

THE ROYAL AIR FORCE

AIR POWER

Review

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Royal Air Force AIR POWER Review

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Foreword from CAS

**Air Chief Marshal Sir Richard Johns,
GCB CBE LVO ADC FRAeS RAF**



I continue to be impressed by the excellent standard of the articles that are appearing in the Air Power Review. Not surprisingly, the high quality of debate and the broad range of topics covered in the Review are attracting well-deserved plaudits from our readers around the World. Indeed, in the last issue, the then Commander Allied Air Forces Central Europe, General John Jumper USAF, provided his personal viewpoint on the Allied victory in Kosovo. If you have not yet read his article, I strongly recommend you do so as it provides a fascinating overview of the operation with a forceful and most pertinent conclusion.

For my part, and without wishing to have an adverse impact on the very high quality of articles in this latest issue of the Review, I have included in this edition my script from the Sir Frederick Tymms Memorial Lecture which I presented at the Royal Aeronautical Society last year. The lecture was my first opportunity to speak openly on Air Power in the aftermath of Allied operations in the Balkans, and you will note that as well as addressing many of the fallacies disseminated by the media at the time, I also cover in more general terms my thoughts on the enduring nature of Air Power.

This will be my last foreword to the Royal Air Force Air Power Review, as I retire from my post as Chief of the Air Staff in April. I do so in the knowledge that the Review has established itself throughout the world as a high quality and respected journal. This success reflects not only the hard work of the editorial team but also the high quality of the articles submitted for publication. So thank you to everyone who has taken the time and trouble to contribute. To the many others who have enjoyed the Review but have not yet been tempted to commit their thoughts to paper, I simply offer my encouragement. No-one has a monopoly of good ideas or military wisdom so the more that contribute to the Air Power debate the better.

Richard Johns



INTRODUCTION BY DIRECTOR OF DEFENCE STUDIES (RAF)

In his Chesney Gold Memorial Lecture to the Royal United Services Institute in 1973, Professor Michael Howard stated that he was 'tempted indeed to declare dogmatically that whatever doctrine the Armed Forces are working on now, they have got it wrong. I am also tempted to declare that it does not matter that they have got it wrong. What does matter is their capacity to get it right quickly when the moment arrives.'¹ Arguably, military doctrine has come a long way in the intervening quarter of a century. We now have a recognisable hierarchy of doctrine, the vast bulk of which is consistent with key allies and with NATO at both the strategic and operational levels. Single Service doctrine is increasingly joint in tone, content and delivery – as was evident to all of those who were privileged to hear the panel comments at the launch of AP 3000 (third edition) British Air Power Doctrine. But strategic and operational level doctrine documents do not tell the whole story. Active debate within the covers of journals such as the Air Power Review contributes considerably to ensuring that our doctrine continues to develop in step with changes in technology and in concert with world events. This issue is no exception.

The first article is the text of a speech given by the Chief of the Air Staff, Air Chief Marshal Sir Richard Johns, to the Guild of Air Pilots and Navigators at the Royal Aeronautical Society in September 1999; this was delivered as the annual Sir Frederick Tymms Memorial Lecture. Given the importance of the debate on the use of air power within the Service, among the public and in academia, it is extremely important to be able to publish (and therefore record) the entire text – rather than just the sound bites that have become the norm in the media. The speech not only outlines CAS's views on the Kosovo air operation, it also presents an invaluable critique on the contemporary utility of air power. This text, along with CAS's valedictory foreword, makes an auspicious start for the Air Power Review in the new millennium.

In the second article, I have sought to evaluate the use of air power for strategic effect in the light of the strictest test of all – actual combat in the conflict against Serbia. Effects-based warfare is very much the flavour of the moment in discussions of air power. At its most basic, this form of warfare aims to achieve a given objective in as precise a manner as possible. If one wishes to close down a power station, a weapon delivered into the control room would have the same effect as demolishing the entire plant, but with less collateral damage (and less to repair when conflict moves into a peacekeeping situation). To do this at any level requires accurate intelligence and analysis; this is even more vital if we are to do so on the strategic plane.

Early analysis of our doctrine in this way is part of what Professor Richard Overy, in our third article, terms 'constant and critical interrogation'. Professor Overy examines the development of air power doctrine in the UK and identifies five factors that have to be

1 Michael Howard MC FBA, 'Military Science in an age of Peace', Chesney Gold Medal Lecture given on 3 October 1973, *Journal of the Royal United Services Institute*, March 1974, Volume 119, No 1, page 7.



taken into account in its formulation. These include the impact of politics, the role of technological change, the lessons of experience, conditions for review and coping with the 'eccentricity factor'. It is incumbent on all involved in thinking about air power, at whatever level, to contribute to the debate if we are to prevent doctrine becoming dogma. This article, coming as it does from one of the United Kingdom's most eminent historians, provides an excellent stimulant for the debate.

The general theme of generating debate is maintained in the next two articles. Colonel Philip Meilinger USAF is a well known exponent of air power whose Ten Propositions Regarding Air Power have been widely read and discussed. His article takes forward US thinking on the use of air power in the next decade. Meilinger succinctly analyses the impact of the use of air power in the Gulf and the Balkans. He points out that many of the apparent disadvantages faced by the coalitions involved in these conflicts were largely offset by air power – even though few airmen would claim that it had won on its own. Colonel Meilinger's views on the future prospects for air power are written on the basis of developments in technology which only the United States can afford across the spectrum. Group Captain John Thomas's article puts forward the UK perspective, inevitably highlighting the disparity in scale and resources. Thomas concludes, however, by stating that whatever the differences between respective air forces, air power will always be, to use John Terraine's words, *To the Right of the Line*².

Wing Commander Neil Meadows has provided our next article on how the considerable air power potential of Joint Force 2000 could be used in future emergencies. He points out that not all contingencies lend themselves to the deployment of this force and its efficacy will depend on the scale and intensity of the conflict. His view that it should not be used for political whim or due to historical precedent is very much consistent with our theme of avoiding the descent from living doctrine into dogma.

The final article has been written for us by another extremely prominent military historian – Dr Alfred Price. 'Target Berlin' provides a graphic description of a maximum effort strike on the German Capital carried out by the US 8th Air Force from their bases in England. The article is based on numerous interviews and other primary source material. Almost as a postscript, Dr Price points out that the value of these raids extended far beyond the material (and psychological) damage they caused; the war of attrition against Luftwaffe fighters went a long way towards the acquisition and maintenance of air superiority over Normandy later in the year.

In the last edition of this journal, I promised that we would publish a list of the Top Ten Air Power Readers and this is included in this edition. Although I confess to cheating by including alternatives to the ten books recommended, the titles covered do offer a strategic overview of the first century of air power. The book section of the journal has also been expanded to include more detailed reviews of a wide range of appropriate titles – rather than just the notices of publication that we had published hitherto. We hope that these reviews will stimulate interest and debate and we would welcome submissions for further editions.

D Def S (RAF)

2 Taken from the title of the history of the Second World War: John Terraine, *The Right of the Line: The RAF in the European War 1939 – 1945*, Hodder and Stoughton, London, 1985.



CONTRIBUTIONS TO ROYAL AIR FORCE AIR POWER REVIEW

The Royal Air Force Air Power Review is published under the auspices of Director of Defence Studies (RAF) and has the sponsorship of 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.

Quality contributions from both service and civilian authors are sought which will contribute to the existing knowledge and understanding of the subject. Any topic relevant to the study of contemporary or historical air power will be considered by the Air Power Review Management Board.

Articles should be original and preferably not previously published, although this will not exclude publication in the Air Power Review if the material is considered to be of sufficient merit. The length of articles may vary from as little as 2,000 to an absolute maximum of 10,000 words. Each author will receive a payment of £200 when the article is published. Assistance and research for photographic, illustrative and diagrammatic information can be provided, but design format and graphic presentation of material on page will be at the discretion of the Editor. Lengthy articles so considered may be published in multiple parts. Bibliographic and other references should be included as end notes to articles. Contributions from serving military personnel should be in accordance with DCI GEN 313 dated 26 November 1999 (Clearance Procedures for Dealing with the Media and Other Public Speaking and Writing). Contributions from serving Royal Air Force personnel must be approved by Publications Clearance Branch (Air), Ministry of Defence, 3-5 Great Scotland Yard, London, SW1A 2HW.

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Sir Frederick Tymms Memorial Lecture



to the Guild of Air Pilots
and Air Navigators at
The Royal Aeronautical Society
on 21 September 1999



presented by
The Chief of the Air Staff
Air Chief Marshal Sir Richard Johns
GCB CBE LVO ADC FRAeS RAF

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was most grateful and indeed honoured to receive GAPAN's invitation to give the Guild's autumn lecture in memory of Sir Frederick Tymm, a founder member of the Guild of Air Pilots in 1929 and himself a Master of the Guild in 1957/8. Sir Frederick is also well remembered as a driving force in obtaining livery status for the Guild, which was achieved in 1956. All this was a culmination of a most distinguished career in aviation, which started when Sir Frederick joined the RFC in 1917. Thereafter he played a most important role in opening up international air routes in Africa and India before he was appointed as the UK representative on the Council of ICAO in 1947.

Sir Frederick was an airman in the truest and broadest sense of that distinguished designation and in his memory it is my privilege to give you an airman's appraisal of where air power stands today as we approach the end of the century. A century much scarred by war and within which air forces have grown from an almost insignificant auxiliary to the land and sea services into a decisive factor in the conduct of all contemporary joint operations throughout the spectrum of conflict.

I also do welcome this public opportunity to offer my own professional comments on some of the major criticisms levelled at air forces – and in some instances my own Service – involved in recent operation in the Balkans. I have to say that much of what was written and said by commentators and military analysts gave me a sad feeling of déjà vu, as a predictable litany of prejudices and fixed ideas received a ritual airing.

In giving my response, subjective perhaps in places but at least with the merit of being professionally well informed, I do hope that together we can make a more balanced judgement on the contemporary utility of air power and in the process identify one or two signposts which point the way forward to the next millennium.

Perhaps the most predictable of all recent outpourings during Op Allied Force was that the Royal Air Force should be split asunder and returned to its parent services. So before I consider the contemporary and future employment of air power in our much troubled world let me reflect briefly on why the Royal Air Force was born of a merger of the RFC and RNAS each with its own brief but dazzling history. A merger, as I never tire of reminding people, decided by statesmen, industrialists, generals and admirals, with no Air Marshal yet available to assist their deliberations.

It came about because the Germans were the first to twig that aircraft had a military utility beyond control of the airspace over and near the battlefield – that it could be used to strike directly at the heartland of an enemy. With attacks on British mainland targets, principally London, in the summer of 1917 by Zeppelin airships and fixed wing bombers, the Germans were the first to exploit this new concept of air warfare. These attacks provoked a public outcry that gave much of the impetus to the formation of an independent air force. This outcry was the primary consequence of the inability of the RFC and RNAS to co-ordinate their operations in order to provide effective air defence of London. But there were other reasons too, particularly the need to resolve disputes between the army and the navy over the supply of aircraft and engines for two competing air arms. In 1917 the two services had placed orders for 76 new types of airplane and 57 new types of aero-engine much to the delight of their French manufacturers who were the principal suppliers.

The creation of the RAF was the right thing to do but it was MRAF Sir John Slessor's opinion that it would probably have never happened had it not been done when it was. Sir John Slessor was of course an early apostle of what we today call jointery and it was he who first made the very pertinent point that had the RAF not been created in 1918, it is at least a fair bet that the RFC in the years between the wars would have suffered the fate of the tank corps – and then what would have happened to Britain in 1940?



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Largely due to the quite extraordinary foresight, vision and determination of such men as Trenchard, the RAF was adequately prepared to fight and win the battle that saved us in the heroic summer of 1940. And in the years that followed that great victory the men and women of the RAF truly swung into their stride. In conjunction principally with the air arms of the United States, they eventually secured that extraordinary degree of air supremacy in the new age of joint warfare that enabled the allied armies and fleets to win their great victories on land and sea.

Even the most cursory examination of the early history of The RAF reveals three themes of contemporary relevance. First and foremost, the RAF must never be distracted from the raison d'être of its existence. Our Service was conceived in war at a time of great national peril as a fighting service. That is what we still are and must remain because no warfighting operation on land or at sea anywhere within the spectrum of conflict can be satisfactorily concluded without control of the air. We need to be quite clear that air power in warfighting concerns in the first instance the achievement of air superiority to permit the conduct of surface operations. To proceed at a given time and place without prohibitive enemy interference.

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Control of the air is achieved by defeating an enemy's air power, which requires a dedicated campaign to suppress his air force. In this context, the relationship between offensive and defensive air operations is dynamic. They are complementary not alternative elements and the balance between them will depend on a range of factors. This is not straightforward, as the fight for air superiority is a highly complex operation with no absolute finality in it as long as enemy aircraft are operating. The tragedy of Sir Galahad in the Falklands war only six days before the Argentine surrender serves to underline my point.

The second theme to emerge concerns the importance of technology. In the 1920s and 1930s men of vision within many national air forces had concluded that air power is essentially dependent upon scientific and technological superiority. But for various reasons we in this country underinvested in R&D and for this omission we paid dearly in the early years of World War II. Moreover this act of omission undermined the judgement of the early air power theorists which put in train a tradition of over-expectations and inflated claims that mark almost every development on air power technology or capability up to end of World War II.

At that stage, air power, once perceived by many theorists as a military scalpel, was, in truth, a cudgel and a ruthless one at that as epitomised by the emergence of the air delivered nuclear bomb. That said, we must recognise that our Second World War commanders had the foresight to appreciate what air power could achieve for them. But what they lacked was the technological capability to apply air power with precision and certainty. To illustrate my point, in World War II, to hit a target as big as a standard football pitch from medium level took over 9,000 bombs and almost 3,000 aircraft. Today with precision guided munitions we can



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achieve the same certainty of effect with just one aircraft. So with increased precision, the cudgel is redundant albeit I think we still need to be careful in using the analogy of the scalpel. While the arrival of a 1,000lb bomb spot on target may represent precision, the consequences for the target are normally dire.

But rapid advances in technology have done much more besides improve our weapons aiming capabilities. With parallel improvements to range, reliability and endurance and advances in air-to-air refuelling, aircraft can be quickly brought to readiness at their home bases or deployed to an operational theatre. Alternatively where a high level of responsiveness is required, they can be held in the air close to the area of political or operational interest and with maximum visibility, under tight political control and in cadence with other measures of inducement or coercion. Air power thus provides a wide spread of options to governments wishing to exert military pressure short of the risks and costs of committing ground forces in circumstances where a ground presence can sensibly be avoided.

But perhaps the most important area of technology – both now and in the near future – is that of information. This should come as no surprise. It has become the critical issue in many fields of endeavour, not just the military. We have the ability to reach distant targets and to hit them precisely and decisively. But we need to locate and identify them first. And crucially, we have to get the relevant information to the attacking forces before the target can move out of the weapon footprint. Precision and timely, accurate information go very much hand-in-hand. We have of course recognised this for some time, and are making great strides in the fields of information, surveillance, targeting and reconnaissance – or ISTAR, as we call it. The recent announcement on the future ASTOR system is one example of the progress we are making in this area. But we recognise that there is much still to do, and information superiority will be a key priority for us in the years ahead.

The third theme is the importance of our people. They must of course have the right equipment and logistic support. But so often in the past, it has been the quality of our people that has made the difference. Their bravery, foresight, imagination, and their powers of objective analysis have been fundamental in ensuring that we are prepared for crises and that, once committed to operations, we win. We need all those qualities and more in our people both now and in the future.

We are therefore determined to put people at the heart of our forward planning, and one of the key strategic objectives for the RAF is to recruit, train and maintain the commitment of all of its people. This is more challenging than ever before. First of all we are not talking about just regular RAF personnel; we must include our reservists, our civilian employees and, in some cases, contract staff. Secondly, they are not all employed in a direct RAF chain of command; many are in joint organisations and defence agencies. We therefore have to work all the harder at maintaining their

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sense of identity and looking after them in the round. For while we welcome enthusiastically the introduction of joint organisations, we have to remember one overriding imperative. We are in the business of winning battles, and to do that you need people to do difficult and dangerous things; things that test not only the quality of their inner steel but also their loyalty and commitment to their fighting unit whether it be ship, regiment or squadron. The motivational and other reasons that persuade people to put their lives on the line are complex, but ethos and 'tribal' identity are certainly vital factors. And because of our history and the way we are organised, our ethos and identities in the British military are based on the single services. We therefore have to operate jointly where it makes operational sense in terms of military effectiveness and efficiency, while maintaining a clear sense of belonging and loyalty to the parent service.

At the same time, of course, we have to satisfy the demands of our people. Striking a balance between operations and training, between time deployed and time at home, is becoming increasingly difficult in this new era of expeditionary operations. If we are to retain our people for the time we need them – to develop and exploit their expertise and experience – we have to understand and be sympathetic to the aspirations of not only the men and women of the service, but also their families. Moreover, it remains a fact of life that a force that is continually being employed – even on relatively small scale operations – will need far more people than one which is only used occasionally for large scale conflicts. This was of course a key strand of the Strategic Defence Review, and it is increasingly conditioning our thinking on the balance of regulars, reservists and contract personnel. And we must get this right, because the need for us to respond rapidly and effectively to crises is as great as ever.

Turning from themes may I touch briefly on the enduring characteristics of air power? If you believe as I do that the world will continue to witness clashes of group interests that will from time to time erupt into collective violence, then the ability rapidly to constrain the ambitions of an enemy will remain an invaluable option to the resolution of crises. And if



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diplomacy and deterrence should fail, resulting in conflict at whatever level of intensity, we airmen must be prepared first to shape the ring for our ground forces and secondly to provide direct support to their activities within it. We must be ready to respond to their requirements by removing an enemy's operational options and by reducing his capacity to fight – in effect denying him the initiative and dictating the conditions of confrontation.

