficiencies.

1950s fighters were intended to deliver tactical nuclear weapons or intercept nuclear bombers. Decisions about conventional modification were at best marginal. Combat performance during Vietnam demonstrated that fighters such as the F-105 Thunderchief were highly susceptible to ground fire. If the Thud survived its attack, it often failed to destroy its target, being unable to deliver guided bombs or carry enough general-purpose bombs. Although the Air Force produced several tactical aircraft capable of dropping conventional munitions between the Korea and Vietnam Wars, none can be considered as

substantial improvements. Only when they purchased the Navy-designed F-4 did the USAF possess a fighter that could deliver all types of bomb loads and successfully engage in air-to-air combat.[183] Additionally, creative initiatives led to the development of the AC-47 and AC-130 Gunships in the early 1960s, which proved viable combat platforms during Vietnam. Had the Air Force embraced Flexible Response earlier, tactical airpower could all the sooner have reduced losses during the initial months of the air war in Vietnam.

A Model II examination of conventional air-to-ground munitions development during the 1950s reveals that the Air Force compromised its conventional munitions due to the relatively new advancement of nuclear weapons. During the 1950s, much effort went to nuclear weapons and ICBM developments, and little to tactical conventional munitions. Although TAC and General Weyland foresaw the brush-fire war, they were content that conventional munitions existed with an adequate capability. More importantly, from an organisation's health perspective, TAC saw the procurement of tactical nuclear munitions as necessary to its survival. Only after TAC realised that it would not be overcome by SAC, could non-nuclear weapons program improvements be considered. Unfortunately, most of the lower-level Air Force organisations also shifted their efforts to nuclear programs. Furthermore, the Air Force did not gain control of conventional bomb development from the Army Ordnance Division until the early 1960s; an easy way to factor USAF efforts and funding in order to focus the Air Force's attention on nuclear weapons. Again, had the Air Force embraced flexible response sooner, it is likely that conventional munitions development and procurement would have had an effect in Vietnam.

Air-to-air weapons development fared much better, although still not as well as in the Navy. AIM-4 Falcon and the Vulcan M-61 20mm cannon were significant to aerial armament developments. Similarly, AIM-9 Sidewinder (and later the AIM-7 Sparrow) for USAF fighters provided a significant air-to-air capability. Although all the missiles were designed to be employed against non-maneuvering bombers, continued testing and modifications during the 1950s led to advanced missiles that surpassed anything the Soviets had produced. Most importantly, standard operating procedures were in place to provide for further developments in air-to-air weapons development. The principal hurdle for advancements in DoD air-to-air weapons development was the reoccurring adversarial relationship between the Navy and the Air Force, a struggle for power and primacy.[184]

The standing requirement for periodic training improved USAF tactical airpower. Through the CASF, ROTs to Europe, and many annual joint and combined exercises, tactical airpower was able to practice deploying and employing realistically. Although a good deal emphasis in nuclear weapons steered tactical airpower training, much of the training transferred to the employment of conventional weapons. The level of detail in planning missions, the low level bombing runs, the protection from enemy fighters, air refuelling, and tactical reconnaissance are all similar in tactical conventional or nuclear missions. The fact that the Air Force continued to train vigorously between Korea and Vietnam improved tactical airpower's value at the commencement of the Vietnam War.

From a Model II framework, several organisational efforts continued to advance tactical conventional combat airpower during the 1950s. Advancements in fighter development and air-to-ground munitions were only marginally effective. Conversely, improvements in air-to-air weapons and continual training throughout the 1950s substantially advanced tactical combat airpower. The mixed results of this Model II analysis demonstrates that despite the emphasis on strategic missions and nuclear weapons, the Air Force did not entirely neglect tactical conventional airpower, whose advancement was due to ongoing routines and operating procedures. Factoring of the Air Force's decision-making problems resulted in the preservation of USAF tactical conventional airpower during the time of nuclear plenty. An examination of the individual decision-making process within the Air Force will complete the understanding of whether and to what extent the USAF neglected tactical airpower between Korea and Vietnam.