In practical terms this means first achieving and sustaining control of the air space – remember the first and vital responsibility of the air force – before then denying the enemy the capacity to concentrate, manoeuvre, deploy or prepare an ambush without fear of detection and, if appropriate, attack. In doing so we must continue to expand our ability to exploit the fundamental and long established characteristics at the decisive time and place.

So much for theory. Let me now turn to experience and practicalities. A moment ago I mentioned shaping the ring for our ground forces and of course there is nothing new in air power moulding the environment for the benefit of surface units. This is exactly what the allied air forces did before the Normandy landing in 1944 and incidentally what the Luftwaffe failed to do for the German army in the face of our air defences in 1940. And it is also what the coalition air forces did in the Gulf War at least to my airman's eye. The other side of the Gulf War story is given by General Kroesen, US army retired who wrote in 1994 and I quote: "The recent air campaign against the Iraqi forces gained not a single one of the US or UN objectives in the Persian Gulf War. Four days of land combat aided immeasurably by the air campaign achieved every goal and victory".

For my money however, it was the coalition air forces that denied Saddam Hussein the strategy of his choice. This was achieved through the immediate establishment of control of the air, which allowed General Schwarzkopf to authorise attacks on both strategic and tactical objectives. Saddam's army was thus cut off and progressively cut down. Battlefield surveillance by Joint Stars and other systems took place with impunity and total information dominance was achieved. Coalition ground forces could thus re-deploy for the key flanking attack without detection or disruption. With powerful land forces exploiting the impact of air power, the coalition imposed its strategy on Saddam Hussein. And happily 18,000 hospital beds proved largely superfluous to requirements while in the land fighting the US Army 7th corps used only 10 to 15% of the 70,000 tons of ammunition allocated to it.

Almost inevitably, the end of the war lessons learned exercise immediately provoked an endless debate as to how the war was won. In my view, this was a sterile exercise, some of it certainly provoked by defence contractors with their own commercial interests to satisfy, and all of which cloaked more serious issues and assessments from public scrutiny and debate. We should be quite clear that the evident success of air power was dependent on the use of Saudi air fields, the early achievement of air superiority following a gutless performance by the Iraqi air force and of course terrain and climatic conditions which were



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generally conducive to the conduct of air operations. On the debit side, inherent limitations in aircraft sensors needed to guide PGMs placed some inhibitions on the total effectiveness of air power. Pilots found that infra-red electrical optical and laser systems were seriously affected by cloud, rain, smoke and high humidity.

The point I want to make at this stage is that within all levels of warfare, whether on land at sea or in the air, there are few if any absolutes. Balanced judgements within the joint arena of warfare can only be made through the abandonment of prejudice and by dispassionate consideration of first, military facts and second, political sensitivities which condition the use of military force.

Perhaps the experience of Bosnia-Herzegovina will help serve to underline my point because the shaping of the operational environment in the Balkans provides a most illuminating contrast to that of the Gulf War. You will recall that for many months in a very complex operational environment, air power was not brought fully to bear. It was applied irregularly and in small doses as

timing, in relation to the diplomatic initiatives and operational and humanitarian constraints, was critical. Moreover, given the widespread dispersal of small and often isolated detachments of multi-national ground forces caution had to be exercised.

In retrospect, we can identify problems with confused political objectives, the often contradictory requirements of peace enforcement and humanitarian relief, and difficulties ensuing from extended and duplicated chains of command. But procedures were improved and the perceptions which may have been created in 1993 and 1994 as to the relative impotence of air power were abruptly shattered as UN land forces were re-deployed for self-protection and the weight of NATO air power was unleashed in Operation Deliberate Force.

You may recall that the air campaign was specifically authorised by the London Conference which allowed both the UN and NATO command keys to be turned. Under the leadership of General Rupert Smith and with a carefully orchestrated planning of NATO air chiefs, the precise application of air power made its decisive contribution to the totality of pressures which forced the Serbs to accept the demands of the international community.

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Of course this success was not due to air power alone. Over a long period ground forces had held the ring while international leaders and aid agencies played out their hands. The Croat offensive in the Serb Krajina was important in weakening Serb resolve as was the presence and support of UNPROFOR's rapid reaction force artillery. But I share the view of Admiral Leighton-Smith, the NATO theatre commander at the time, that it was the relentless pressure and precision of up to

7 NATO air attack packages a day that finally persuaded the Serbs that the international community really meant business. Some 48 target complexes within which there were 338 individual aiming points were attacked with 1,026 munitions of which some 708 were precision guided. More than 80% of the targets were destroyed or suffered serious damage.

Despite many differences between the environment of the Gulf and Bosnia-Herzegovina the contribution of air power towards the achievement of the respective strategic objectives had some commonalities

Despite many differences between the environment of the Gulf and Bosnia-Herzegovina the contribution of air power towards the achievement of the respective strategic objectives had some commonalities. In both instances air power responded flexibly to the needs of the moment and it was employed within an overall strategic plan. Air power was both available to support the tactical activities of lower level commanders and free to pursue higher level strategic objectives. But most importantly, while the limitations of some aspects of air power technology were demonstrated, both operations provided a proving ground for advanced weapons systems that our air forces had been incorporating into their inventories over the previous decade. The consequence was that air power's offensive potential began fully to match its earlier promise and hopefully all the critics of air power will come to understand that imposing the characteristics of past bombing campaigns – notably the bomber offensive against Germany in World War II and North Vietnam 25 years later-on to present day air strike capabilities represents a classic case of trying to compare apples and oranges.

This brings me to Kosovo. Let me kick off with some incontrovertible statistics. Over 78 days of the air campaign NATO air forces flew some 38,000 missions of which about 1/3rd were strike sorties that delivered some 10,000 tons of ordnance. From a purely national perspective, 100 air defence sorties were flown by RN Sea Harriers and over 1,000 bombing sorties by RAF Harrier GR7 and Tornado GR1s. RAF VC-10 and Tristar tankers and our E3D Sentry AWACS aircraft flew a further 500 combat support missions while hundreds of sorties were flown by air transport aircraft in support of our deployed forces.

And while all this was going on in the Balkans do not forget that we flew a further 700 missions over the Iraqi no-fly zones where Saddam continued to mount a sustained campaign against coalition aircraft in his attempts to shoot one down. Since the end of Operation Desert Fox in December 1998, our aircraft have faced 325 direct threats from Iraqi ground-based forces, including SAMs and anti-aircraft artillery. In response, coalition aircraft have been forced to take defensive action on 104 days during the past 39 weeks, and for their part, RAF Tornado GR1s have dropped laser-guided bombs on 32 occasions, hitting 41 separate targets.

From a purely national perspective, 100 air defence sorties were flown by RN Sea Harriers and over 1,000 bombing sorties by RAF Harrier GR7 and Tornado GR1s



But to return to Kosovo, throughout the course of operation Allied Force, NATO air operations were subject to continual critical analysis from a number of media and military 'experts', whose reports gave the impression that NATO aircraft had operated from a safe haven above 15,000 feet raining down bombs on a largely defenceless Serbia. Furthermore, they suggested that many of these bombs missed their targets and no real damage was done to the Serbian military machine, apart from the destruction of dummy tanks, because NATO air crew would not come down to low level to close with the enemy. Then, when the cease-fire was secured and offensive operations at an end, these critics implied that the 78 days of the air campaign was largely nugatory effort, and that it was the growing threat of a land invasion which had caused Milosevic to bend to NATO's will.

Let me give you an airman's view on these points. First it is absolutely true that the NATO chain of command placed a high premium on the safety of its aircraft and aircrew – and as the professional head of my service I say a good thing too because I would not want the men and women entrusted to my care ever to feel that I or my senior commanders would be tempted to be profligate with their lives. That said, had we given the Serbs greater opportunity to shoot down our aircraft by consistently flying within the range of their man portable SAM systems and light AAA, and had they succeeded in knocking down some NATO aircraft every time they flew over, I can think of nothing which would have given a greater boost to their morale.

Moreover we have to ask whether the cohesion of NATO, the centre of gravity of the alliance, would have been sufficiently strong to accommodate a steady flow of aircraft losses. I think a lot of otherwise well informed and intelligent people, albeit totally lacking in military experience, cannot get to grips with the fact that war is not an exercise in chivalry in which honour demands an even handed and fair contest. War is and will remain a nasty and brutal business in which the aim is to achieve political objectives with the least possible loss to one's own side. This requires you to concentrate your strengths and advantages on the enemy's weaknesses and no prizes are awarded for manufacturing an evenly balanced fight let alone for sustaining unnecessary casualties.

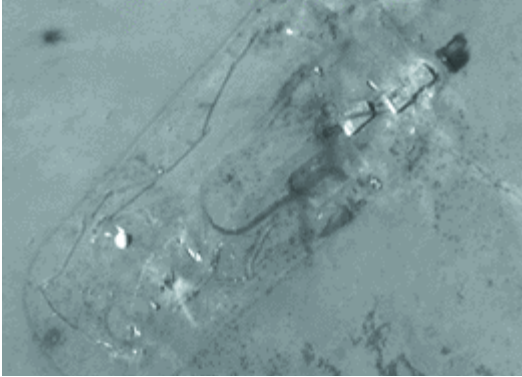
I should also point out that the airspace above 15,000 feet was not a safe haven. While the Serb air force quickly threw in the towel – and incidentally lost 115 combat aircraft, including helicopters, in the course of the war – their GBAD fired over 700 SAMs at coalition aircraft and engaged with heavy AAA on numerous occasions. We did not lose aircraft because we first won the battle for control of the airspace. Thereafter, the effectiveness of our counter measures, the skills of our aircrew and a large slice of luck brought home all but 2 of the 829 airplanes from 14 countries that were chopped to NATO control.

RAF aircrew flew 10% of the offensive missions and on numerous occasions when the weather was against us, they penetrated Serb air defences to get to their targets. But because they were unable to identify positively their aiming point or because conditions would not

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Serb SA3 GOA missile battery





Destruction of radar facility in Pristina, Kosovo

permit a consistent aiming solution they brought their weapons all the way home. It takes guts to do that because an airplane without its weapon load is far more manoeuvrable when under threat. But apart from guts it also represents a discipline within the ranks of our operational aircrew of which I am deeply proud.

It is also no secret that NATO placed strict limitations on targeting in order to avoid collateral damage, which meant it was much easier to strike effectively at fixed installations than at fielded forces in Kosovo. And with that in mind may I make one further practical point on the issue of altitude. Given reasonable weather it is much easier to attack a target from medium level than at low level. You have more time to acquire a target, to identify it positively, and then to achieve the best weapons aiming solution – all of which is vital if you are to minimise the risk of collateral damage. On the

other hand the lower you go the smaller your field of vision and the less time you have to acquire, identify and aim at a target, all of which increases the risk of collateral damage.

Low level operational flying is the most difficult and demanding of military flying disciplines and that is why we train so hard at it. Moreover to persecute a successful low level attack requires one of two pre-conditions. Targets must either be sufficiently large to permit acquisition in time to permit an attack or the aircrew must have very accurate co-ordinates of the target's position. As the Serb army had the time to disperse and camouflage all their significant fielded equipment, low flying operations in Kosovo were not a realistic option. That said, had NATO land forces been committed to an opposed invasion, close air support from low level would have been provided around the clock with our aircraft benefiting from ground-based laser designation of their targets.

As to the effectiveness of the campaign 467 static targets were attacked and less than 20 of these missions involved incidents of significant collateral damage. More than three-quarters of these targets suffered moderate to severe damage. Against fielded targets, you will have seen what SACEUR, Gen Milosevic's security forces and restricting their operations in Kosovo. The figures which he quoted were not materially different from those issued at the end of the campaign. But war is not a matter of pure statistics. No figures can show the extent to which the Yugoslav military had to keep tanks and other assets hidden and inoperative to avoid them being hit. And as Gen Clark said:

"The conflict ended on NATO's terms. The Serb forces are out. The refugees are home. Peace is in place".

The real issue, then, is not what was destroyed – although Serb propaganda claims are very wide of the mark – but why did Milosevic capitulate? Only Milosevic himself knows for certain but given the opportunity to ask him the question we have to face the probability that on past form his reply would not be the whole truth and nothing but the truth. In my opinion his decision was certainly prompted by a number of factors.

The indictment of Milosevic and four other senior FR Yugoslavia figures by the International Criminal Tribunal for the former Yugoslavia exercised a most unsettling effect on his personal morale. His increasing international isolation, culminating in Russian involvement in the diplomatic process of pursuing the G8 principles of 6 May was a further pressure point, and an important parallel activity to the military campaign. Also of importance was the build-up of forces for KFOR after the Washington Summit, and the announcement that NATO would be updating its planning for ground options. This must have played a part in convincing Milosevic that waiting for NATO's will to break was not an option.

But I do believe that these three factors either individually or collectively would not have exercised sufficient pressure to explain why Milosevic, a master of unscrupulous brinkmanship, should so suddenly accept NATO conditions in early June. So that leaves us with the coercive effect of the air campaign within which I think we can make three informed judgements.

First, even if we destroyed less fighting equipment in Kosovo than first estimated, it is clear that when the Serbs came out of hiding to counter UCK activity they suffered serious losses to air attack

First, even if we destroyed less fighting equipment in Kosovo than first estimated, it is clear that when the Serbs came out of hiding to counter UCK activity they suffered serious losses to air attack. It would therefore have been apparent to the Serbs that their operations against the UCK were being rendered largely non-effective by NATO air power. Second, perhaps more critical, is the effect of the attacks on Serbia itself. Apart from the damage to military infrastructure, there is considerable evidence that NATO's air attacks were seriously damaging the wealth of the industrialists and fat cats who underpin Milosevic's hold on power. Third, what is undeniable other than by distorting facts beyond recognition is that had we not bombed we would not be in the position today where the majority of refugees have been able to return home.

Although the air campaign was the decisive element in Allied Force this is not to say that success was achieved by air power, let alone by air forces, acting in isolation. Operation Allied Force was a joint operation within which alliance navies and armies as well as air forces made their own contributions. The navies provided launch platforms for aircraft and cruise missiles while land forces contributed reconnaissance drones in support of the air campaign and made an invaluable contribution to humanitarian relief. And by their very presence on the ground land forces undoubtedly helped prevent further regional destabilisation and conflict spillover.

Taking an overview of Kosovo, Bosnia and Gulf operations, I think we can safely conclude that when joint operations are considered air power will usually be the primary instrument of initial reaction. Air power is attractive because it can be quickly deployed and returned

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and it demands less human and material commitment to achieve political objectives while involving fewer political risks. But every conflict is unique and air power will not always provide the best solution and is unlikely ever to be a panacea.

Looking to the future, I think one can be certain in restating the fundamental military truth that control of the air will remain a fundamental pre-requisite for the successful conduct of any surface campaign. Air power will continue to shape the battlespace to allow naval and land forces to exploit the impact of air operations. And while sometimes, as in Kosovo, it may be possible to achieve strategic objectives without the committal to action of surface forces, we must continue to aim to achieve the most efficient application of military effort through the harmonisation of both surface and air operations. This will only be achieved across the whole spectrum of defence if the effectiveness of our armed forces is based on an appropriate balance of mobility, fire power, and manoeuvre capabilities.

So before I conclude, let me attempt briefly to draw together the main arguments I have advanced on the role and status of air power in the course of what I acknowledge to be a fairly discursive scene-setter for our subsequent discussion this evening. I believe I have advanced 4 main propositions.

•1. First, that since its inception, the primary role of the RAF – indeed of any air force – is to win and sustain control of the air. •2. Second, that such control is and will remain essential to the success of military operations in the joint environment of today and tomorrow. •3. Third, that air power, with its inherent characteristics of height, speed and reach enhanced by technological advances in weapon precision and target acquisition, have made it the capability of first choice in the containment of crises or, in the event of conflict, as the primary tool for shaping the battlespace to permit the effective and battle winning employment of surface forces. •4. Fourth, and last but by no means least, the fundamental importance to the continuing success of the Royal Air Force of recruiting and retaining highly trained and motivated men and women all trained to operate in a joint environment, but imbued with the ethos, history and pride of their parent service.

If in the process of demonstrating these propositions, I have also succeeded in answering many of the unjustified criticisms of air power in recent operations, then I shall regard my time as well spent!

In offering an airman's appraisal on the contemporary state of air power and its strategic and operational significance, I have done so in the spirit of that great airman Sir Frederick Tymms whose life this lecture commemorates. I have covered a broad canvas in variable detail but hopefully with a style and some sense of balance that will have provoked your interest as well as your comments and questions. I also hope you will have got some feeling of the fierce pride I have taken in the courage and discipline of RAF aircrew who continue their operations as I speak over Iraq, in their helicopters supporting KFOR, and in other places besides. So as we face the future let me conclude by saying that I am very much aware of the challenges that face the RAF and that I fully recognise that it is my task as CAS to ensure by personal example the service responds to these challenges, with determination, resourcefulness and, dare I say, good humour and confidence.



Air Operations for Strategic Effect -

theory and practice in Kosovo



Milosevic.

People have preferred to feel rather than to know about strategic bombing.

Dr Noble Frankland¹

As befitting an operational aviator, as well as being the co-author of the official history of the World War II Strategic Air Offensive against Germany², Frankland was an air power enthusiast from the classic mould. He considered strategic bombing to be at the heart of air power³ – the vital characteristic that set air power apart from land and naval warfare. His sentiments in the opening quotation remain as relevant now as they were in the aftermath of the Second World War. Much of the public debate⁴ during the Kosovo campaign tended, in volume if nothing else, towards the emotional end of the spectrum rather than the analytical. A considerable quantity of material was published over the crisis with the more serious arguments ranging from the moral and legal issues through to technical matters. One of the most common themes, however, was the debate that centred on whether air power could win the day on its own. The ‘armchair generals’⁵ and some academics on the one hand suggested that only an overwhelming ground force could secure the province of Kosovo. Others (arguably the more enlightened) kept faith in the efficacy of air power, but without necessarily advocating its utility in isolation. One of the more striking results from the debate was the ‘conversion’ of military historian John Keegan⁶ whose implacable opposition to the ‘air power alone’ theory was overturned by Milosevic’s eventual capitulation.

This apparent victory for air power will continue to generate debate for years to come – not least because the real reasons for Milosevic’s actions will remain, at best, highly classified and may well be interred with his bones. As stated by General Jumper in the last issue of this Review,⁷ we must be wary of drawing generic lessons from such an idiosyncratic operation. This does not, however, suggest that the debate is sterile: indeed analysis is highly relevant at all levels, from the implications for the assumptions that underpinned the United Kingdom’s Strategic Defence Review, through the technical merits of specific weaponry, to the robustness of national and NATO doctrine.



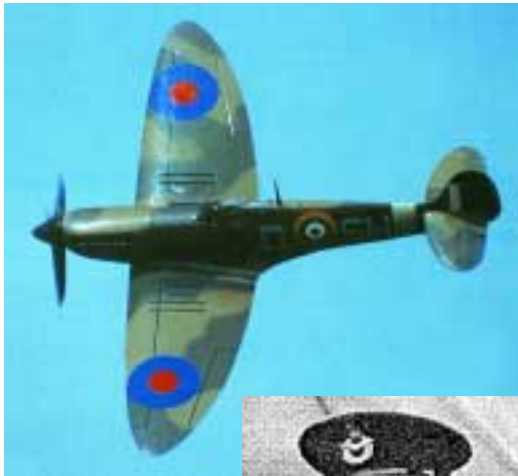
It would be neither practical nor appropriate for this article to attempt to cover all of this ground. But with the ink barely dry on the third edition of AP 3000 – British Air Power Doctrine, it is timely to examine the use of air power for strategic effect in the light of the Kosovo air operation.⁸ This article will therefore cover the – often competing – theories of strategic air power and coercion; the legacy of air power operations in the Balkans; the political build up to Operation ALLIED FORCE; the air war itself; and finally the robustness of British air power doctrine in the wake of NATO's first offensive operation.

THE THEORY

The various theories and counter-theories of the strategic use of air power have already filled innumerable pages. Authors have invariably felt that they are bound to cover the story of the birth of the Royal Air Force and its subsequent fight for survival. Some versions of the story have been the result of scholarly research;⁹ others, however, have been rather superficial with selective analysis chosen to complement the theme of the host book. The essence of the plot is that Trenchard inherited (from his rival, and fellow CAS, General Sir Frederick Sykes) a plan for a bombing strategy aimed at dislocating the enemy's key industries. Trenchard's position gradually switched from implacable opposition (based on the impracticalities of the scheme) to fulsome support. Trenchard heavily emphasized the damage that air attack could wreak on enemy morale. He believed wholeheartedly that air power must be used as an offensive weapon and that the defence of the United Kingdom could best be achieved by hitting the enemy so hard that he had to reallocate valuable offensive resources to the defence of the home land. Trenchard was well aware of the practical difficulties of intercepting bombers, particularly as the performance of the fighters was often worse than that of their targets. His emphasis on the importance of offensive action has remained a constant theme in the history of air power thinking. Developments in radar technology and aircraft such as the Spitfire, however, radically changed the Trenchard concept of air superiority, albeit with considerable reluctance from those air force staff who had been brought up on a diet of strategic bombing.¹⁰ The benefit of forcing the enemy to increase his investment in defence was also seen during the bomber offensives in both World Wars.¹¹

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The very survival of the fledgling Air Force was also understandably high on Trenchard's agenda. As post-Great War budgets were slashed, the RAF needed its own, distinct role. If air power was primarily in support of land and naval forces, assets could be redistributed with an appropriate saving in organisation costs – and then the junior service would probably be allowed to wither on the vine. The strategic bombing role offered both a lifeline for the RAF and a cudgel with which to beat sister services in the scrimmage for funding. As this was a continuing process, the concept of strategic bombing became embedded in the RAF psyche, particularly under the charismatic leadership of 'Boom' Trenchard. The vision of strategic bombing in which fleets



Developments in radar technology and aircraft such as the Spitfire radically changed the Trenchard concept of air superiority...



of invincible aircraft would strike terror into the hearts of the enemy populace causing their total collapse was not, however, born out by the technological realities of the inter war years – or even until the advent of nuclear weapons.

In practical terms, however, the RAF needed a role in which air power could be utilised and developed in parallel with the mantra of strategic bombing. The use of aircraft for imperial policing provided this outlet.¹² Notwithstanding some of the more bellicose sentiments expressed over the strategic bombing concept, it was evident in the execution of the policing duties that causing widespread casualties was not the aim. In fact Sir John Slessor makes it plain in his description of operations that efforts were made to avoid such an outcome.¹³ Briefings to the RAF Staff College over the inter-war years highlight the pragmatic approach to real operations. Colonel Philip Meilinger¹⁴ quotes a presentation by Tedder in 1934 to describe the doctrine as being an air strategy for paralysis – not obliteration. This description is particularly apposite in the light of the relevant chapter in the newly issued third edition of AP 3000.¹⁵

British Air Power Doctrine recognizes a single centre of gravity at the strategic and operational levels, but not in the tactical arena (unlike other forces that accept a number of centres at each of the higher levels). This article will concentrate primarily on air operations for strategic effect. This effect could theoretically be created by independent and distinct use of air power alone, or, more likely, it will be part of joint or multi-national activity. Air operations for strategic effect are aimed to destroy or disrupt the defined strategic centre of gravity of an opponent.¹⁶ It is worth emphasising at this point that the *effect* sought by the use of air power may not necessarily be the physical destruction of the chosen target set. Indeed, the centre of gravity may not be the enemy's army (which Clausewitz saw as being the natural choice); it may be as ephemeral as a despot's ability to further his family's fortunes and influence. Warden¹⁷ has suggested that attacking the

leadership of a foe could lead to strategic paralysis, thereby possibly obviating the need for attacks on fielded forces. Air assets other than attack aircraft may, however, be involved in strategic air operations. Activities such as supervision of a no-fly zone or the provision of relief supplies may have strategic effect, depending on the circumstances prevailing at the time.

The objective of strategic air operations, consistent with the tenets of manoeuvre warfare, is to shatter the enemy's cohesion and will – not just to destroy men and materiel

The objective of strategic air operations, consistent with the tenets of manoeuvre warfare, is to shatter the enemy's cohesion and will – not just to destroy men and materiel. Target sets will have been selected, as part of the estimate process, for their strategic relevance and may include the machinery of government, military forces, infrastructure and so forth. Given the flexibility of air power, other targets at the operational and tactical levels may be attacked in parallel with, or subsequent to, strategic operations. The target sets at this high level of operations, and the weapons proposed, will inevitably excite considerable political, legal and humanitarian interest in the highest spheres of governmental machinery. Whilst the military preference is for the espousal of a clear political aim followed by centralised planning and then decentralised execution, it is entirely proper in a democratically accountable structure that

political oversight is maintained. This is bound to be most appropriate, and most contentious, at the strategic level. The possible necessity of maintaining coalition solidarity may make this aspect of an operation or campaign particularly fraught.

A study of the historical uses of air power at the strategic level suggests a number of possible lessons that may influence coalition planning. The actual shock of aerial bombardment may be sufficient on its own to influence the target government – particularly if the intended victim has been sceptical as to the will of his foe. The psychology of this type of operations is at best hugely difficult and, more probably, such that each case is *sui generis*. The actual effect of the attack, rather than just the damage assessment, is extremely difficult to assess, particularly if it has been accompanied by information operations. The US operation against the Gaddafi regime in 1986 is held by some to have been successful in its shock effect; but it is by no means certain that ELDORADO CANYON did little more than force Libya to be more covert in its support for terrorism.¹⁸

A concerted bombing offensive can have a profound effect on a target population. In a democratic state with open media, this may result in increased pressure on the ruling elite. In any event it may well force the target government





...measuring 'public morale' is hardly a scientific art in any country let alone one that is subject to police control, censorship and propaganda

to reallocate scarce assets to defence of the homeland.¹⁹ The less accountable the leadership of the target state, however, or the more 'total' the war, the less likely they are to bow to public opinion. Furthermore, measuring 'public morale' is hardly a scientific art in any country let alone one that is subject to police control, censorship and propaganda.

Any dealings with a state such as Milosevic's Serbia must make these options at best questionable. The majority of the press is firmly under state control and the Interior Ministry Police would ensure that serious unrest did not become a threat. Hoping for the populace to pressurise a dictator may be overly optimistic. Furthermore an external threat would tend more to unite the people behind Milosevic, particularly if the potential aggressor had taken up cudgels on behalf of the loathed Albanian neighbours. Nor are the Serbs slow to exhibit a marked tendency towards national martyrdom – particularly over Kosovo with its historic

connections to the infamous Battle on the Field of Blackbirds in 1389. Drawing too many examples from the historical use of strategic bombing may be counter-productive. An analysis of more recent usage of air power in the Balkans could therefore be more useful.

THE LEGACY OF AIR POWER IN THE BALKANS – DELIBERATE FORCE

The break up of the Socialist Federal Republic of Yugoslavia shortly after the successful end to the Gulf War has occasioned veritable rain forests of literature, both in the open press and in academic research papers. It is well outside the scope of this article even to review a sample of the works, let alone describe the dissolution of Tito's legacy. Suffice it to say that the Yugoslav Peoples' Army (JNA) had failed to prevent the secession of Slovenia in the Summer of 1991 and the world was subsequently reminded of the potential brutality of violence in the region as Serbs and Croats fought out their bitter struggle in the border areas of Croatia. As the first peacekeeping troops entered that country in early 1992, the few Balkan specialists watched the area with mounting trepidation, anticipating an upsurge of violence in the multi-ethnic state of Bosnia-Herzegovina.

Bosnian Serb paramilitary units had formed in anticipation of Muslim-led calls for secession, greatly aided by the JNA who released war stocks of weaponry to their Serbian brethren. Bosnia withdrew from Yugoslavia in March 1992, resulting in immediate conflagration as the Bosnian Serbs sought to use their military potential for maximum territorial gain.

The first air power on the scene, almost inevitably, were AWACS aircraft in support of the NATO/WEU operation to enforce the arms embargo (SHARP GUARD). (In addition, the Sarajevo airlift began on 2 July 1992.) United Nations Security Council

Resolution (UNSCR) 781 prohibited all military flight operations over Bosnia and Operation SKY WATCH soon reported that the ban was being observed only in the breach. This was followed on 31 March 1993 by the issue of UNSCR 816 which banned all flights not authorised by the UN; SKY WATCH was replaced by DENY FLIGHT and policing of the No-Fly Zone began in earnest. Further air power missions were added to the DENY FLIGHT folder including the option to use Close Air Support for relief of UN peacekeepers under attack. The whole operation was fraught with problems. HQ 5 ATAF, under whose command the operation fell, was ill-equipped to handle an operation of the complexity of DENY FLIGHT, let alone undertake an extensive offensive campaign.²⁰ The practical situation was exacerbated by the often delicate relationship between the UN and NATO. There was considerable concern that a rash NATO air attack, possibly fuelled by high level political frustration, could seriously endanger the lives of the peacekeepers on the ground.²¹ This resulted in the so-called dual-key approach under which a given target had to be approved at high level in

As the first peacekeeping troops entered that country in early 1992, the few Balkan specialists watched the area with mounting trepidation...



both organisations.²² Air power was used on occasions such as the attack on Ubdina airfield in late 1994; NATO proudly announced that this had been the largest air raid in Europe since World War II – Richard Holbrooke described it in horror as being closer to ‘pinpricks’.²³ General Sir Michael Rose defended similar actions as being ‘textbook examples of the precise use of force in a peacekeeping mission’.²⁴ From these two viewpoints, it is evident that perceptions are all-important.

As the months went by, the situation in Bosnia continued to deteriorate. The UN’s worst fears were realised in May 1995 when the Bosnian Serbs took 370 (largely French) peacekeepers hostage following NATO bombing of ammunition depots at Pale. Srebrenica fell to a brutal assault in mid-July and the clamour within the international community for ‘something to be done’ rose to yet another peak. NATO planning within AFSOUTH had by this time improved to the point whereby suitable Bosnian Serb targets had been identified throughout the theatre – including ‘indirect’ targets such as bridges and command facilities.²⁵ These indirect targets were specifically chosen to increase the level of coercive pain levered on the Bosnian Serbs.

On 28 August 1995, a mortar bomb exploded in a Sarajevo marketplace killing 68 people. The Bosnian government blamed the Serbs. The Bosnian Serbs blamed the Muslims for firing on their own people in an attempt to provoke a NATO response.²⁶ There then followed a short delay while plans were finalised and, more importantly, UN forces were allowed to take up positions that they could defend. DELIBERATE FORCE started in the early hours of 30 August 1995. Some 220 fighter aircraft and 70 support aircraft from the US, UK, Italy, Germany, Netherlands, Greece, Turkey, Spain and France took part, generally flying four or five ‘packages’ of aircraft on each day that weather allowed operations. Some 3515 sorties were flown delivering 1026 weapons against 48 targets.²⁷ For presentational purposes, the NATO attacks were carried out as part of the campaign to protect the safe areas – directly and indirectly. It is obvious, however, from Holbrooke that any coercion of the Bosnian Serbs towards a peace settlement would be beneficial.²⁸ Furthermore, the air campaign was materially assisting an ongoing Croatian Army²⁹/Muslim ground offensive – much to the discomfort of the Bosnian Serb Army who found that the concentrations of tanks and artillery necessary to counter this assault made excellent targets for air power. Holbrooke suggested to Milosevic that the air campaign was not coordinated with the ground offensive, but later in his account admits to having advised President Tudjman of Croatia as to which towns his troops should occupy to facilitate later negotiations.³⁰ The marked escalation in external military involvement resulted in a new momentum for the talks’ process.

Wright-Paterson Air Force Base in Dayton Ohio was chosen as the venue for substantive talks between the erstwhile warring factions. The delegates arriving from the Balkans by air had to walk past ramps laden with operational aircraft, leaving the Serbs in no doubt as to the scale of air resources available to an American led coalition. For many commentators and participants the use of air power was decisive. Carl Bildt, however, correctly brings the enthusiasts back to earth with the reminder that the key events were political rather than military – not least because the US administration was at last prepared actually to recognise



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politically the Bosnian Serb entity³¹ (this had stymied earlier attempts at a settlement).

Beyond the implication that DELIBERATE FORCE had galvanised both sides into negotiating a settlement at Dayton, it is always difficult to penetrate the Stygian gloom of Belgrade politics. Milosevic had already been seen to have sold out the Krajina Serbs; he then confounded the 'Greater Serbia' theorists by supporting Dayton. Some key factors can, however, be identified. There was a marked improvement in the terms on offer at Dayton with the recognition of the Bosnian Serb entity. What is more, Russia was fully integrated into the political process³² and would certainly not have supported Belgrade militarily. After months of dithering, which Milosevic would have perceived as endemic weakness, the international community had sanctioned the use of air power on a significant scale and showed no signs of relenting in its use. Again from the Serbian perspective (both in Belgrade and Pale), Western resources must have appeared unlimited. Finally there was the risk, from Milosevic's perspective, that coalition air power would increasingly be coordinated with Croat/Muslim ground forces and that more Bosnian Serb territory would be lost in action than at the conference table. Even though Milosevic has consistently shown himself to be a master tactician (rather than a strategist), his evil genius almost certainly appreciated the prospect of the 'keener' elements of the international community becoming bogged down in policing the settlement for years knowing that the alternative would leave him or his successors a clear field.

THE KOSOVO AIR OPERATION

The background to the most recent crisis in Kosovo has excited considerable and understandable interest. The literature on the Balkans has increased exponentially over the last decade; it will, however, be many years before a neutral and authoritative account is available. In the meantime the would-be student needs to retain the mental health warning that many authors have prepared their works with the sound of axes being sharpened in the background. A visit to the region in search of first hand research would almost inevitably result in a series of contradictory history lessons, usually accompanied by the selective use of maps and washed down with Slivovitz. For the purposes of this article, it is sufficient to go back to 1987 when the Serbian Communist Party *apparatchik* Slobodan Milosevic latched onto the plight of the Kosovo Serbs as a vehicle for his own rise to power.³³ He stripped Kosovo, and the Hungarian majority area of Vojvodina, of their status as Autonomous Provinces and vainly attempted in the former to redress the population balance by importing Serbs who had been displaced from other regions. The ethnic Albanian population still outnumbered the Serbs by a huge margin. Their 'shadow' economy and political system functioned well; while Sarajevo was under siege and Belgrade was in the grip of economic sanctions, Pristina appeared almost prosperous³⁴ in comparison with other parts of the Balkans – not least because the Kosovo Albanian economy was supported by hard currency remittances from the diaspora. This stability was maintained under the benign rule of Ibrahim Rugova whose pacifist stance³⁵ tended to reduce the possibility of strife. But no one was naïve enough to doubt that Milosevic would not hesitate to inflame the situation if domestic politics required a diversion, or if the Albanians openly espoused independence.

The aftermath of the Dayton agreement traumatised the ethnic Albanians – particularly as Lord Owen's consistent calls for the plight of Kosovo to be included in the settlement were ignored. Their policy of non-violence had not worked. The subsequent (but unconnected) collapse into anarchy of Albania in 1997 resulted in an almost unlimited supply of weapons becoming available, and the scope for armed insurrection suddenly opened. This mounting frustration, along with a massive influx of light weaponry, resulted in the Kosovo Liberation Army (KLA) growing from a minor bunch of disillusioned ex-patriates into a serious threat to the Serbian authorities. The cycle of violence expanded with the inevitable counter-offensives through 1998. The spectre of massacres, ethnic cleansing and other atrocities prompted the international community into the Rambouillet talks process.³⁶ Milosevic could not accept the terms on offer. Having come to, and maintained, power on the basis of rabid nationalism, he could not back down without some semblance of a fight. There was a clear risk of secession, and the detail of the agreement contained, from Belgrade's perspective, serious erosions of Serbia's sovereignty.³⁷ Acceptance would have been political suicide for Milosevic – not a trait for which he is renowned.