(To be concluded in the next issue)

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FK-8 aircraft of No 8 Squadron commanded
by Leigh–Mallory from 1917-1918

The Maintenance of Air Superiority in a Land Campaign

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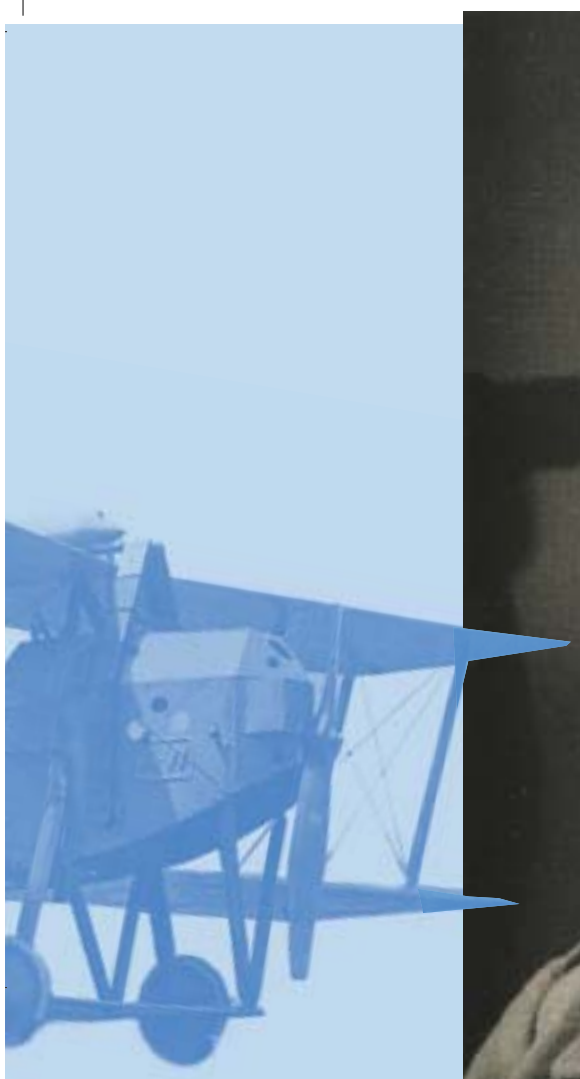

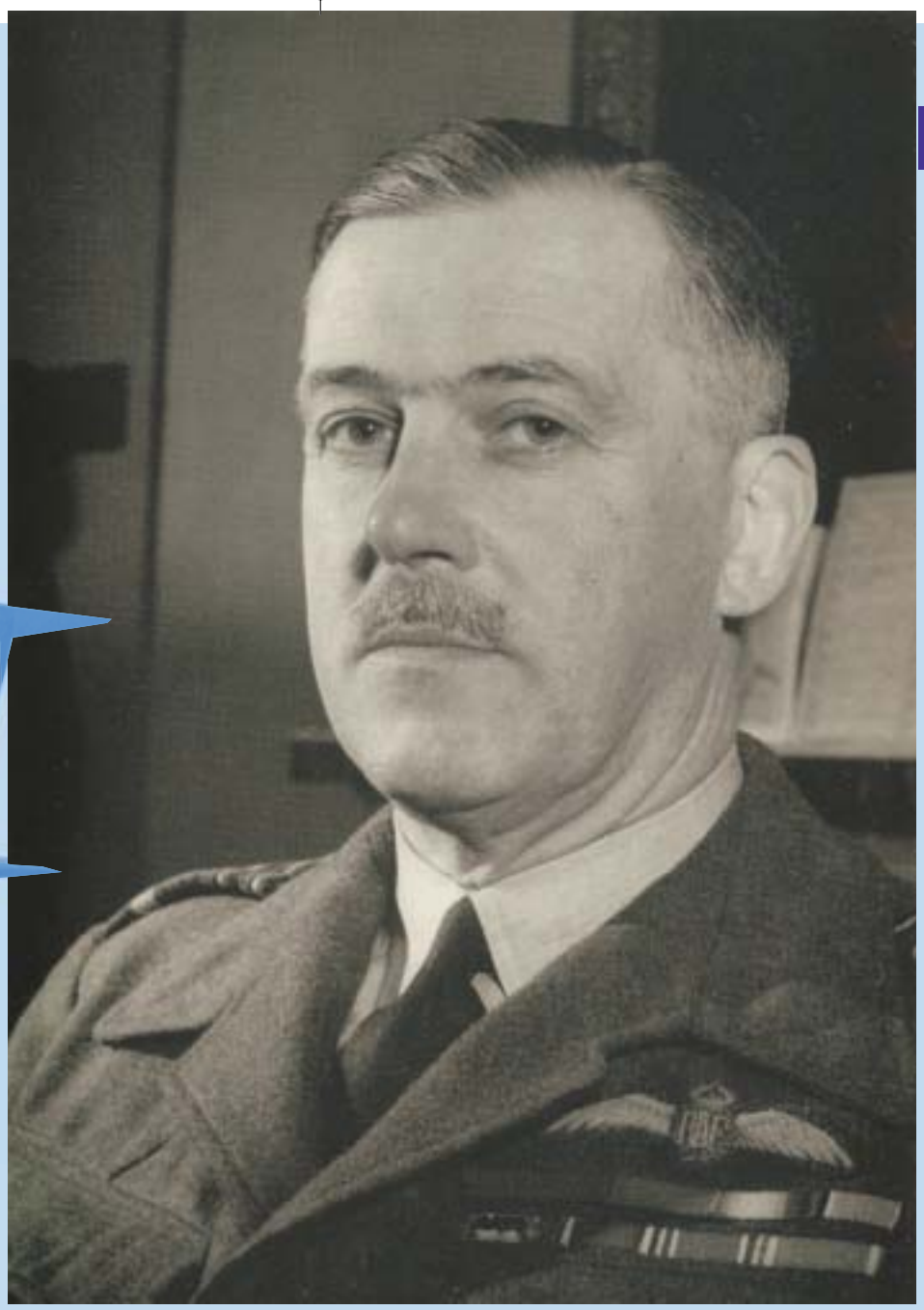

By Wing Commander T Leigh-Mallory DSO

In any future land campaign the attainment and maintenance of air superiority will have a far-reaching effect on the progress of land operations. The bombing forces which will be employed in the future will be so much greater and more effective than anything of which previous experience has been gained, that their effect on land operations can be a far more serious factor than they have been in the past. The degree of interference which an army may experience from an enemy's air force, will vary as the measure of air superiority possessed by that air force. Should the enemy possess a marked degree of air superiority, he will not only be very much better supplied with information than our own commanders, but he will also be able to hinder military movement and dislocate supply systems to such an extent that projected operations may be jeopardised. The object of this article is to discuss the methods by which air superiority may be attained, first considering some of the factors which affect operations in the air, and secondly what alternative policies there are to choose from.

MEANING OF AIR SUPERIORITY

Before starting to discuss the method of attaining air superiority, it would appear desirable to give some definition of it. Air superiority may be described as the attainment of operational freedom by our own aircraft, and denying it to the enemy. It must be pointed out that the complete domination of the aircraft of one side by those of the other is a state of affairs which will only be achieved when that side's resources of pilots and aircraft have been completely exhausted and cannot be replaced. It is obvious that this will be very rare, and in actual fact air superiority will tend to fluctuate as new types of aircraft or new tactics are introduced. This was very noticeable in the war 1914 – 18. For instance, during the Battle of the Somme commencing July 1st, 1916, our superiority was so pronounced that it had a very marked effect on the German Army, causing considerable bitterness between their army and air service. By the winter months the superiority was less marked, and by the spring of 1917 the balance was almost as much in the Germans' favour as it had been in ours the previous July.

The changes can be attributed to the fact that the Germans were quicker in producing new and better types of fighters, and the reorganisation of their fighter squadrons in a circus under Von Richthoven. During the Battle of Verdun the superiority fluctuated, the French having it at the start; a change of policy then enabled the Germans to gain the upper hand for a short time, and before the end of the battle the French regained it. It is evident, therefore, that air superiority is liable to fluctuate and has to be contested continually. Consequently it is felt that the term 'superiority' is better suited to air operations than 'supremacy'.

FACTORS AFFECTING ATTAINMENT OF AIR SUPERIORITY

In fighting on land the object of the military commander is to bring his enemy to battle and defeat him. He knows that with his own and an enemy's army in proximity, it is only a matter of time before they meet. During that time interval, the general topography of the country will play a big part in the moves of the 2 armies. Possibly there is a race to secure some physical feature, or possibly the terrain offers an opportunity to one side to defeat the other side in detail. It is evident, therefore, that topography has a very important effect on land operations, and that contact with an opposing army cannot be delayed very long. This being the natural military idea of bringing the enemy army to battle, it is often difficult for the military mind to realise that in air fighting, not only is it not inevitable that the 2 air forces should meet in battle, but that actually it is the most difficult matter to bring the enemy air force to battle, unless he is just as willing as you are to fight. Why is this?

In the first place it is extremely difficult to find aircraft when once they are in the air. The size of the atmosphere alone makes this most difficult. One knows how difficult it is, when standing on the ground, to see aircraft flying over 7,000 feet, even on a clear day, but the factor which enables one to focus one's eyes on to the aeroplane is the sound. This factor is entirely eliminated in the air by the sound of one's own engine, so one has no clue as to where to look.

Being able to see objects when in the air is very largely a question of the contrast of the object with the background. In the air itself there is no background, and, if an aeroplane is suitably camouflaged, it is exceedingly difficult to see against the background of the land when flying below one. When one adds to these difficulties the possibility that the large and indefinite space may be divided up by various stratas of clouds, it will be obvious that the business of finding other aircraft in the air is exceedingly difficult.