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Milosevic may have doubted the will of the international community and almost certainly bargained on NATO not being able to maintain its cohesion. He must also have hoped that Russia would not tolerate an open attack on a fellow Slav sovereign state and would have anticipated a veto on Chapter VII action in the UN Security Council. Although Serbia's own respect for international law is less than comprehensive, Milosevic may also have reckoned on the international community taking a conservative approach based on the absolute sovereignty of nation states. In the event, Milosevic miscalculated. The West was quite clear that military action was justified as an exceptional measure to prevent an overwhelming humanitarian catastrophe.³⁸

It could be argued that an analysis of NATO strategy in the lead-up to the campaign would be as doomed to confusion as an attempt to rationalise Balkan history. It is evident that many hoped that the mere exercise of military force would be sufficient to make Milosevic realise his ultimate destiny. This apparent optimism may have been based on realisation of coalition fragility, rather than cold military appreciation. NATO options varied from a limited conventional attack against fixed military targets across Serbia through to a 2-phase operation against specific Kosovo related military targets.³⁹ At first sight, it would appear that these options would have given NATO the flexibility to apply air power to a wide range of targets. Therein lies the probable rub. Too extensive a range would undoubtedly have been politically unacceptable to the less committed members of the alliance. And a hesitant campaign would have allowed Milosevic's small paramilitary units to get inside the Alliance decision making loop. The subsequent disconnect in NATO aims may have become evident in the publicly stated war aims of its leaders. SACEUR, General Wesley Clark, stated in a NATO briefing on 25 March 1999 that:

"We're going to systematically and progressively attack, disrupt, degrade, devastate, and ultimately – unless President Milosevic complies with the demand of the international community – we're going to destroy these forces and their facilities and support."

On the other hand, Lieutenant General Michael Short, who was the air commander in theatre at the time, subsequently gave evidence to the Senate (and in TV interviews) that there had been severe national differences over the targeting of Serbian centre(s) of gravity. Short stated somewhat graphically that he would have preferred to have

"gone for the head of the snake on the first night".⁴⁰

It is possible that Clark may have been reflecting NATO appreciation of an operational centre of gravity while his air commander had identified the strategic Centre. This argument would have been consistent with the Service background of the officers concerned – particularly in the classic Clausewitzian desire to destroy the enemy army. The tone of Short's evidence suggests, however, that there was considerable frustration over the high level of (perfectly proper) political control.

Milosevic may have doubted the will of the international community and almost certainly bargained on NATO not being able to maintain its cohesion. He must also have hoped that Russia would not tolerate an open attack on a fellow Slav sovereign state...

Notwithstanding the internal debate, the air operation commenced at 1900 GMT on 24 March 1999 and continued for 78 days. Some 38,004 sorties were flown of which 10,484 were strike missions. The UK flew 1,618 sorties of which 1,008 were strike.⁴¹ The air campaign began with a series of strikes on air defences across Serbia and Montenegro and against a limited number of military targets in Kosovo and elsewhere in Southern Serbia. Targeting policy was under political control in NATO and nationally. Any Western assessments⁴² that Milosevic would collapse immediately were quickly shown to be wrong as his special forces and para-military units set about an ethnic cleansing operation of unprecedented brutality. The refugee situation alone threatened the stability of neighbouring Macedonia and Albania. Disquiet in Greece and Italy also made NATO cohesion look questionable.⁴³ In the event, the combination of Serbian intransigence and extreme brutality only served to confirm the NATO coalition in its determination.



The US deployed Apache to Albania, AC130U Spectre Gunships began operations from Italy and the sortie rate overall increased, peaking at close on 800 per day by the end of May

NATO progressively increased the pace and tempo of the operation, extending the spectrum of targets open for attack.⁴⁴ After early objectives had been achieved, including the consolidation of air superiority, NATO was able to shift its focus to the Yugoslav Army's fielded forces.⁴⁵ The rate of attrition increased, not least because the weather had started to improve allowing more formations of aircraft to deliver their ordinance without fear of causing collateral damage. The US deployed Apache to Albania, AC130U Spectre Gunships began operations from Italy and the sortie rate overall increased, peaking at close on 800 per day by the end of May.⁴⁶ At the same time, ground troops were continuing to form in Macedonia and speculation was mounting in the press that land operations could be attempted in a 'semi-permissive' environment: the hitherto comforting (for Belgrade) mantra that ground troops would not be used in Kosovo had gradually reduced. Milosevic could be in no doubt that NATO cohesion had been maintained and that there was no evidence of diminution of allied appetite for the conflict. Furthermore no real help was forthcoming from Moscow.

Peace talks started to produce results, culminating in the signing, on 9 June, of the Technical Military Agreement which set out how the Serbs would leave Kosovo. NATO peacekeeping troops entered Kosovo on 12 June (a day after a small contingent of Russian troops unexpectedly drove into Pristina). The Serbs evacuated large numbers of troops and military vehicles, claiming that NATO had been duped by simple deception techniques.⁴⁷ The inevitable post mortems, 'bean-counts' and so forth will doubtless continue to be bandied around for years to come. Lessons will undoubtedly be learned – provided we remember General Jumper's advice about drawing generic lessons from such an idiosyncratic operation. The mistakes, such as the bombing of the Chinese Embassy and attacks on refugees, will be mulled over. And the sterile debate as to whether air power 'did it alone' will drone on. The bottom line remains, however, that Serbian forces evacuated Kosovo without the loss of 'the bones of a single Pomeranian Grenadier'; NATO-led forces are in control, supervising the return of refugees.

What brought about Milosevic's change of heart may never be known. But there are similarities between the end of this conflict and the end of DELIBERATE FORCE. As with Dayton, the peace settlement was an improvement on what was on offer at Rambouillet, not least over specific recognition of Serbian sovereignty. Again Russia had given little more than popular support – the forces of international economics proving stronger than pan-Slav nationalism. The international community had been seen to dither up to the banks of the Rubicon, but having decided to go forward did so with increasing strength and determination. Air power was used on a significant scale against a wide range of targets – not just the military assets. Furthermore, from the Serbian perspective, Western resources must have appeared unlimited (despite articles in the specialist press suggesting otherwise⁴⁸). As with the situation leading up to Dayton, Milosevic must have been concerned that NATO air power was at least being taken advantage of by the KLA.⁴⁹ Serbian military responses to KLA action brought troops and equipment out into the open for long enough for the NATO targeting cycle to respond. Finally, Milosevic could again see that the West had become committed to another long sojourn in another area of the Balkans. He may have calculated that coalition capacity to provide ground troops was more limited than the provision of air power, which could have significant ramifications for the next flash point (possibly Montenegro?).

So how does the doctrine on the use of air power for strategic effect hold up in the light of Operation ALLIED FORCE? Notwithstanding the debate within NATO, this author has been unable to locate an official definition of the enemy strategic centre of gravity. But Milosevic's personal hold on power must have been a reasonable possibility (provided, as always, that success would not have resulted in him being replaced by someone more radical – a very likely contingency in Serbia).

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It is probably too early to say what the long-term effects of the Operation were on Milosevic. He was probably unsettled by his indictment as a war criminal, not least because it left neither him, nor his cronies, with an escape route to comfortable exile.

In the past, Milosevic has adeptly manipulated sanctions regimes and hyperinflation by allowing his cronies to profit from the constrictions in supply and demand. These have almost invariably worked in hard currencies with black marketeers making huge profits on both the transaction and the rate of exchange. Ironically, in previous 'hard times', Kosovo with its remunerations from the diaspora has been a fertile source of Deutschmarks and Swiss francs. The continuing air campaign almost certainly was squeezing the Serbian economy to the point at which there were few profits to be made. Support from corrupt businessmen could only be taken for granted when they had something to gain; if Milosevic could not maintain the momentum of the gravy train, his erstwhile cronies could easily turn against him. This is even more likely if he needs hard currency to be repatriated for the rebuilding of Serbia.

Milosevic has always been an adept politician; he has demonstrated considerable prowess in manipulating the fractured opposition and, at the time of writing, little change is evident on this front. Serbian paramilitary units have been consistent in their support for Milosevic and this is almost bound to continue – mutual support is vital with war crimes indictments on the horizon.⁵⁰ Support within the army is probably more fragile. Milosevic has consistently removed potential opposition, but even his hand picked general staff must have become increasingly frustrated with the plight of their troops who had to hide in underground car parks. The ability of air power intelligence assets to identify concentrations of troops can only have added to this trend.

The use of air power for strategic effect is based primarily on the identification of the weak spot in the make up of the enemy, attack on which will lead to his acceptance of diplomatic imperatives: accurate assessment of the enemy's perceptions is vital. The strategy maker then works around the loop to analyse how to attack this weak spot – it may be a centre of gravity, a centre of influence or, indeed, a seam between elements of his decision-making fabric. The next step is to draw up the target list and attack using the best weapons available, or politically acceptable. The consequences of the action are then analysed prior to the cycle repeating. This is not carried out automatically; the battle damage assessment must include an analysis of enemy perceptions and responses to the progress thus far. If necessary, the target set is amended to reflect say a hardening of attitudes. Given the flexibility of air power, other targets at the operational and tactical levels may be attacked in parallel with, or subsequent to, strategic operations.

The full range of strategic targets appears to have been attacked in the Kosovo air operation. Sceptics who insist on counting the men and materiel that have been 'plinked' miss the point that the aim is strategic effect – not the large-scale destruction of physical assets, nor the wholesale lowering of morale. Frankland's quotation is as relevant after Kosovo as it was when he wrote his history of the World War II bombing campaign. That Kosovo is now in NATO hands proves the point.



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NOTES

- 1 This quotation was also used to start Chapter 6 (entitled Strategic Effect of Air Power) of AP3000 British Air Power Doctrine, Third Edition, (HMSO), 1999' page 2.6.1. The original is from Noble Frankland, *The Bombing Offensive against Germany, Outlines and Perspectives*, (London: Faber and Faber), 1965, page 18. This book was based on his delivery of the University of Cambridge *Lees Knowles Lectures* in 1963.
- 2 Sir Charles Webster and Noble Frankland, *The Strategic Air Offensive against Germany*, (London: HMSO), 1961; 4 volumes.
- 3 *Outlines and Perspectives*, page 16.
- 4 For a useful review of the theory of the relationship between the public debate and the inevitably classified reflections of officialdom see Jonathan Mermin, *Debating War and Peace – Media coverage of US Intervention in post-Vietnam era*, Princeton, Princeton University Press, 1999.
- 5 This rather derogatory term was used by the Foreign Secretary, Robin Cook, on the Radio 4 *Today* programme on the morning of 25 March – after the first night's bombing. For better or worse, the term stuck irrespective of the operational pedigree of those concerned.
- 6 John Keegan, 'So the bomber got through to Milosevic after all', *Daily Telegraph*, 4 June 1999, page 28. See also John Keegan, 'Yes, we won this war; let's be proud of it.' *Daily Telegraph*, 24 June 1999, page 26. Contrast this with General Sir Michael Rose, 'Peacekeepers fight a better war than bombers', *Sunday Times*,

20 June 1999, page 26.

- 7 General John Jumper (Commander of US Air Forces in Europe and of Allied Air Forces Central Europe), *Kosovo Victory – A Commander's Perspective*, *RAF Air Power Review* Vol 2 No 4, December 1999, page 1.
- 8 Note that, doctrinally, the air operation was part of the overall campaign – not a campaign in its own right.
- 9 See for example, Air Vice Marshal Tony Mason, *Air Power – a Centennial Appraisal*, (London: Brassey's), 1994, Chapters 1 and 2.
- 10 R J Overy, *The Air War 1939 – 1945*, (New York: Stein and Day), 1980, page 15.
- 11 Ibid, page 121. See also Tami Davis Biddle, 'British and American Approaches to Strategic Bombing: Their origins and Implementation in the World War II Combined Bomber Offensive', in *Air Power Theory and Practice* ed by John Gooch, (London: Cass), 1995, page 98.
- 12 See David Omissi, *Air Power and Colonial Control: the Royal Air Force 1919 – 1939*, (New York: St Martins).
- 13 John C. Slessor, *The Central Blue*, (London: Cassell), 1956 page 62.
- 14 Philip S Meilinger, 'Trenchard and 'Morale Bombing' the Evolution of Royal Air Force Doctrine Before World War II', *The Journal of Military History*, Vol 60, No 2. April 1996, page 264.
- 15 British Air Power Doctrine, AP 3000, third edition, (London: HMSO), 1999, Chapter 6.
- 16 Ibid, page 2.6.1.

- 17 John A Warden III, *The Air Campaign*, (New York: to Excel), 1998; the original version was first published in 1989 and was highly influential in the Gulf War air campaign.
- 18 See, for example, Joseph Leppgold, 'Hypotheses on Vulnerability: Are Terrorists and Drug Traffickers Coerceable?' in *Strategic Coercion, Concepts and Cases*, ed by Lawrence Freedman (Oxford: OUP), 1998, pages 144-147.
- 19 Overy, *The Air War 1939-1945*, page 121.
- 20 For an authoritative account see Colonel Robert C Owen USAF, 'The Balkans Air Campaign Study', published in two parts in the *Airpower Journal*, Summer and Fall 1997.
- 21 Richard Holbrooke, *To End a War*, (New York: The Modern Library), 1998, page 63.
- 22 General Sir Michael Rose, *Fighting for Peace*, (London: Harvill), 1998, page 160 (for example).
- 23 Holbrooke, *To End a War*, page 61.
- 24 Rose, *Fighting for Peace*, page 161.
- 25 Owen, 'The Balkans Air Campaign Study', page 20.
- 26 Rose, *Fighting for Peace*, page 43.
- 27 Owen, 'The Balkans Air Campaign Study', Fall 1997, page 8.
- 28 Holbrooke, *To End a War*, pages 145 - 150.
- 29 Thomas Quiggin, Do airstrikes amount to an effective policy?, *RUSI Journal*, April/May 1999 page 17 is quite specific over the involvement of regular Croatian Army troops.
- 30 Holbrooke, *To End a War*, pages 147 and 160.
- 31 Carl Bildt, Holbrooke's History, Review Essay, *Survival*, Autumn 1998, page 187.
- 32 Pauline Neville-Jones, Bosnia after IFOR, *Survival*, Winter 1996-97, pages 45 - 65. This essay gives a UK perspective on the process to balance Holbrooke's somewhat Washington centric view.
- 33 See for example, Tim Judah, *The Serbs: History, Myth, and the Destruction of Yugoslavia*, (Yale: Yale University Press) 1997.
- 34 But only by prevailing Balkan standards. The author, in his capacity as a Balkans analyst in the Cabinet Office, visited Kosovo in 1993. Two Albanian youths were shot dead in the street outside the author's hotel at about 5.00 AM.
- 35 Rugova was, and still is, a quietly spoken academic who shunned all question of militant action against the Serbs. He would expound at great length how a softly-softly approach was the only way to challenge the Serbs - even over lunch he was never without his scarf around his neck.
- 36 For a detailed discussion on the international legal aspects of these talks see Marc Weller, 'The Rambouillet Conference on Kosovo', *International Affairs* 75, 2 1999, pages 211 -251. Weller has acted as counsel to the Bosnian Muslims and the Kosovo Albanians.
- 37 See John Pilger, 'Revealed: the amazing NATO plan, tabled at Rambouillet, to occupy Yugoslavia', *New Statesman*, 17 May 1999. Pilger contended that a full copy of the plan had been published in France but had been suppressed in the UK. His objection was that it allowed NATO unbridled access to any part of Yugoslavia and was therefore an excessive infringement of sovereignty.
- 38 See the MoD justification on www.mod.uk/dicmt/kosovo/legal.htm. See also Catherine Guicherd, 'International Law and the War in Kosovo', *Survival*, vol 41, no 2, Summer 1999, pages 19-34. AP3000 states correctly on page 1.1.10 that legal opinion is divided over this issue. In a less extreme case than Kosovo, intervention may be more hotly debated.
- 39 See for example, Rebecca Grant, *The Kosovo Campaign: Aerospace Power Made It Work*, Air Force Association Special Report, Arlington, September 1999, pages 4 - 7.
- 40 Reported in Greg Seigle, 'USA claims France hindered raids', *Janes Defence Weekly*, 27 October 1999, page 3.
- 41 Details taken from www.mod.uk/news/kosovo/account/nato.htm on 11 Oct 99.
- 42 See for example, Sue Cameron, 'Top Brass Brassed Off', *The Spectator* 17 April 1999, page 14.
- 43 CAS has described NATO cohesion as being its 'Centre of Gravity'. Air Chief Marshal Sir Richard Johns, Presentation to the Guild of Air Pilots and Air Navigators on 21 September 1999.
- 44 Nick Cook, 'Serb air war changes gear', *Janes Defence Weekly*, 7 April 1999, page 24.
- 45 Air Cdre Andrew Vallance, 'Kosovo exclusive - a planner's perspective', *Aircraft Illustrated*, September 1999, pages 20 - 23.
- 46 Kosovo War Diary, *AIR International*, July 1999, pages 14 - 15.
- 47 'Air Power over Kosovo. A historic victory?', *IISS Strategic Comments*, Vol 5, Issue 7, September 1999.
- 48 Greg Sample, 'US Cruise missile stocks dwindling', *JDW*, 7 April 1999, page 3.
- 49 Bryan Bender, 'KLA action fuelled NATO victory', *JDW*, 16 June 1999, page 5.
- 50 'Foul Play: Serbia's opposition', *The Economist*, 9 October 1999, page 60.

DOCTRINE NOT DOGMA:



Lessons from the Past

By Professor Richard Overy, King's College, London

Military doctrine is by definition historical. It changes through time, as circumstances and experience dictate. It is, in this sense, an intensely unstable or evolutionary phenomenon. This has always been a difficult situation for the military establishment of any country to cope with.

The temptation is to take doctrine at a fixed point and to keep it that way to maintain some semblance of intellectual certainty. Doctrine can then turn into dogma. It no longer encourages creative thinking about the function and nature of military activity, but forces that activity into a particular mould, which may be more or less suitable for the current situation. More commonly history has shown that a dogmatic attachment to strategy inhibits the creativity and responsiveness essential to military thought; it generates a cast of mind that is conservative, uncritical, or, at times, ideologically inspired. Doctrine becomes not a means to an end, but an end in itself.

There are no shortages of examples in twentieth century military history to support the contention that doctrine tends to solidify like a slowly moving lava flow. The very idea of doctrine – as a set of formal, written, guidelines on the organization and function of an armed service in pursuit of certain stated strategic objectives – is to a large extent a twentieth century development, it owed a good deal to the emergence of military aviation, because air forces, more than armies and navies, were forced to justify their independent existence by adopting a doctrine distinct from the more senior services. The formulation of air doctrine had the effect of encouraging the rest of the military machine to think harder about its own strategic outlook.





...the RAF established in 1918 a so-called Independent Force, under the command of General Hugh Trenchard, whose purpose was to mount a bombing campaign against German cities and military installations 'independent' of the conduct of the group war

This was the situation that faced the infant Royal Air Force (RAF) when it found itself in the early 1920s under strong pressure from both the army and the Royal Navy to abandon an independent organization in favour of the close support of surface forces. The *raison d'être* of the RAF as an independent force lay in the circumstances of the final years of the Great War. Aircraft were organized independently as a defence force against German bombing of London and the coastal towns. More significantly, the RAF established in 1918 a so-called Independent Force, under the command

of General Hugh Trenchard, whose purpose was to mount a bombing campaign against German cities and military installations 'independent' of the conduct of the group war. Trenchard emerged in the 1920s, despite his initial scepticism, as the foremost champion of an independent air force, and of a strategy of aerial bombardment against targets other than those in the immediate battle zone.

In Trenchard's view the impact of bombing owed more to its moral effects than its power of physical destruction. He suggested the untested, and untestable, hypothesis that the enemy could be defeated by destroying the will to fight, rather than the means to fight, became a central tenet of British air power strategy. In 1928 the British Chiefs of Staff began a searching inquiry into the nature of air doctrine. It gave Trenchard the opportunity to define his terms more clearly. He took as his starting point the view that unlike the other two services, the air force could not very easily pursue the classic counter-force objective. The RAF took the view – which was maintained right through to the Second World War – that an enemy air

force presented a target that was too dispersed and fleeting to be defeated by other aircraft. Unlike a conventional force, Trenchard argued that air power ought to be directed at the enemy's willingness or capacity to make war at all. Of air attack he wrote that 'the moral effect is very great', even incalculable. He continued:

'it is clear that such attack, owing to the crushing moral effect on a Nation, may impress the public opinion to a point of disarming the Government and thus become decisive'.¹

The argument could be supported by the experience of the RAF in what was called 'Empire policing', where political results were cheaply obtained by attacking rebel tribesmen with a handful of aircraft and low-calibre bombs.

The Chief of the Naval Staff took a different view. In the naval response to Trenchard it was forcefully suggested that the RAF ignored the traditional principles of concentration of effort for the direct attack of the enemy armed forces, whose defeat alone would produce the desired political effect.² Trenchard won the day. The Chiefs agreed that the RAF could specify the strategy which made best use of air resources and promised the best strategic results. An independent assault on the war-willingness of the enemy became the centre piece of British air doctrine. It is what British airmen – and much of the British public – expected the enemy to do. The RAF War manual opened with the words: 'The bomb is the chief weapon of an air force and the principal means by which it may attain its aim in war'.³ The pursuit of independent bombing was done at the cost of a serious counter-force strategy, or even an effective strategy of defence, until the radar chain was built in the late 1930s. Cooperation with the navy and army was not regarded as a significant strategic objectives by the RAF, and very little was done to prepare for such an eventuality.

The Trenchard doctrine was modified in the late 1930s when the RAF began, on the instructions of the Chiefs-of-Staff, to prepare a plan for the long-range bombing of German industry. When the economic strategy failed in 1940-1, largely for technical reasons, the Trenchard view was resurrected, despite the fact that it remained unproven. British morale had not cracked in the Blitz in the decisive sense implied by Trenchard, and there was little to suggest that it would do so in Germany. In the summer of 1941 Trenchard wrote a strong letter to the Air Ministry, which was widely circulated. He urged the RAF to concentrate on the morale of the German people by attacking it by night and day continuously. On the specious grounds that the German people 'remain passive and easy prey to hysteria and panic', while 'History has proved that we have always been able to stand our casualties better than other nations', Trenchard suggested that the German population would simply stand no more and end the war.⁴ It was a view strongly supported by the Chief of the Air Staff, Sir Charles Portal, and by Churchill's scientific adviser, Lord Cherwell. The Trenchard doctrine triumphed again as dogma.

This time the response of the other service chiefs was more forthright. Admiral Sir Dudley Pound condemned Trenchard's paper as 'a complete overstatement'. He continued: 'The danger of hard and fast priorities unintelligently interpreted has often been exemplified'.⁵ He knew dogma when he saw it. None the less the Chiefs-of-Staff endorsed a new strategy for Bomber Command in July 1941 in which the assault on German morale was given pride of place. This was the strategy inherited by Air

Marshal Arthur Harris when he was appointed commander of Bomber Command in February 1942. Although he has been popularly viewed from a quite different perspective, it is to Harris' credit that he recognised dogma too. When he assumed command the force was drifting, politically vulnerable because of its poor performance, quite unequal to the task of breaking the German will to resist. He regarded morale as such as an absurd objective in a state 'with the concentration camp around the corner'.⁶ He believed, as he had done as Deputy Director of Plans in the mid-1930s, that air power had one purpose, given the current state of technology, and that was to destroy the physical base of German war production by hammering the most important centres of production heavily and repeatedly. Whatever the drawbacks of such a campaign, which are well-known, Harris did set up a clear strategic objective, created the force structure and technology necessary to achieve it, and rejected the dogmatic assertion that morale was the key. The US 8th Air Force broadly followed the Harris line. US practice differed only in the belief that specific target systems could be hit with accuracy, rather than entire industrial cities.

The Trenchard view is hard to justify. It was accepted dogmatically and in the face of circumstances which should have encouraged a doctrinal revolution in the RAF. There were strong political constraints on a bombing strategy. When the RAF entered war in 1939 the prevailing instruction was to avoid any bomb attack in which there was the slightest chance of injury to a civilian. The British government, like the American, was among those exploring throughout the 1930s some means of outlawing the use of aircraft against anything but military targets in the strict meaning of the term. There were self-evident practical constraints. The prevailing technology might well have been equal to the tasks of subduing poorly armed colonial

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Stirling bombers en route to target

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rebels; it was inadequate for the kind of operations needed to subdue an enemy population on almost every count. Nor was there any conclusive evidence that bombing had the moral effects claimed for it. The bombing of Ethiopian villages in the Italian-Ethiopian war, or later the bombing of Guernica in the Spanish Civil War, were evidently demoralising but politically indecisive. The belief in the power of the bomb to affect the outcome of war remained, in the words of Marshal of the RAF, Sir John Slessor, a 'matter of faith'.

Why did British air doctrine develop in this way? The answers to that question, and there are many, provide important indicators to the factors that influence the

development of doctrine more generally. Political factors played their part, quite aside from the military issues involved. In the first place the RAF did need to justify its existence as a separate force, not only in 1919 when post-war retrenchment made the RAF a prime target for cutting, but throughout the inter-war years. An independent and unique doctrine, one which stressed the modernity and originality of air strategy, was regarded as essential to the political survival of the force. In addition, air doctrine was inseparable from the conditions of inter-service rivalry in the inter-war years. That rivalry was based on competition for scarce resources of money and industrial capacity for defence purposes. The senior services developed strong intellectual grounds for dismissing the idea of an independent air arm, but much of the rivalry between the services was based on material issues, or relative status. The RAF required a strong sense of what it was there for, in order to convince successive Chancellors of the Exchequer that the force was worth funding. As a result, the force was perhaps over-reliant on the strength of Trenchard's personality. The development of doctrine was difficult to separate from the political will and capability of the individuals involved in its formulation.

In the second place, doctrine suffered from a relatively poor level of evaluation and review. Of course, the military services between the wars lacked the kind of management skills and apparatus which forces in the late twentieth century take for granted. None the less, there was strikingly little serious discussion about air doctrine. The commitment to bombing was based on only the slenderest foundation of military experience. The post-1918 survey of the effects of bombing Germany in the last year of the war was pessimistic and inconclusive.⁷ It was not a sufficient basis on which to erect a strategy of independent air power. The experience of Empire policing, in which many senior officers in the 1930s had been engaged at some time or other, supported the idea of independent bombing in a context unlikely to be replicated in a European war. Consider a case published in the *Journal of the Royal United Services Institution* in 1938, 'Air Control in Ovamboland'. The author described the suppression of a rebel headman in southern Africa, who was brought to heel with the use of three aircraft bombing his kraal

and his cattle.⁸ The lesson to be drawn from the experience was that the moral pressure exerted by air attack was sufficient to achieve a political outcome. It was an assumption which could be, and was, extrapolated by the RAF to explain the offensive posture of the force and the central role assigned to bombing.

Clearly, from this example, the formulation of doctrine cannot be regarded as autonomous. Personalities, politics, technology, and experience combined in an intricate web of influence whose effects on doctrine were diverse but often profound. In this case doctrine ran ahead of what experience had taught, or the technical threshold would permit, or political circumstances make possible. The result was an attitude to air warfare that left the RAF after the outbreak of war in 1939 with a wide gap between ambition and capability. It might well be argued that some combination of these factors will usually influence the choice and development of doctrine under any circumstances, particularly in peacetime. Where a service has a powerful political interest to protect, as did the RAF between the wars, the prospects of doctrinal distortion, even of dogmatism, are likely to be more pronounced.

Doctrinal rigidity is more likely to occur, as with air power, at points where there appears a radical shift in military technology. The change from cavalry to tanks, or from conventional to nuclear bombs, are obvious examples. In the case of sea power, the transition from the age of battleships to the age of aircraft carriers, radar and air-sea collaboration was exceptionally rapid, and led in some cases, to a temporary gap between doctrine and military capability which was the reverse of the experience of the RAF. For naval staffs the aircraft threatened two things: the end of the battle fleet and the big gun engagement at the core of naval doctrine, and, more dangerously, the rapid eclipse of navies as a factor in war. The advent of air power made conventional naval doctrine unstable, even redundant in the eyes of aviation radicals, and invited a response that bordered on the dogmatic.

The Royal Navy did not ignore aircraft. The Royal Naval Air Service under Churchill's leadership pioneered independent air activity in the early stages of the Great War. Yet in the inter-war years aircraft were given a largely subsidiary tactical role

The Royal Navy did not ignore aircraft. The Royal Naval Air Service under Churchill's leadership pioneered independent air activity in the early stages of the Great War. Yet in the inter-war years aircraft were given a largely subsidiary tactical role. Until 1931 British naval doctrine assigned to aircraft a role in fleet reconnaissance. They were not expected to play a role in the big gun engagement; it was expected that the traditional maritime duel would decide the outcome of the naval war. From 1931 with the creation of command for aircraft carriers the situation began to change. But in 1935, when naval air doctrine was more clearly defined, aircraft were still regarded as auxiliary. The functions aircraft

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were to perform reflected this subordination. They were to conduct fleet reconnaissance; during the big gun actions they were to act as artillery spotters. They were to protect the fleet from enemy air and submarine attack, and attack enemy capital ships to reduce their speed and make it possible for a big gun engagement to finish the job. Little thought was put into the role of air power in trade protection, and less into the effects of air attack on shipping. Naval vessels were expected to be able to defend themselves from air attack by concentrated shipboard anti-aircraft fire. The development of a separate RAF Coastal Command in 1936 did not produce an effective air-sea cooperation. Coastal Command was regarded as a sophisticated reconnaissance organization, spotting the enemy's ships so that the navy could destroy them.

All of this was some six years before Pearl Harbour and before the sinking of the *Prince of Wales* and *Repulse* in the South China Sea. Only seven years separated this evaluation from the Battle of the Coral Sea and Midway which were decided by aircraft without a single ship-to-ship salvo. To be fair, the Royal Navy was not alone in this assessment of the transforming effects of maritime air power. When the German Navy began in the late 1930s its plans for major expansion, the force was divided between those who wanted a slim offensive force, composed of submarines and supported by aircraft, and those who wanted a large battle fleet based around a core of major battleships. In 1939 Hitler opted for the latter to meet what he perceived to be Germany's long term strategic interests as a global power, but also because he associated naval power, as did so many of his contemporaries, with its symbolic expression: the big-gun battleship.⁹ The battleship school within the German Navy had its own position to consider within the service hierarchy. To have embraced the 'slim navy' would have required close collaboration, even perhaps a dependence, on the new German Air Force which neither service found congenial.

In Japan a paradoxical situation developed. The Japanese navy was at the forefront in the development of aircraft carriers and of offensive naval aviation. Naval aircraft equipped with good quality armament were developed to sink fleet units, and to prevent the enemy from doing the same to the Japanese fleet. Yet Japanese admirals remained wedded to the idea of the large battle fleet and the super-battleship. The Battle of Midway was planned as a major fleet engagement, in which the main task



HMS Achilles with aircraft-catapult facility and RAF personnel.



force would pursue and destroy the outgunned remnants of the US Pacific Fleet. The big guns were never fired in anger. Nor were they for most of the Pacific War. The *Yamato*, the world's largest battleship, was sunk by a hail of aerial bombs in 1945 when it sailed out for a final defiant flourish, a swansong for the battleship age.

It could be argued that the failure to react more effectively or more rapidly to the advent of maritime air power, for offensive or defensive purposes, was not an expression of self-interest or dogmatism, but was the product of a rational assessment of the relative future development of naval and air technology, and of the immature state of naval aviation in the 1930s. From this perspective, the plans to build a large German battle fleet, or Royal Naval plans to build and update its capital ships during the 1940s – the Naval Race that never was – were rational medium-term ambitions. On the other hand, the argument that aircraft could inflict serious damage on shipping, in the absence of the array of anti-aircraft defences that developed after 1945, was not lacking by the 1930s. In 1935 the Royal Navy exercises in the Mediterranean produced the conclusion (from an airman) that 'aeroplanes are certain to find and locate a hostile fleet ... and would probably inflict heavy losses'. The technology was immature but not lacking. The United States Navy made much more progress in the inter-war years in this direction than did European navies. Naval air armament was in many cases not much more effective than the low-calibre bombs with which Trenchard's strike force was

furnished, but effective aerial torpedoes were developed, and deck-piercing bombs. The best naval aircraft by the outbreak of war were capable of inflicting fatal damage on ships. It is difficult to escape the conclusion that European naval commanders were slow to adapt doctrine to match new technical capabilities. Aircraft did not make navies redundant after 1945, but they forced a major reorientation. The process of adaptation might well have been less costly in men and ships if the navy (and, it should be added, the air force too) had demonstrated greater doctrinal openness.

Aircraft did not make navies redundant after 1945, but they forced a major reorientation

There are more general lessons to be learned from these examples. In any organization there is a persistent tension between convention and innovation. The presumption is that innovation will always be progressive, and that existing structures, procedures and practices are in the nature of things a barrier to progress. Innovation for its own sake, however, has little more to commend it than a reactionary commitment to established behaviour. The critical issue in military institutions is the achievement of balance: a weighing of existing organization and ideas against the pressures for change, in order to achieve at any given time something close to the optimum. History demonstrates that the greatest pressure to change is generated under conditions of actual combat. Dogmatic thinking has usually failed the test of war.

In prolonged periods of peace the tendency to consolidate or to conserve is magnified. This is not to argue that military innovation is dependent on war alone; it is to suggest that to prevent doctrine from becoming dogma is a singularly challenging task under all conditions short of major war.

At the risk of appearing too categorical, there are at least five (there may well be more) elements to be taken into account in the formation and development of doctrine which can be regarded as decisive. They operated to a greater or lesser extent in the examples already examined. Briefly summarised these elements are: the impact of politics, broadly conceived; the role of technological change; the ability to absorb the lessons of experience; effective conditions for review; and finally, what might be called the 'eccentricity factor'. Each of these elements will be elaborated in turn.

1. The impact of politics

The history of the inter-war RAF shows that self-interest can also be self-defeating. The isolation of the RAF from the navy and army and its pursuit of an independent strategy left it able to do very little in 1939

Political factors affect the formulation of doctrine in a number of ways, and are more likely, on the evidence already looked at, to distort doctrine and its application than any other factor. The political context cannot be ignored in the formulation of doctrine, particularly where a regime is committed to particular long-term strategic goals, or is intent on expanding or contracting the arms base to a significant degree. The wider political context can be mediated to an extent – if, for example, the military themselves play a substantial part in determining that context – but it cannot be ignored, least of all by retreating into dogmatic positions. A recognition of political realities may well make it easier to adapt doctrine in creative ways, as the German military did in the 1920s under the exceptional conditions of enforced disarmament.