Another point to be borne in mind is that any air fighting is apt to be inconclusive, because aircraft can only carry a limited amount of ammunition and petrol, and consequently a fight usually has to be broken off before any decisive results have been attained

Then supposing you have found an enemy formation, what are your chances of stopping it? An important point to consider in answering this question is that modern fast day bombers are very nearly equal in speed, and when travelling light, in climb, to fighters. This means that if a formation of fighters sights a formation of bombers and it is not flying at a greater height than the bombers, then it definitely cannot catch them up, for as soon as an effort is made to attain greater height then the forward speed is slower and the bombing formation merely draws farther away. The best the fighters can hope to achieve is then to gain sufficient height to be able to intercept the bombers on their way back, assuming that they can keep them within sight and that the bombers return by approximately the same route. Supposing a formation of fighters does meet a formation of bombers of equal size, it is misleading to think that the fighters can easily disperse the bombers; the very reverse is the case. The fighters attack with their front guns, which will only fire straight along the axis of the aeroplane. This means that, when attacking, the fighter dives straight at the front of attack and consequently only one fighter can attack a certain point at a given moment, otherwise in converging on one point the fighters would run into each other. The result of this is that each fighter, in carrying out an attack, has the fire of several pairs of light automatics concentrated on him. Consequently, for fighters to stand a good chance of defeating a bombing formation, they must have a considerable superiority in numbers.

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off before any decisive results have been attained. To summarise these factors which dominate the question of gaining air superiority:

a. There is a considerable tactical advantage to be gained in having superior height, because there is more chance of being able to bring your enemy to battle when once one has located him.

b. The powers of evasion in the air are very great.

c. Even when 2 formations do engage each other, air fighting is apt to be inconclusive.

The obvious retort to all this is, if fighting in the air is so elusive and inconclusive, the course to pursue is to go and attack his aircraft while they are on the ground.

THE ATTACK ON AERODROMES AS A FACTOR IN ATTAINING AIR SUPERIORITY

In discussing this problem one always gets the impression that it is considered rather odd that the Air Force do not advocate the bombing of enemy aerodromes. Either there is some queer free-masonry in the air not possessed by other services, or airmen fear that their own activities might be restricted if reprisals were carried out on their own ground establishment. Needless to say these are complete fallacies; if the air force could find so easy a solution to so knotty a problem, then they would be only too delighted to concentrate their energies on bombing the aerodromes of their enemies. There are, however, the following disadvantages which render systematic bombing of the opposing aerodromes unprofitable.

If regular bombing of aerodromes is resorted to the enemy will obviously scatter his aircraft widely round his aerodromes, possibly even placing them in surrounding fields; consequently after the first surprise is over, the targets presented will be very scattered, with the result that very little material damage will be done, and the casualties to personnel be insignificant. The aircraft destroyed can be very quickly replaced. At the end of the last war we were producing 100 aeroplanes per day; when one considers the increase in efficiency of our industries it is not unreasonable to assume that that figure would be equalled within the first year of another war. It is therefore maintained that air superiority cannot be attained by simply destroying aircraft; it will only be achieved by killing the enemy pilots, and so gradually gaining a moral ascendancy.

Although the systematic bombardment of the enemy's aerodromes is not advocated, for the reasons already stated, yet there are 2 occasions on which it is thought such attacks would be profitable. The first of these 2 occasions is when the enemy, owing to the unsuitability of the country, is forced to concentrate his aircraft in a very small area. An instance of this occurred during the war 1914 – 18, when the French concentrated 630 aircraft on to 7 aerodromes in the Verdun area. On one of the aerodromes there were 150 aeroplanes. All 7 aerodromes were covered by a circle of 3 miles radius, the centre being about 10 miles from the lines. The first night attack by the Germans, which was directed against 2 of the aerodromes which contained 75 aeroplanes each, destroyed no less than 60 aircraft. It is rather interesting to note, in substantiation of the argument advanced above against systematic bombing of aerodromes, that on the next night the Germans attacked 4 of the aerodromes, which between them contained 390 aeroplanes, and the casualties dropped down to 25 aircraft destroyed and 20 damaged.

The second opportunity would be a surprise attack carried out to disorganise the enemy air force, on the eve of some important military operation. Before this could be undertaken with success, it would be necessary to have photographs of the enemy aerodromes, to decide which would present suitable targets. Having selected the enemy aerodromes they should be attacked with the greatest possible intensity, first by night and then by day.

Having reviewed some of the factors which affect the attainment of air superiority, it is now possible to discuss the different methods of attaining it.

DEFENSIVE PATROLS

It is highly possible that in a land campaign a demand might be made by the army for the close protection of some important area by a system of defensive patrols. In asking for this they would have the precedent of the Home Defence Force to refer to. Would an Air Force commander be right to adopt this policy? In the first place the possibility of the fighters in the Home Defence Force intercepting enemy bombers, depends absolutely on receiving warning in sufficient time to enable them to get their height soon enough to intercept the enemy bombers. What makes it possible to receive this warning in time is an elaborate system of listening posts and observation posts scattered over a very wide area. The information from these posts to be of any use must reach the RAF commander, under whose orders the fighters are working, within a very few minutes; otherwise their report will be too late to be of any use. This, then, necessitates the most perfect system of communication. What is applicable to a Home Defence Force is obviously unsuitable for a land war, in which we shall have a foreign system of communication to deal with, probably a foreign language, and the absence of a trained observer corps living in the country. It is evident, therefore, that we could not operate our defensive patrols in a land campaign on the same system as in the Home Defence Force. Consequently it would mean maintaining aircraft continuously in the air in the neighbourhood of the place to be defended. To do this would mean having at least 3 fighter squadrons in order to maintain one in the air. One squadron alone flying at a more or less fixed height would obviously be little good. Several squadrons would be necessary flying at different heights. Even with these squadrons constantly in the air, an enemy might easily penetrate to the vital spot and drop bombs without being intercepted. It is unlikely that more than one of the 3 squadrons would actually engage any one raid; this would probably be insufficient force to prevent an enemy bomber squadron achieving its object.

Consequently it is considered that defensive patrols, carried out with the object of defending an area for an indefinite period, are too ineffective and expensive to be recommended for use in a land campaign in a foreign country. It is, however, suggested that defensive patrols might be of great value, when some vital spot has to be defended for a short period. Supposing a long column had to pass through a defile, in daylight, when it would be very vulnerable to air attack. Not only might defensive patrols be very useful for that short period, but it is possible that it might afford such an opportunity of bringing the enemy air force to battle as to justify the concentration of every available fighting aeroplane at that spot.

ESCORTS

The second demand which might be made by the army is for escorts to be provided, to enable some important reconnaissance or bomb raid to reach its objective. When an escort is mentioned in this connection, a formation of single-seater fighters is meant, as these are the only recognised fighters we have at the present moment.

It must be remembered that these fighters can only use guns firing straight forward, and consequently they can only engage the enemy by turning and fighting. The result of this is that, should the reconnaissance or bomber aircraft be attacked, the only course is for the escort to go for the attackers. A general fight between our own and the enemy fighters then ensues, and the reconnaissance or bomber aircraft continue to the objective unescorted, because the moment the fighters start to engage the enemy, they automatically cease to be an escort. The result of this is that the moment the fighters leave the bombers, the latter case to have any protection.

It is suggested that the more effective means of protecting long reconnaissance and bomb raids, is either to provide a formation of 2-seaters with a high performance which can protect the reconnaissance or bombing formation without leaving it, or alternatively to increase the size of the reconnaissance or bombing formation, so that it is sufficiently large to provide its own protection. The latter alternative would appear the most economical and effective course to pursue.

Apart from the arguments already advanced concerning defensive patrols and escorts, it must be emphasised that these policies, being passive, would never establish air superiority. They would result in the enemy being left alone, if he was satisfied to leave us alone. Wars in the air can never be won by such means as these, but rather entail an aggressive policy, the main object of which must be to force the enemy to battle and destroy him.

OFFENSIVE PATROLS

The first step in this direction is to have offensive patrols, carried out by fighter squadrons in the neighbourhood of enemy aerodromes. The question as to whether these should be single or 2-seater fighters is not fully discussed in this article. It must, however, be obvious that, given approximately equal performance, which should be quite possible at the present time, the man who can bring the greatest volume of fire to bear from the greatest number of directions must obviously possess a distinct tactical advantage. The man who can do that is he who fights in a 2-seater.

The task of the fighters employed on offensive patrols is to seek out the enemy aircraft in the neighbourhood of their aerodromes, and destroy them. It has, however, been previously pointed out how difficult it is to bring an enemy to action if he wants to evade you. Naturally by flying in the neighbourhood of enemy aerodromes it should be possible to bring an appreciable number of enemy aircraft to action. However, the enemy will probably possess many aerodromes and our fighters cannot be everywhere at once, and consequently enemy formations will undoubtedly be able to elude our offensive patrols and carry out their missions. Consequently, the offensive patrol is not felt to be the complete answer, because it is not sufficiently decisive in its results.

COMBINED BOMBING ATTACKS AND OFFENSIVE PATROLS

The difficulty always is to bring the enemy to action in sufficient numbers to make the issue of any one air fight or series of air fights have a vital influence on the air situation. It is suggested that the best opportunity of bringing this about will be by attacking some absolutely vital spot which the enemy is bound to defend if he hopes to avoid defeat.