The second political element is more tractable. It is possible, and evidently desirable, to reduce political conflict between the services to a minimum. Self-interest is hard to resist, given the competition for scarce resources, and the understandable desire to maintain the prestige and capability of the force. The history of the inter-war RAF shows that self-interest can also be self-defeating. The isolation of the RAF from the navy and army and its pursuit of an independent strategy left it able to do very little in 1939. Active collaboration between the forces in the formation of doctrine, or simply the absence of a clear antagonism, is preferable to continuous rivalry. The kind of lateral thinking that this promotes may lead to the situation where a service is arguing away its *raison d'être*, as the RAF was forced to do when manned bombers gave way to Polaris submarines. At the least, doctrine should be examined with the following questions in mind: *to what extent has the formulation of doctrine been governed by self-interest of the force, and does it matter?*



The new generation of German weapons – jets, long-range rockets, ground-to-air missiles – provided the weapons for the Cold War confrontation of the 1950s, but they were not strategically significant for World War II



2. The role of technological change

There is no simple answer to the issue of whether doctrine should be driven by technological change or vice versa. Technical innovation can profoundly influence the development of doctrine. Historically, technological change has produced occasional abrupt breakthroughs which lead to a short period of doctrinal instability – for example, the introduction of combat aircraft in the First World War, or atomic weapons at the end of the Second – and interrupt a more gradual process of development. The impact of a sudden change can be either overestimated, as it was with strategic bombing, or underestimated, as it was with maritime air power. In general, doctrine should match the current level of technology which is capable of effective deployment. The contrast between Soviet practice in the Second World War, where a small group of robust, technically advanced weapons was mass-produced for the kind of battles being fought on the eastern Front, and the German preference for smaller numbers of optimum-quality weapons at the forefront of development, which were over-complex and expensive, demonstrates the danger of being technology-led. The new generation of German weapons – jets, long-range rockets, ground-to-air missiles – provided the weapons for the Cold War confrontation of the 1950s, but they were not strategically significant for World War II. Optimum technology is not always, in this sense, usable and effective – an observation that might be applied to the nuclear weapons programmes generated by the super-powers since 1945. On the other hand, the optimum doctrine, as the RAF found in the 1930s, is not attainable if the technological base is not yet sophisticated enough to support it. Doctrine has to be steered between these two extremes.

3. The lessons of experience

Doctrine does not emerge in a vacuum. It is profoundly affected by historical experience. The evaluation of the experience is critical to the formulation of effective doctrine. The process of evaluation is common to all armed forces, but it carries within it a number of dangers. It is difficult to examine past experience without bringing to that process a particular cast of mind, a predisposition to interpret the material in particular ways. Professional historians are no more exempt from these tendencies than military staffs. Evaluation is a matter of sound judgement; it requires real candour, a genuine detachment, and, above all, a scientific approach. Slessor's description of air strategy in the 1930s as 'a matter of faith' may well reflect the historical reality, but it was not a sound basis for doctrine. The tendency for evaluation to reflect the eye of the beholder was evident in the different responses to the air battles of the 1930s. The bombing of Guernica during the Spanish Civil War drew entirely different responses from those who observed its effects. The German Air Force, whose planes attacked Guernica, were unimpressed by the effects of urban bombing and stuck to a tactical air doctrine until the technology might permit something different. Soviet observation of the bombing in Spain ended the experimental development of heavy bombers and long-range aviation, and pushed the Red Air Force towards a rather narrow conception of tactical air power. The RAF on the other hand saw Guernica, together with Italian experience in Ethiopia, or Japanese bombing of Chinese cities, as confirmation that bombing was effective against civilian morale. Paradoxically, the RAF did not draw lessons from the German bombing of Britain during the Blitz, which confirmed that economic targets were difficult to destroy permanently, and that civilian morale could survive over 40,000 deaths. Instead they launched their own bombing offensive with poorer resources against a well-defended enemy state, with the object of smashing German industry and undermining German war-willingness to the point of collapse. In this case, of course, much more was at stake. If the RAF had admitted the drawbacks of bombing doctrine the bombing offensive would never have been attempted. The improved performance of Bomber Command over the war was entirely a product of tactical and technological improvements learned in the hardest of all schools, combat itself.



Paradoxically, the RAF did not draw lessons from the German bombing of Britain during the Blitz, which confirmed that economic targets were difficult to destroy permanently, and that civilian morale could survive over 40,000 deaths

This example illustrates the importance of applying the principle of 'appropriateness' in making evaluations from experience. There are evident dangers in extrapolating from small wars to large wars, or vice versa. Bombing in Spain was not like a bombing war between major states. Bombing Vietnam or Korea was not the same as bombing Germany or even Japan. Doctrine should, and usually does, reflect a variety of different contexts and environments for the likely conduct of operations.

4. The conditions for review

Since doctrine is from its nature impermanent, it must be the subject of almost perpetual review. Here once again there are problems of balance between what should be conserved and what should be revised. The existence of some kind of effective review body with the right to treat doctrine irreverently must in itself promote the desire to demonstrate change. Review bodies have their own interests to promote, not least of which is a justification of their existence and their budget. Change is not for its own sake. It may be desirable under certain circumstances for a review body to conclude that current doctrine stays as it is, and it justifies its existence no less by doing so.

Review bodies have their own interests to promote, not least of which is a justification of their existence and their budget

The exact nature of the process of review cannot be prescribed in every case. But some process of regular scrutiny, when doctrine is re-assessed in the light of fresh ideas or new experience, or a political sea-change, is a significant step towards identifying the elements of dogma. It might well be objected that regular monitoring on this scale would render doctrine unusable, because it would exist in a permanent state of uncertainty; this would make it difficult to plan the long-term development of technology or force structures if doctrine were subject to unpredictable and possibly radical alteration on a regular short-term basis. The evidence from the Second World War suggests that, if anything, the opposite is the case. Under conditions of extreme instability the Red Army tore up its manuals in 1942 and initiated at the highest level a thorough review of everything from the mission of the armed forces down to battlefield tactics.¹⁰ The results produced a remarkable revival in Soviet fighting power. Over the rest of the war period the Soviet General Staff were open to change. The flexibility of the Soviet military machine was the opposite of the popular image of the Soviet regime – totalitarian, ideologically driven, dogmatic – and its responsiveness surprised the German forces who had taken advantage of the many Soviet weaknesses in 1941. The pressure of war produced in this case a willingness to adapt doctrine to circumstances with remarkable effect. Both the Soviet and British forces in general performed better during the war when they were forced to make their doctrine up as they went along. The history of British tactical air power is probably the most obvious example. The RAF's dogmatic rejection of counter-force strategy and hostility to air-army cooperation meant that tactical air doctrine had to be formulated and practised under wartime pressure.



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Review raises the issue of reviewers. Should they be independent? How independent should they be? There has been historically an obvious reluctance to import outside expertise into areas properly regarded as military. During the Second World War relations between the British military authorities and the Operational Research teams, which had a large complement of external academic expertise, were strained. The German armed forces made significantly less use of independent expertise than other armed forces, and resented civilian intervention. Yet civilian evaluation, however hard to swallow, could have a serious effect on the conduct of operations. The Butt Report on the performance of Bomber Command produced in 1941 almost led to the eclipse of bombing strategy, and forced a hard rethinking of bombing doctrine. The ideal lies perhaps somewhere in between, in the development of an intellectual community part military, part civilian, capable of generating an effective exchange of ideas and competence. Academic disciplines operate in a perpetual state of self-critical but constructive review. These are transferable practices. Doctrine is not inscribed in stone; it calls for constant and critical interrogation.



The Fairey Battle light day-bomber is the story of a promising aircraft that tragically failed to perform its task in war.

The Butt Report on the performance of Bomber Command produced in 1941 almost led to the eclipse of bombing strategy, and forced a hard rethinking of bombing doctrine

5. The 'eccentricity factor'

Coping with eccentric interventions in the formulation or practice of doctrine might seem on the surface no more difficult than Air Marshal Harris found it to be. He had the habit of showing every amateur expert the door. Yet eccentricity, quite literally the property of deviating from the norm, plays its part in military affairs. The revolutionary insight, like the transforming invention, is rare. More common is the ability of a particular individual from sheer strength of character, or quality of leadership, to distort or ignore existing doctrine and to impose his own solution. Winston Churchill is almost certainly the most obvious example. Time and again his interventions were talked down by the Chiefs of Staff; occasionally he prevailed. The effect was at times damaging. What Churchill did do was to sharpen the military minds around him by forcing them to think differently, to deviate occasionally from the norm.

A cynic might suggest at this point that wars are not won by doctrine at all, but through qualities of political leadership or generalship and the effect of both upon the state of morale, none of which can be easily incorporated, if at all, into written doctrine. There is no formula for coping with the eccentric, beyond a willingness to remain open to the unorthodox idea or the military firebrand. Harris was no doubt wrong to show everyone the door, but right to be sceptical. But in his own way he too was an eccentric; he put his own stamp on Bomber Command and turned it into a much more effective force than it had been for the first two and half years of war, but he did so in regular defiance of colleagues in the RAF, and senior commanders and politicians outside it. There is a long and distinguished list of others who, like Harris, imposed their personality on the rule-book. The random factor does not render doctrine redundant. The long-term development of military thought and military organization has continuities which transcend the impact of the eccentric. Doctrine is not simply about winning battles; it is about the construction and development of peace-time forces. It helps them to define their function and shape and to make both clear to their paymasters and the wider public. The five factors explored here, in the harsh light of historical experience, illustrate the many ways in which military doctrine can avoid the pitfalls of dogmatism, while remaining receptive to innovation and capable of absorbing sudden shocks or arbitrary intervention. Military doctrine is neither ideal nor universal; it is historically specific and in flux, and the best doctrine reflects that reality.

NOTES

- 1 Public Record Office, Kew, London, AIR 9/8, memorandum by the Chief of the Air Staff, 'The War Object of an Air Force', 2nd May 1928.
- 2 PRO AIR 9/8, Note by the First Sea Lord, 21st May 1928.
- 3 PRO AIR 9/8, 'Air Policy and Strategy', lecture at the Royal Naval Staff College, Greenwich, 23rd March 1936, p.1.
- 4 Memorandum by Lord Trenchard on 'The Present War Situation', 19th May 1941, in C. Webster & N. Frankland, *The Strategic Air Offensive Against Germany*, London, 1961, volume 4, pp. 195-6.
- 5 Note by Sir Dudley Pound on Lord Trenchard's memorandum. 2nd June 1941, Webster & Frankland, iv, p. 198.
- 6 A.T. Harris, *Bomber Offensive*, London, 1947, p. 97.
- 7 Air Ministry, *Synopsis of British Air Effort During the War*, HMSO, Cmnd 100, April 1919.
- 8 H. G. Wilmot, 'Air Control in Ovamboland', *Journal of the Royal United Services Institution* '83, 1938, pp. 823-9.
- 9 See C. Thomas. *The German Navy in the Nazi Era*, London, 1990, pp. 177-9.
- 10 For example L. Rotundo (ed), *Battle of Stalingrad: The 1943 Soviet General Staff Study*, Washington, 1989.



RAF Harrier GR7 with LGB
Photo Sgt Jack Prichard

THE FUTURE OF AIR POWER



Observations from the Past Decade

It is an axiom that sound military doctrine – the formalized concept of how we intend to fight – must be based on both experience and theory. A doctrine that relies exclusively on the past quite literally will fight the last war. On the other hand, doctrine that only looks forward, in disregard of the past, is built on a foundation of quicksand with no empirical evidence to support it. It is my intention to look at the future of warfare, specifically the role of airpower in future war, by first looking at the recent past. These events and their implications for American foreign policy, plus a discussion of some emerging technologies and new ideas on how to employ them, will point towards the future of airpower. At the same time, the use of force must be placed in the context – the economic, political and social environment – in which it is likely to be employed. A beginning note: airpower is an inclusive term that incorporates the air assets, fixed and rotary wing, manned and unmanned, of all the services. It also includes space assets.

It has become common to talk of new challenges facing NATO: the clash of civilizations, the rise (or re-rise) of nationalism, terrorism, nuclear proliferation, religious radicals, and the awakening of China, to name a few. When discussing such challenges, military analysts too often face the future as if there was little or no past to provide guidance. There is some merit with this approach; after all, every crisis is unique and therefore requires a unique solution. Nonetheless, there is a distressing tendency to ignore the war in the Persian Gulf, to brand it as such an aberration, to so denigrate the Iraqi military and its leadership, as to contend there is nothing to gain from its study. Similarly, events in the Balkans are passed off as irrelevant to the future because of their peculiar and unique nature. This would be dangerous.



We are often reminded, for example, that the coalitions against Iraq and Serbia were so powerful and had so many advantages that their success was inevitable. It is hard to argue with these great advantages: alliances that largely isolated Iraq and Serbia, prepared bases and pre-positioned stocks in-theater, months of calm to train and prepare for battle,

great economic strength, the moral high ground that coalesced world public opinion, superior technology, and, in the case of the Gulf War, terrain that seemed to favor air operations. Such an assessment, however, owes much to hindsight. In the summer and fall of 1990 there were many voices, including noted military professionals, who publicly spoke out against the use of military force. They pointed to Iraqi strengths that augured ill for the coalition. The same was true in the Balkans. Pundits and analysts evoked memories of World War II when it took dozens of Axis divisions to subdue Yugoslavia.

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As for the terrain, Colin Powell's alleged comment summed the issue: "We don't do mountains." We must remember these coalition disadvantages in the Persian Gulf and the Balkans in order to dispel the aura of inevitability that came to surround these operations. Nothing seemed inevitable at the time. To what extent these obstacles were overcome will shed light on future military operations.

The disadvantages the coalitions faced in these two theaters were real, even if they proved less troublesome than first imagined. In the Balkans, for example, attempting to fight a war by committee with nineteen nations having veto power was enormously cumbersome, to say nothing of Russian and

Chinese outrage at the air campaigns over Bosnia and Kosovo. Military experts warned that the conditions in the Yugoslavian region were not at all like those in the desert, that air strikes against Serbian positions and equipment would have little effect because the terrain and weather were a severe handicap to air operations. Others argued that attempting to put pressure on the Serb populace would only harden their resolve. It is the thesis of this paper that it was the unusual and unique strengths of

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destroyed, by all accounts Saddam lost a substantial portion of his arsenal – well over 50 percent. Iraqi casualties, both military and civilian, were, however, surprisingly light. In a reflection of the extreme precautions taken to minimize such casualties, the Iraqi government has placed the number of deaths during the war at less than three thousand – a remarkable figure given the weight of the air effort.¹

In another area of the world, Yugoslavia had been disintegrating since 1991, under the anxious eyes of NATO. Attention soon focused on Bosnia where bitter fighting went on between Serbs and Bosnian Muslims. On 28 August 1995 two mortar shells exploded in a market place in Sarajevo, killing thirty-seven civilians; it was assumed the Serbs had fired them. The world was outraged, leading to an air campaign against Serbia, termed Deliberate Force. Over a twenty-two day period, 220 coalition aircraft flew 3515 sorties against 48 targets, mostly air defense sites, ammunition/supply depots, or fielded forces. Stating that “every bomb is a political bomb,” General Mike Ryan, the air commander, personally scrutinized each targeting decision so as to minimize errors that could result in civilian casualties or collateral damage. The Dayton Peace Accords that followed in November resulted in a negotiated settlement granting Bosnia independence with UN peacekeeping forces in place. Milosevic yielded due to the air campaign, a Croatian ground offensive that had succeeded in pushing his troops back, and increasing unrest among his population. US Secretary of Defense William Perry stated: “Deliberate Force was the absolutely crucial step in bringing the warring parties to the negotiating table at Dayton, leading to the peace agreement.”² That appraisal was echoed by Richard Holbrooke who brokered the deal at Dayton. Serbian civilian casualties were estimated at less than thirty dead; there was only one allied aircraft lost in the strikes, and both its crewmembers were later recovered.³

airpower that helped ameliorate coalition disadvantages. Furthermore, it is these same strengths will make airpower an effective policy tool in the future.

The results of the military action in the Persian Gulf War of 1991 were dramatic: it was the most lopsided victory of modern times. Coalition casualties were exceptionally low: 240 dead and 776 wounded. Over 86,000 Iraqi soldiers surrendered, virtually without a fight, while a like number deserted. Although there are a plethora of statistics extant regarding the number of Iraqi tanks, armored personnel carriers, and artillery pieces

Events in Kosovo were similarly dramatic. Milosevic had been oppressing the Albanian Kosovars for years, and the UN estimated that 250,000 Kosovars had been driven from their homes by March 1999. NATO's negotiations to end the violence, followed by threats of using force, proved fruitless. Assuming it would replicate the quick and successful bombing campaign that saved Bosnia, NATO began with a surprisingly tepid air campaign on 24 March that slowly accelerated over the succeeding weeks. The daily sortie rate was fairly low, bomb sizes were sometimes reduced to minimize damage, restrictive rules of engagement resulted in many aircraft returning with their ordnance, and higher level guidance from both Washington and NATO headquarters was pervasive. Yet, NATO achieved its goals after continued bombing for seventy-eight days and 14,006 strike sorties that dropped 23,614 weapons. When Milosevic conceded on 3 June, NATO claimed it was because he had lost over one-third of his heavy equipment, over one hundred aircraft, and dozens of other military and industrial facilities and structures. Serbia's electrical grid was down, its oil refineries shut, and its economy in shambles. Moreover, this was accomplished at an astonishingly low cost in human life: NATO lost but two aircraft – the pilots were recovered – and Serbian civilian casualties were approximately six hundred dead.⁴

In general terms, military operations in the Persian Gulf and the Balkans indicate several trends and characteristics relevant to future NATO involvement:

- NATO vital interests will not ordinarily be at stake, but the mantle of world leadership is taken very seriously by our leaders and by our public. We will therefore continue to intervene in situations where we believe such involvement is “the right thing to do” and where it is believed this will result in innocent lives being saved. “Vital interests” have given way to “key values.”
- NATO intervention will generally not be predictable either by location or scale. Very few predicted as little as one month in advance that there would be major wars fought in Korea, the Falklands, or the Persian Gulf. Similarly, very few foresaw the duration and expense of military operations short of major war, such as Northern and Southern Watch (the air patrols over Iraq now in their eighth year). What begins as a limited involvement with a specific “exit strategy” often is quickly overcome by events.
- Overseas basing will continue to be limited. As a result, NATO, and especially the US, must be able to project and sustain its military power and influence over great distances. Nonetheless, it is also true that overseas basing is essential for extended operations. It is not conceivable that military operations could be sustained in the Middle East, for example, solely from bases in the US.
- Casualties and damage are of increasing importance to NATO and indeed world public opinion. Our interventions must therefore be discriminate, measured, restrained and appropriate. Our adversaries will be able to get away with far more

violence and lawlessness than we can. Precision weapons are essential for such situations. Moreover, we must be able to deliver these precise weapons so as to minimize our own casualties. In this regard, the high cost of such weapons is deemed less important than the lives they may save.

- Just as nuclear weapons drove war down to the conventional level in the aftermath of World War II, so too have the events of the past decade driven it down to the asymmetric level whenever NATO is likely to be involved. The relatively effortless destruction of large and well equipped Iraqi and Serbian armies and air forces sent a powerful message to would-be aggressors: the only possibility of success against NATO lies in not fighting it on even terms or in a conventional fashion.
- Adversaries will be intelligent, clever and dedicated to their cause. They will devise ways to avoid or limit our technological, qualitative and quantitative superiority. Asymmetrical strategies and tactics will include an emphasis on mobility, concealment, hardening, and the commingling of civilian and military targets. Weapons of mass destruction will proliferate as will their means of delivery. Indeed, it will not be necessary for countries – or terrorist groups – to develop nuclear weapons in order to be a serious threat. Chemical and biological weapons are also frightening and difficult to defend against.

The combination of these factors points towards a NATO military response that is flexible and that employs discreet, precise, long-distance power projection.

More specifically, the past decade has given us many other lessons to consider. Lessons can be tricky things, however. There are countless examples when serious military professionals from different countries or services looked dispassionately, logically, and rigorously at past events and deduced totally different “lessons” based on those events. After World War I German officers examined the experience of trench warfare and concluded the only solution was to restore mobility to the battlefield via a combination of



armored vehicles and airpower. French officers examined that same experience and determined just as conclusively that the response to the trench stalemate was a series of highly elaborate and defensible static fortifications – the Maginot Line. Learned lessons are not always correct lessons. We proceed with that monition in mind.

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- It is imperative that future strategists, planners and commanders remember the axiom that military strategy must match government policy. Once the civilian leaders have determined the policy objectives, planners must then devise a military strategy to fulfill those objectives. It is surprising how often this simple principle has been violated in war. The Japanese wanted raw materials and resources in a Southeast Asian empire. In order to achieve that goal, however, they selected a military strategy of attacking the United States – an enemy they could never defeat. Other less extreme examples are the unhappy American experiences in Somalia and Haiti. Defeating the dominant warlords and restoring democracy and peace were noble goals, but they were simply not achievable given the military resources committed and the strategies employed.

Specifically regarding the use of airpower, planners will begin looking at targets to strike or neutralize. They must ensure those targets do in fact lead them closer to achieving their policy goals. I am told that following the Gulf War a writer was interviewing a senior airman regarding the targeting strategy of the air campaign. The officer was asked why a certain bridge, seemingly unconnected with any major military or industrial target and situated in an isolated location, had been struck by coalition aircraft. The officer was surprised by the question, and answered, half seriously, that “it was hit because it was bridge; we do bridges; we’re good at bridges.” Targets should not be hit simply because they are hittable, or because they were struck in the last war, or because there are lots of them, or because they are politically “safe,” or because they are less risky to attack than are other targets. Rather, targets should be attacked because doing so will help lead to the policy objectives. If a planner cannot draw a clear connection between the target struck and one of the stated objectives, the targeting strategy needs to be reconsidered.

At a higher level, a more compelling example of this problem was in Kosovo. NATO intervened for humanitarian reasons: the ethnic cleansing of Albanian Kosovars by the Serbs. Yet, NATO leaders, civilian and military, state repeatedly that the goal of the air campaign was merely to degrade the military capability of the Serbian forces so as to reduce their ability to conduct that cleansing. This of course begs the question of how does one define “degrade” – the destruction of a dozen Serbian tanks could fit the literal meaning of that term. But more importantly, how would such degradation, however defined, meet the political objectives of saving Kosovar lives? There seemed to be a gap between NATO’s political goals and the military strategy adopted to achieve them. Fortunately, and almost serendipitously, the air campaign was successful anyway. To reiterate: the military strategy must fulfill the political objectives desired; if they do not, then those military operations, regardless of how efficient, accurate, bloodless, and discriminate, are useless.

- The issue of “casualty intolerance” has been discussed during the past decade because coalition casualties have been astonishingly light. Despite the scale of victory, the Coalition suffered only 240 killed in the Gulf War. This extraordinary performance has led to the expectation that all wars and military engagements will be similarly bloodless. Hence, the loss of an American F-16 over Bosnia dominated news coverage for a week in June 1995. The rescue of the pilot, who was then accorded hero status, illustrates the seriousness with which casualties are now seen by the American public. This experience

was repeated in the Balkans with the return of the three hapless American soldiers who had fallen into Serbian hands. An exclamation point can be added to the casualty intolerance issue by the unhappy experience of US forces in Somalia. The death of eighteen Army rangers in October 1993 was enough to break the will of American leaders, and we withdrew from Somalia. It may be argued that the American people are less queasy about casualties than is generally thought.⁵ What is important to realize, however, is that NATO political and military leaders *assume* their populations are casualty intolerant; they then plan their actions based on that assumption. Heavy casualties are viewed as unacceptable, especially in a limited conflict where vital interests are not at stake.

The drive to limit casualties extends to our adversaries; indeed, it even includes their military personnel. This has resulted in an extraordinary degree of political control over the planning, targeting, and execution processes of an air campaign. It has also spurred the development of smaller but more accurate bombs. These mini-bombs would weigh only 250-300 lbs, but because of their extreme accuracy, would have the effect of a much larger warhead. Moreover, they would at the same time generate less collateral damage. In addition, it appears the USAF has even been using bombs with concrete warheads against sensitive targets in Iraq to further limit casualties and collateral damage.⁶

The goal of limiting enemy casualties has also led to research into what are termed nonlethal weapons. These new weapons employ kinetic, mechanical, chemical, biological, acoustic, or electromagnetic properties to incapacitate or neutralize personnel or equipment. Typical applications of such technologies include beanbag projectiles, tear gas, oil-eating bacteria, laser guns, corrosive agents, and sticky foam. In Desert Storm and Allied Force, air-delivered munitions draped carbon-graphite filaments across power lines, causing the electricity to short out and temporarily shut down. Nonlethals are a growth industry, but there remain formidable technical problems. There are also military, ethical and legal complications that have yet to be thoroughly worked out. For example, will their use in combat send a signal of weakness or lack of resolve to an enemy? Will the use of a biological agent that turns enemy fuel into jelly be in violation of international laws regarding biological warfare? Nonetheless, given the nature of many military operations that are highly politicized and thus require an extremely discriminate use of force, nonlethal weapons have an obvious utility.⁷

A consequence of an increasingly discriminate use of force is the high expectations it produces. Since accuracy has been demonstrated, it is the new standard by which future operations will be measured. Casualties and collateral damage of any degree will generate scrutiny. This is a major constraint facing airmen in their operational planning. When the Al Firdos command and control bunker in Baghdad was struck on 13 February 1991, killing over two hundred Iraqis, the outcry was immediate. Although a military target, the bunker would not have been attacked had planners known it was also being used as an air raid shelter. As a result, targets in Baghdad were avoided thereafter, lest more civilian casualties inadvertently occur.⁸ This concern had a similar impact over Serbia. Air strikes on bridges and factories, as well as errant bombs that hit hospitals, trains,

and residential areas, were immediately shown on television stations worldwide. This prompted NATO air planners at times to use 500 lb bombs instead of the normal 2000 lb bombs so as to minimize damage, to halt the use of “area weapons” such as cluster bomb units, and to instruct pilots to return with their ordnance unless they were certain they would hit their targets exactly. Fear of collateral damage dominated the targeting process. It may be that “media spin” has become a new principle of war. Military leaders must be ever cognizant of the effects their actions will have and how those actions will be depicted on the six o’clock news.

● Jointness is an effective way to ensure unity of effort and a focused application of power. Service parochialism is not dead – and perhaps a little bit of it is good to foster healthy competition – but it seems to have faded as a disruptive force in NATO military operations.⁹ This is partly because the line between the services and their capabilities has blurred over the past two decades. For example, all of the US services have air arms; the Navy has a large ground contingent (the Marines); the Army has a significant fleet of supply ships; and all the services rely on space assets. This multi-faceted and increasingly integrated capability has produced senior officers far more familiar with the full range of military operations, thereby reducing tensions, misunderstandings and disagreements. Familiarity breeds consent.

It could also be argued that this emphasis on jointness is in fact another manifestation of an aspect of the American way of war: redundancy. Attempting to decide between the efficacy of land-based airpower versus aircraft carriers, marines or soldiers, or the utility of missiles versus aircraft, is resolved by simply choosing all of the above. Although some may see this as wasteful and inefficient, there may be a method to such madness. This redundancy greatly multiplies the problems confronting a potential adversary. If the US had “merely” a large and capable army, or air force, or navy, or amphibious force, then an enemy could focus on that single threat and devise an effective counter. But how does one fight a US that has *all* of these capabilities? There are simply too many arrows in that quiver for any adversary to negate all of them. Thus, seeming indecision in American defense policy can also be seen as a great strength.

● Air supremacy is essential for the effective conduct of NATO military operations. If air supremacy is lost, the cost in casualties to our forces on the ground, at sea, and in the air will rise dramatically. It has become joint doctrine that the first priority at the beginning of a military operation is to take down an enemy’s air defense network and neutralize his air force. After that is accomplished, all else becomes far easier and safer. Two photographs should come to mind to illustrate this point. First, recall the picture of the coalition supply depot at Ad-Dammam in Saudi Arabia during the Gulf War: hundreds of vehicles lined up bumper to bumper in serried ranks stretching almost to the horizon. It is what a bomber pilot would term “a target rich environment.” That is what can be done with air supremacy. Second, visualize the photo of the “highway of death” leading northwest out of Kuwait City. On 26 February 1991 the Iraqis attempted to retreat northward, but they were detected, trapped, and attacked from the air. In thirty minutes, aircraft destroyed fourteen hundred vehicles. That is what happens to the side that

loses air supremacy. It also must be understood that achieving air supremacy is usually not an end in itself; this achievement must then be exploited. It is the follow-on actions of military force that will take us towards our overall political objectives.

There is a danger, however, that policy makers, the public and even military planners, may begin to take air supremacy for granted, to assume that it will be an automatic feature of any future military involvement.¹⁰ This would be a dangerous misconception. NATO has the finest air forces in the world, more than a match for any potential adversary. But this dominance is not a God-given right; it was earned over a period of decades, at great effort, and at a cost of billions of dollars. It will take continued effort to guarantee such air dominance in the future, because air defenses, especially ground based, are becoming increasingly dangerous.

● Technology can dominate war. The question of technology versus the individual has always been at heart a cultural one. Airmen tend to place more efficacy in technology than do surface officers. This is perhaps due to the fact that airpower, by its very nature, is dependent on advanced technology. Man has fought wars on land for millennia, but it is only during this century that he has been able to fight in the air and space. This dependency on technology is deeply ingrained in the airman's culture, but we must be wary of accepting the arguments of either the technologists or the humanists and rely instead on empirical data and evidence.

Technology has dominated the conflicts of the past decade for the eminently practical reason that it has worked. Coalition aircraft have had an overwhelming superiority in air to air combat: 38:1 in the Gulf War and 10:0 over the Balkans. American-built M-1 tanks destroyed Iraqi tanks often with a single shot before the latter were even close enough to bring their own guns to bear. US and European space assets assured near "information dominance" over Iraq and Serbia. Ironically, this success story was almost prevented. During the 1980s a group of US politicians and defense analysts decried the emphasis on technology. They said the military "gold plated" its weapon systems, which not only drove up costs, but also made them overly delicate and thus likely to fail in combat. The weapons they deplored included the F-15, F-18, C-17, stealth technology, radar-guided air to air missiles, large deck aircraft carrier, M-1 tank, Bradley fighting vehicle, and the Patriot missile. All were expected to be failures in combat, but all have proven to be

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successful.¹¹ Spending money on overly complex or unnecessary weapons is to be strongly condemned, but no airman, sailor or soldier wants to be holding the second best gun, even if – or perhaps especially if – it is cheap. As long as Americans place life over machines, they will continue to support the idea of military technology second to none – even if that costs a great deal.

Another method to lower cost, limit casualties and enhance chances of success is through the use of unmanned air vehicles (UAV). They are cheaper than manned aircraft, require no design compromises to accommodate a crew, and put no lives at risk. To date, UAV have been limited largely to reconnaissance and communications duties, and their performance has been mixed. Although less costly, they are still expensive (the Predator costs \$3 million, and the new Global Hawk is projected to cost \$10 million), have limited payload and endurance, and are more vulnerable than anticipated: thirty were reportedly shot down over the Balkans. Nonetheless, a new generation of these aircraft appearing in the next decade promises to be more capable and reliable than its predecessors, while also being able to deliver ordnance in hostile environments.¹²

● Stealth technology generated great skepticism when first revealed. Many doubted its usefulness, but even if it was initially successful, the skeptics argued, effective counters would soon be developed. The naysayers were proven wrong. The record of the F-117 in Desert Storm was sterling. Beginning on opening night, F-117s penetrated through the heart of Iraqi defenses to bomb targets in downtown Baghdad. They then continued to return to this high threat area, while also striking targets throughout Iraq, over the next six weeks. In over seventeen hundred combat missions not a single F-117 was damaged by enemy fire, much less shot down. The “Nighthawk” was unable to sustain this perfect record in Operation Allied Force: on 27 March an F-117 went down near Belgrade.¹³ Nevertheless, its combat record remains amazing. The B-2 stealth bomber, not yet operational during Desert Storm, was unveiled in combat operations over Kosovo. It also performed extremely well, flying forty-five sorties from a base in Missouri and dropping 652 precision-guided munitions (PGM) with excellent accuracy. Although flying only 1 percent of the total sorties, it accounted for 11 percent of the tonnage dropped.¹⁴ It is probable that all future US aircraft will have stealth characteristics, but there are still drawbacks to this technology.

Stealth technology is expensive. It is not only difficult to design and manufacture, it can also troublesome and costly to maintain. As a result, the use of the F-117 and B-2 is often seen as cost-ineffective. In one sense, this is true. Ordnance can be delivered by aircraft such as the F-16 or F-18 that are less expensive. It must therefore be remembered why stealth was developed and why it is so important: deadly air defense systems. There are some targets that are simply too dangerous for non-stealthy aircraft to tackle. Cruise missiles are an added option, but they generally have a smaller warhead, are less accurate, and are expensive – over \$1million per round. The accuracy and survivability of stealth aircraft allows them to strike targets effectively that otherwise would require larger force packages of not only multiple strike aircraft, but also additional escorts, jammers, SEAD aircraft and tankers.¹⁵ The difference involved in numbers of aircraft committed, ordnance, fuel, aircrew, training, and lives at risk between stealthy and non-stealthy aircraft is great.



A host of new air-deliverable weapons are now being developed that offer the hope of severely attriting an enemy before he can get close enough to hurt friendly ground troops

No new weapon can dominate war indefinitely, so there will eventually be a defense against stealth. The question is how long it will take for that counter to be developed. Submarines can also be considered a form of stealth technology, and although scientists have attempted for decades to penetrate that protective cloak, they have been largely unsuccessful. Stealth aircraft technology could prove equally durable.¹⁶

● Precision weapons have revolutionized air warfare. It is not unlikely that NATO will again face an enemy who, like Iraq, possesses a sizable army complete with heavy artillery, armor and mechanized forces. That does not mean, however, that we must confront such an enemy with symmetrical forces. Instead, it would be wiser to fight him at arm's length. Although this may not always be possible, there is a difference between being prepared to fight a vicious and probably bloody land action as a last resort, and assuming that such an action will occur and thus planning for it as the first resort. A host of new air-deliverable weapons are now being developed that offer the hope of severely attriting an enemy before he can get close enough to hurt friendly ground troops. The alphabet soup of such weapons is typically numbing – JDAM, JSOW, JASSM, WCMD, SFW, etc. – but the capabilities they offer are eye opening. Most of these weapons, and note that most have already been successfully used in combat, are similar in that they magnify the ability of an aircraft to destroy enemy facilities, vehicles, and conventional ground forces.¹⁷

During the Gulf War the Iraqis attempted their only offensive ground operation on 29 January 1991. They occupied the Saudi border town of Khafji and began moving three heavy divisions south to counter the coalition ground attack they believed would soon follow. Rather than step into that trap and precipitate a bloody ground war, however, the coalition reacted with airpower. Over the next two nights aircraft pummeled the Iraqis, destroying hundreds of tanks and other vehicles and stopping the offensive cold. One of the more authoritative commentaries on the war termed it “the war’s defining moment.”¹⁸ The Iraqis never attempted another assault.

PGM are relatively cheap compared to the targets they can hit – a 2000 lb laser-guided bomb costs approximately \$25 thousand and the new JDAM costs \$18 thousand; whereas, the tanks they destroy cost over \$1 million each. Although more sophisticated weapons like cruise missiles cost over \$1 million per weapon, that is still seen as acceptable given the accuracy and low risk they provide.