It is suggested that, in future wars, the combined use of bombers and fighters will be necessary for the attainment of air superiority

A B-17 bomber escorted by P-51 Mustangs

In a land campaign this might be some particular factor, a railway, or some defile. To bring about the air action desired, the target should be within easy distance of both our own and the enemy fighters, and it should be attacked with such intensity that the enemy will be compelled to use the greater part of his air force to defend it. An opportunity of this nature occurred during the August 8th battle in 1918. The Germans had 2 main roads along which they could retreat. Very early in the battle one of them, and to a lesser extent the other also, became a congested mass of troops, guns, limbers and lorries. The Germans were faced with a crisis and saw that intense air action against these retreating columns would have a most disastrous effect. They immediately concentrated the major portion of their air force on that front to counter our attack. Had we attacked these columns in far greater force, and concentrated most of our fighter squadrons there for a short period, it seems highly probable that we could have brought about a series of engagements in the air which might have crippled the German Air Force for the rest of the war.

It is suggested that in future wars, the combined use of bombers and fighters will be necessary for the attainment of air superiority. Further, for this combination to be used really effectively, advantage must be taken of critical military situations to bring about the big air battle.

It is desired to emphasise, in concluding, that the attainment of air superiority cannot be regarded from a parochial point of view. One must study the enemy, his war organisation, his communications, find his weak spot, and then strike a blow, concentrating one's whole offensive effort at the decisive spot. To achieve this, it will be desirable to parcel out bomber and fighter squadrons to military formations. The control of our bombers and fighters must certainly be flexible, but must also be centralised so that should an opportunity to attain air superiority present itself, there will be nothing to prevent us concentrating all our available forces to that end.

Century of Flight

by PETER J ALMOND

Price: £9.99
ISBN: 09339392-5
Publisher: W H Smith

Although this is a small book, it is a real gem because it goes far beyond the aircraft and pilots featured in aviation history books and tries to tell the story of the impact of flight across the full range of human development. Peter Almond has given prominence to airports and how flying for most people has become either a hassle of delays and crowds or a simple move from a lounge/shopping mall to a lounge/cinema/restaurant, with little sense of the outside world at all. Aviation has had the mostremarkable impact on bringing people together, eg the British 'GI brides' returning to Britain with their kids in 1953 (p 251). The opening essay was written in a non-technical way to reach a wide audience, and the main section kicked off (p 36) with the beautiful Aviator's Poem (accompanied by the perfect Spitfire picture from Getty's archive).

Each caption tells a story or provides a context. The author has tried to show the real fragility of the early planes, such as the 1910 death of Charles Rolls (of Rolls-Royce) (p 68-9), and the determination of women to share in the growth of the vast new technology from the start (p 74), through to Amelia Earhart and Amy Johnson (front cover), and the women auxiliaries of World War II (p 205). He has also tried to show how aviation events produce the century's most sensational pictures of news, politics and history, whether it is Bleriot crossing the channel, Lindbergh crossing the Atlantic, the Dambusters, Gary Powers' U2 shot down over Russia (p 296-7) or 2 hijacked planes crashing into the World Trade Centre in New York (p 424-5). This is the most up-to-date book of its kind, and includes the Afghanistan operation. Some people may be surprised at the relative skimpiness of World War II (and dividing it at 1943), but in the context of 100 years Almond argues that it works because pre-1943 was mostly defensive for the allies, post was primarily offensive. The Dambusters and Doolittle Raid were picked for their morale- boosting impacts on the US and British publics.

The intended point of Almond's selections was not just simply to show the variety of aircraft types but what impact they had in real situations. Thus it mattered less that the first atomic bombing in 1945 came from a B-29 aircraft than the human and physical devastation it unleashed (p 242-3) (nuclear radiation burns are rarely, if ever, seen in aviation books), and helps explain why air power became the most powerful military force on earth. The power of helicopters is in their utility. Thus the air ambulance idea couldn't be more dramatically demonstrated than the picture in Pakistan (p 400).

And then there is just the sheer starkness and beauty of flight. The sound barrier broken (p 414), Stealth (p 389), the Vulcan (p 285), Pacific Clipper (p 181), Wright Flyer (p 63) etc. And the fun – early aviation: p 65, p 128, p 161; middle: p 325, p 336; modern: p 359, p 435, p 442. Not to mention the bizarre: from the first carrier landing (p 112), to the wind blast tests (p 292) to the microlight over Hong Kong (p 440).

Arguably, the book could have been bigger, to show off Getty's remarkable pictures to best effect (as in his first book with Getty, *Aviation: The Early Years* (Konnemann 1997)). But then there is a trade off for price, and this is a transportable book. It is also available in the US through Barnes and Noble. There is a French edition and soon to be Italian and Spanish editions. All in all this is a comprehensive and imaginative book, and very good value for money.

The Growth of Fighter Command 1936–1940

by T C G JAMES

Price: £39.50
ISBN: 1471-5414
Publisher: Whitehall History Publishing in association with Frank Cass (London)

Reviewed by Group Captain Peter W Gray

In the annals of British air power history, only a relatively tiny number of documents stand out as being of huge significance. Arguably, General Smuts' report leading to the formation of the Royal Air Force is one such work of seminal importance. In terms of the survival of the nation, Air Chief Marshal Sir Hugh Dowding's letter of 16th May 1940 to the Under Secretary of State at the Air Ministry was critical. As Commander-in-Chief of Fighter Command, Dowding very properly drew the attention of his colleagues in the senior headquarters to the fragile state of our fighter defences. The popular myth is that Dowding refused to send more Hurricane squadrons to France. It is, however, clear from this, now declassified, official history of Fighter Command that Dowding 'request[ed] that as a matter of paramount urgency the Air Ministry will consider and decide what level of strength is to be left in Fighter Command for the Defence of this country' (reproduced in full at Appendix 11). The subtle difference is important. What is arguably more important, however, is the note reproduced in the following Appendix written by Air Chief Marshal Sir Cyril Newall (Chief of the Air Staff) in full support of his front line Commander. The chain of correspondence immediately highlights the benefit for air power students of having this sort of material immediately to hand in the excellent series of Official Histories.

These documents were originally classified and were written, by the Air Historical Branch, while the War was still in progress. This volume, and its successor (which covers the Battle of Britain), was written by Cecil James – a young Cambridge historian who had been invalided from the Army after service in Malaya. James had unlimited access to the contemporary files, and arguably more importantly, to those involved in the respective corridors of power. As the editor points out in the introduction, the fact that the work was intended for publication allowed James to discuss many issues with somewhat more candour than would otherwise have been the case.

The book, true to its title, outlines the growth of Fighter Command from its formation through to 1940. It is worth noting, however, that the narrative commences in 1922 when steps were originally taken to ensure that Home air defence was an integral part of the peacetime defence of the United Kingdom. This stands somewhat at odds with those who contend that the Royal Air Force was totally fixated on strategic bombing. James chronicles the formation of the new functional Command with admirable clarity. He outlines the basis of the layered defence system that had been gradually built up into what was subsequently – and erroneously – termed 'Dowding's System'. James's analysis also allows the reader to see the relationship between the Commander and his colleagues on the Air Staff and their role in the establishment of a coherent radar-based air defence system.

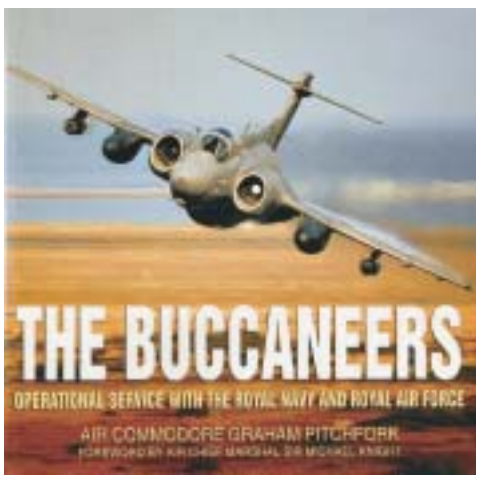
It is axiomatic that one of the roles of history is to strip away myth from the realities of events. It is also essential to be able to view these happenings through the eyes of those in place at the time. This book greatly facilitates both approaches and should be mandatory reading for anyone seriously contemplating work on Fighter Command during World War II.

The Buccaneers

Operational service with the Royal Navy and the Royal Air Force

by Air Commodore Graham Pitchfork RAF (Retd)

Price: £25.00
ISBN: 1-85260-611-8
Publisher: Patrick Stephens Ltd (Haynes Publishing)



Reviewed by Group Captain Chris Finn

Graham Pitchfork's new book on the Buccaneer is markedly different, both in size and content, from previous works on the subject, describing the over 30 years' operational history of the aircraft from both chronological and thematic viewpoints. The book starts with the early history of the development of the Buccaneer and then covers carrier operations, including the transition to the Spey-engined Mk 2 aircraft. The next chapter covers the Buccaneer's entry into RAF service including the use of the accident-prone Mk 1 as an interim conversion aircraft pending the delivery of new Mk 2b aircraft to the RAF. The chapter on training places considerable weight, quite rightly, on the development of the fore-runner to all the QWI courses now undertaken across the RAF's current fast-jet force. He then looks at the two different roles of the aircraft, maritime and overland, and the differing nature of operations from Honington and Laarbruch. Finally the book describes the Buccaneer's service in the Lossiemouth Maritime Wing, in its only operational service in the Gulf War and then in its final days.

An experienced Buccaneer navigator who served with both the Fleet Air Arm and the Royal Air Force, Graham's experience of the aircraft as an instructor, flight commander and squadron commander has enabled him to highlight both the high and the low points of the aircraft's 30 years of frontline service. This comprehensive and well-researched history of the Buccaneer is as much the story of the men who flew her as the development of the aircraft itself. The book is replete with photographs of the Buccaneer in all its operational roles, many of which are previously unpublished. But it is the well-chosen anecdotes which bring an authoritative and personal flavour to the book and make it, as Sir Michael Knight says in his foreword, 'a thoroughly readable work'.

At one level then, this is a comprehensive and interesting history of an aircraft which the Royal Air Force never really wanted yet which, in its twilight years, made an outstanding contribution to the Royal Air Force's efforts in the Gulf War. At another level, however, it is the story of the men who flew the Buccaneer and their irreverent but highly professional approach to life. Every Force claims to be unique and far better than its technologically cosseted successors, but Graham Pitchfork's book is compelling evidence that the Buccaneer Force's claim to that is more justified than most.

ROYAL AIR FORCE HISTORICAL SOCIETY SEMINAR

The next RAFHS seminar will be held at the Royal Air Force Museum, Hendon, on Tuesday 8th April 2003. The subject will be:

The RAF in the Falklands Campaign

The day will be chaired by Air Mshl Sir John Curtiss, the Air Commander for Operation CORPORATE. Among the featured speakers it is expected that Air Chief Mshls Sir Richard Johns and (other commitments permitting) Sir Peter Squire will both be participating, not as past and present CASs but recalling events as seen from their contemporary perspectives as a Station and Squadron Commander respectively. A number of other air officers, including AVMs Ron Dick, David Emerson and Sandy Hunter, will similarly be dropping a notional rank or two. While paying due regard to the more spectacular events associated with the Harriers and Vulcans, it is intended to focus equally on some of the less published aspects of the campaign, including the contributions made by transport and maritime aircraft, the preparatory phases, logistic support and the activities of the RAF Regiment.

The programme will run from 1030hrs –1630hrs. Admission will be £15, which includes coffee on arrival, a buffet lunch with wine and an optional cup of tea before departure.

You do not have to be a member of the RAFHS to attend, but why not try us – and then join. If you join, you will receive a copy of the printed and bound proceedings of this seminar and of the Society's subsequent publications (three per year). Booking forms (and membership application forms) may be obtained from:

Wg Cdr C G Jefford (RAF Retd), Walnuts, Lower Road, Postcombe, Thame, OX9 7DU
(Tel 01844 281449).

THE ROYAL AIR FORCE HISTORICAL SOCIETY – ' THE TWO AIR FORCES' AWARD

1. In 1997, the Royal Air Force Historical Society agreed to a request from its United States equivalent organisation, The Air Force Historical Foundation, to fund an annual award called 'The Two Air Forces Award'. The award will be given, on each side of the Atlantic, to the serving officer, airman or airwoman who writes the most pertinent article of the year on a Defence-related topic.

2. The Director of Defence Studies (RAF) is responsible for selecting papers and recommending suitable candidates to the committee of The Royal Air Force Historical Society for their consideration. Annually, he will survey widely across the range of published work and in making his recommendations will consult the JSCSC Asst Cmdt (Air) so that papers produced by ACSC students can be considered. Submissions will be scrutinised by the Society's committee, and the successful candidate will be awarded a trophy at a ceremony organised by the Society. Articles must discuss a military or defence related theme, be original, thought provoking and innovative in content. The committee reserve the right not to make the award if, in their opinion, the standard of submissions does not justify it.

3. The winner will be notified by The Royal Air Force Historical Society and arrangements for the presentation will be advised by them. The award winner's name will be published in the Air Force List. Full details of each year's winner are to be sent direct to: PMA(CS)2a(RAF), Innsworth, before 1st May each year.

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ST. CLEMENT DANES, STRAND, LONDON
CENTRAL CHURCH OF THE ROYAL AIR FORCE

This beautiful Wren Church, which is also the Royal Air Force Central Church, has a world-wide following and is open daily from 08.30 am – 4.30 pm. There is Choral Eucharist or Matins every Sunday at 11.00 am, sung by the famous choir. Civilians and all members of the Armed Forces are welcome to visit the church and attend the services.