Precision weapons, especially standoff precision weapons, have arrived in force. In the Gulf War, only 9 percent of the bombs dropped by coalition aircraft were precision guided. In the Balkans the percentage of PGM employed was 69 percent in Bosnia and 35 percent in Kosovo.¹⁹ Virtually all American strike aircraft and attack helicopters now have the capability to deliver PGM, and they have

become the weapon of choice in our military operations. There are several reasons for this. First, increased accuracy allows a target to be neutralized with far fewer weapons. PGM have increased accuracy by two orders of magnitude: one aircraft carrying PGM today is comparable in its effects to one thousand aircraft carrying dumb bombs in World War II.²⁰ This has implications for the number of aircraft required to deliver such munitions, the trained personnel to maintain and fly those aircraft, the logistics to deliver and support the planes, weapons and personnel, and perhaps most importantly, the number of lives put at risk in delivering those weapons. For example, a common measure of combat efficiency is the “tooth to tail” ratio: the number of fighters versus the number of support personnel. A military force with a low tooth to tail ratio, few fighters relative to the number of supporters, is seen as inefficient and wasteful. In the age of the PGM, this is an outmoded concept because it assumes that a large number of attack assets is both necessary and desirable. It is not. If the same amount of damage can be performed by a far smaller number of personnel, then the size of the support structure backing them up – out of harm’s way – is of minor import. As noted, the NATO public seems less concerned with losing money than they are with losing lives.

PGM allow parallel operations: the ability to strike multiple targets at different levels of war simultaneously. This is a significant development. Because of the inaccuracy and thus inefficiency of previous bombing efforts using dumb bombs, neutralizing targets was a slow process. Previously, the issue was “how many aircraft will it take to destroy a single target,” but now the question more appropriately is “how many targets can one aircraft destroy on a single mission.” For example, five hundred bombers of the Eighth Air Force during World War II might attack an oil refinery in Germany and cause moderate damage. They would fly again two days later against a different target; two to three days later there would be a different target, and so on. Perhaps after a month they would return to the original oil refinery, which had been largely repaired during the interim, and the process began anew. This was attrition writ large. In 1943 the Eighth Air Force attacked 124 discrete targets. Five decades later, in the first twenty-four hours of Desert Storm coalition aircraft using PGM and missiles struck 148 separate targets – fifty in the first two hours.²¹ In Operation Allied Force over Kosovo, which was a much smaller effort than Desert Storm, NATO aircraft and missiles still struck forty different targets during the first few nights of operations. Parallel operations can seriously unbalance an enemy, and make it difficult for him to plan and coordinate a coherent response. Nonetheless, as noted above,

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simply hitting many targets quickly should not be mistaken for a sound military strategy. The value of those targets and whether their destruction brings us closer to our political objectives are what matters.

Such an impressive capability has its challenges. Precision weapons need precision intelligence. If it is now possible to put a weapon through a specific window of a specific building, then it is necessary to know if that is the correct window – the blunder of hitting the Chinese Embassy in Belgrade is a particularly telling illustration. This greatly elevates the level of detail required from the intelligence gathering agencies. These difficulties are magnified further by the proliferation of mobile military targets. The most difficult tactical task facing airmen today is the ability to detect, track, and destroy mobile targets, especially in bad weather, beneath a cloud deck, or when they are hidden under trees. Although a major effort was mounted in the Gulf War to eradicate the Iraqi Scud menace – over fifteen hundred sorties flown – analysts were forced to conclude after the war that it is possible no Scud mobile missiles were destroyed by air attack.²² This problem reappeared in the Balkans. Despite a far more capable reconnaissance effort that included advanced JSTARS aircraft, as well as an increased use of UAV and space assets, airmen still had difficulty in finding and destroying Serbian tanks, artillery pieces, and other vehicles. Moreover, Iraqi Scud technology was rudimentary in many respects. More capable missiles and guidance systems are now being developed by China, Iran, India, and North Korea that promise greater range, payload and accuracy.²³ Cruise missiles, an equally dangerous threat, are also expected to proliferate. There has been much talk since the Gulf War that the US has acquired what the Soviets would have called a “reconnaissance-strike-complex” (RSC). This would allow the ability to locate, identify, attack, assess damage, and re-attack (if necessary) a target in near real time. Although many of the surveillance and command and control assets are in place to produce such an RSC, Kosovo illustrates the difficulties still faced.²⁴ Until the mobile target problem is resolved, no such complete or effective system as an RSC exists.

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● One of the great failures of the Gulf War was the coalition's inability to find and destroy Iraq's weapons of mass destruction (WMD) research and production facilities, and weapon stockpiles. Although this was a stated goal of the coalition, accurate intelligence was lacking to achieve it. It was disconcerting to discover that there were many nuclear research facilities in Iraq that had not been identified either before or during the war. It was United Nations inspectors roaming Iraq afterwards that discovered and then disabled such sites.²⁵ How many more exist that have not been discovered? Given that our technological ability to monitor Iraq from the air, space, and on the ground has been far greater than is normally the case, such a poor track record is not comforting when one thinks of other countries where our surveillance capability is far less.

Air and space platforms like JSTARS, Rivet Joint and Cobra Ball (special electronic surveillance versions of the RC-135), U-2, P-3, unmanned air vehicles, and various imaging satellites, will increasingly be used to locate WMD and their delivery systems. These assets can be tied together into a tool called the Counterproliferation Analysis and Planning System (CAPS), which employs extensive computer modeling and analysis to locate, track, and predict development in WMD activities.²⁶ Another concept under development would rely primarily on multiple passive sensors to detect and monitor nuclear weapon materials. Since all nuclear materials emit distinctive signatures, certain types of spectrometers can detect these emissions over facilities in a wide area, even from unknown nuclear sites in that area. This system, the Wide-Area Nuclear Detector (WAND) concept, would aid in detecting the movement of such nuclear materials, thus aiding in the counterproliferation process.²⁷ Once detection is made, targeting and destruction are probable, but detection remains a difficult nut to crack.²⁸ It remains to be seen whether or not the systems described above will work, and so the detection of WMD persists as one of the foremost technical challenges facing airmen today.

- Space assets have shrunk the globe and our militaries now rely on satellites for communications, command and control, surveillance, intelligence gathering, weather forecasting, mapping, and location finding. In addition, some of the new precision munitions, specifically the JDAM and JSOW, use GPS signals for guidance. Space now permeates military operations. Of the two hundred American satellites circling the earth, approximately half are used for military purposes – fifty US and European satellites directly supported military operations over Serbia.²⁹ As always, however, such new opportunities carry with them a new set of problems.

Many countries and private companies are jumping into space, diluting NATO dominance. During the Gulf War, the space powers were either part of the coalition or at least were not affiliated with Iraq. As a result of that dominance, the “left hook” ground offensive enjoyed tactical surprise. What if Saddam had had access to surveillance satellites or their products? The concern raised when Russia deployed electronic surveillance vessels to the Adriatic during the Kosovo conflict highlights this potential problem. It is estimated that by 2010 at least ten countries will have orbited imaging satellite systems with a resolution capability of one meter or less.³⁰ The ability to blind and isolate an enemy from outside information as we did Iraq will seldom be possible in the future.

Given this general framework, how will military force be used in the future? It is usually stated that the object of war is to impose your will on the enemy by destroying his will or his capability to resist. At the risk of over-simplification, military strategists are often put into two categories. The first includes those who focus on seeking methods of confusing, deceiving, frightening, or otherwise influencing the mind of the enemy in the hope of shattering his *will* and thus causing surrender. The other school is more direct; it believes that if one attacks the enemy's military forces or industrial infrastructure, thus removing his *capability* to



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resist, then surrender must follow. Some, especially those trained in the social sciences, have put new terms on these old concepts, and now refer to *coercion* and *denial* strategies. There has been a vigorous debate over the past decade between the proponents of these two camps. In truth, it is virtually impossible to separate these two types of strategies in practice. If the point of attacking, say, an enemy's forces is to deny him the ability to fight, then it is likely such an inability will have a strong coercive effect on the enemy's will. Conversely, if an attack on the enemy's oil refineries is intended to break an enemy's will because it destroys something he values, then at the same time the value of the oil revenue lost will decrease his ability to fight. The issue therefore becomes one of emphasis.

To a great extent, the choice of strategy is driven by objectives and by the nature of the war. In a total war, with surrender and subjugation of the enemy as the goal, it is likely the destruction of the enemy's will *and* his capability will be necessary. Thus, in World War II the Allies attacked both Germany's will and her capability – coercion and denial. In the case of Iraq, it was similarly a question of both strategies being employed, albeit for different reasons: the coalition wanted to coerce Saddam to leave Kuwait; but it also wanted to deny him the capability of remaining an offensive threat in the region thereafter. Other conflicts, such as that in Kosovo, are more problematic. It was NATO's goal to coerce Serbia into stopping ethnic cleansing in Kosovo. Coercion would ordinarily entail the attack of high value targets in Serbia itself, but planners also employed a strategy of denial: they targeted Serbian military

forces and infrastructure actually engaged in Kosovo. Milosevic surrendered, but it is impossible at this stage to know why. Was it because of the losses his military forces suffered in Kosovo – which accelerated greatly during the last two weeks of the war; or was it due to the severe damage done to the Serbian infrastructure, estimated at over \$30 billion? Perhaps it was both strategies working together, along with the realization that the bombing would continue indefinitely and with no respite, that broke Milosevic. On the other hand, reports increasingly indicate that the damage actually sustained by the Serbian army, though high, was less than initially thought. This would tend to indicate that the coercive aspect of NATO's air campaign was the dominant cause of Serbian surrender. It may therefore be useful to re-examine the coercive strategy known as gradual escalation, so deplored in Vietnam and seen as anathema by airmen ever since.

In contrast to the unhappy experience in Vietnam, air planners in the Persian Gulf War chose a violent, massive air assault against Saddam's regime and military forces, which began the first night of the war and continued unabated for the next six weeks. However, that experience seems to have been quickly forgotten. The air campaign against Serbia resembled more the failure of Vietnam than it did the success of the Persian Gulf. On average, less than fifty strike sorties were flown each day over Serbia during the first two weeks of the air campaign, compared to the 1200 strike sorties flown on the opening night of Desert Storm. The number and types of targets struck were restricted and subject to rigid rules regarding weapon size, type, and tactics employed. Although the intensity of the air strikes built steadily to over five hundred sorties per day, airmen remained frustrated. And yet, the air campaign proved to be successful.

As a consequence, it is likely that when the political and tactical constraints imposed on air leaders are extensive and pervasive – and that trend seems more rather than less likely – then gradual escalation will be more appealing. A measured and steadily increasing use of airpower against an enemy, which gives him ample opportunity to assess his situation and come to terms, combined with a remarkably low casualty rate for both ourselves and the enemy's civilian populace, may be the future of war. The crucial thing, however, is to understand the policy goals and the nature of the war so that the most effective air strategy can be employed. Regardless of the strategy chosen, it remains essential to monitor and measure its progress so as to determine if the stated goals are being achieved.

One of the greatest challenges facing airmen remains that of assessment: how do we know if we are achieving our objectives? The problem has haunted airmen for decades, but seems little closer to solution than it was in World War II. Bomb damage assessment has certainly improved, but this is largely a tactical concept and although important, it can give little insight into the overall progress of the campaign. In other words, although we may have the ability to determine whether or not a bomb or missile struck its target, that does not necessarily tell us what effect, if any, that destruction will have on the overall war effort. Common sense tells us, for example, that if a capital city loses its electrical power, telephones and public transportation systems, then the ability to coordinate and direct a war effort will be greatly impaired. But how impaired? Assigning a number to such a degradation of performance is extremely difficult. Yet, until such measurements are possible, the importance of strategic attacks will be speculative and driven more by preconceptions than by proof.

Despite these limitations, airpower has increasingly come to dominate modern war. There is an old saying that if one wants to know what is considered important, they should follow the money. Although a precise number is difficult to acquire, perhaps 60 to 65 percent of the US Department of Defense budget each year is spent on air and space forces. This is not surprising when one realizes that the Air Force takes approximately one-third of the DoD budget, an aircraft carrier costs around \$6.5 billion, an Apache Longbow helicopter is over \$25 million, and the Navy/Marine F-18 "Super Hornet" program is expected to run in

excess of \$70 billion.³¹ In truth, the US is an airpower nation. The largest air arm in the world belongs to the US Army – it has nearly five thousand helicopters. Second place goes to the Chinese air force, while the USAF ranks third. The US Navy ranks fifth behind Russia.³² The money trail has a clear destination.

In addition, the main doctrinal arguments that occur between the services today tend to center on issues of airpower: the role and responsibilities of the Joint Force Air Component Commander (the JFACC: the individual, an airman, in charge of air assets within a theater); the purpose and authority of the joint targeting board and its relation to the JFACC; the need for a joint fires coordinator to serve as a balance (along with the joint targeting board) on the power of the JFACC; whether helicopters are better suited for close air support or interdiction; the ownership of the “deep battle” (the area generally designated between twenty to one hundred miles in front of friendly ground forces); theater air defense, especially missile defense; and the ownership and tasking authority of space assets. In short, all of these arguments occur over the questions of who controls the dominant air assets and for what purpose will they be used.

The greatest debate remains the most fundamental. Although few airmen have ever made the claim that airpower can win wars alone, they are often accused of believing it, and such an idea is seen as foolish and dangerous. The day Allied Force began, retired soldiers and George Patton wannabes began to write of airpower’s inability to “win the war alone” in Kosovo; their cry was to “send in the ground troops.” In truth, airmen had no preconceived notion of winning the war “alone” and would have welcomed the presence of ground troops, *if* they had been able to deploy and *if* NATO had had the political will to employ them. A joint air-land campaign would certainly have been preferable. But these conditions were not present, so airpower was left to play the decisive role, as it had in Iraq and Bosnia.

Paradoxically, what is often seen as one of airpower’s greatest weaknesses – its inability to hold ground – is in some circumstances precisely what makes it a useful tool of diplomacy. It is less provocative and less risky than ground forces, while at the same time it lessens the danger of mission creep. In some circumstances, another term for ground troops is hostages, as was the case in Bosnia when Serbian forces arrested and/or threatened to kill UN peacekeeping troops in Goradze and Bihac if NATO attempted to use force to stop the violence there. It is thus more advisable for aircraft to patrol the skies over Iraq than it would be to deploy tens of thousands of ground troops there. Similarly, it was more politically acceptable for NATO to bomb Serbia than it would have been to invade it, as the Russians warned us repeatedly.

Francis Bacon, the Elizabethan scientist and philosopher, once wrote, “he that commands the sea is at great liberty and may take as much or as little of the war as he will, whereas those that be strongest by land are many times nevertheless in great straits.”³⁴ By that Bacon meant that armies, once committed, are difficult to extricate. They send powerful signals implying long term involvement and great capital investment of personnel, weapons and logistics. Bacon was implying, however, that some

objectives do not need such commitment; indeed, such commitment may even be inadvisable and provocative. Sea power gives its wielder the option of determining the degree of involvement. Full scale war would still be possible, but not automatic.

This situation is even truer today regarding airpower. Our leaders have been loath to commit combat troops to Rwanda, the Sudan, and the Balkans, or to reintroduce them into the Iraqi situation. In a sense, ground operations are self-detering; we will not seriously contemplate their use if there is a risk involved. Somalia crystallized the issue. We are in an era where NATO interventions may be seen as important, but they are not seen as vital. In such instances NATO leaders, supported by public opinion, may be willing to use military force to save lives, right wrongs, or enforce the peace. But when doing so, this force must be used sparingly; it should not kill civilians or even seriously impact their daily lives; it must not incur significant casualties; it must not irritate our friends, and thus, it should probably not involve a large presence in the region; and, frankly, it should be done "on the cheap." The public does not want their reservists mobilized or their civilian airliners commandeered; they do not want taxes raised or their economies and social programs disrupted. A return to the draft is unthinkable. If any of those actions were to occur, it would signal a move away from a limited involvement with limited objectives.

This is a fine line to walk – to commit military forces but to do so partially armed, in "cold blood," and with one hand tied behind your back. Airpower employed from land or sea bases near the crisis area, used discreetly against military targets, with a high assurance that casualties will be extremely light, offers the best chance of achieving our political objectives. Will it always work? No. However, it stands a better chance of success – success as constrained by the factors noted above – than do other types of military forces. Moreover, and this is a crucial if not openly stated consideration, even if airpower is not successful, the cost of failure will be low. Several divisions of ground troops could perhaps have been sent to the Balkans to engage and defeat the Serbian army, followed by occupation of the contested areas. This would, however, have taken a very long time and been an enormously expensive and bloody proposition. And it too might have failed, but the cost would have been spectacularly high.

The Gulf War, in effect, was a condemnation of our success, and the sentence was Kosovo. The Serbs, who had close military contacts with the Iraqis for many years, knew better than to fight us on our terms. They therefore resorted to an asymmetrical strategy that relied, first, on rope-a-dope tactics: they endured air punishment stoically, believing their heads would last longer than our fists. Secondly, they used small, mobile, and lightly armed forces to terrorize and drive out the Kosovars. These small unit tactics reduced their exposure to air attack, but did not diminish their ability to rout unarmed civilians. Potential aggressors will undoubtedly see the cleverness Milosevic showed in playing a weak hand. Some of NATO's biggest aces were trumped, because we were unwilling to pay the price in political capital, blood, or world censure to use the military force necessary to achieve our objectives quickly.

The application of airpower is not immune from the vicissitudes of strategy, and airmen must beware of the tendency to oversell airpower's capabilities – a common problem in the past. Airpower does, however, address an increasing share of the problems facing NATO in the post Cold War world. The increasing airpower components of surface forces only serve to demonstrate this fact. As new and different crises emerge that require the threat or use of force, air forces teamed with the latest technology and employed in a precise, effective fashion will not only continue to be the symbol of NATO military power, but will expand in importance.

In summary, NATO political and military leaders, and the public, must realize that not all problems are amenable to the use of military force, and those that are may not be suitable for airpower. Yet, given the trends of the past decade in technology and NATO political activism around the globe, airpower will increasingly be viewed as the weapon of first resort. As long as this remains the case, we must ensure our military strategy supports and complements our diplomatic policies, and vice versa. Anything less is a recipe for disaster.

NOTES

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- 2 Quoted in Michael O. Beale, *Bombs Over Bosnia: The Role of Airpower in Bosnia-Herzegovina* (Maxwell AFB: Air University Press, 1997), p 32.
- 3 Robert C. Owen, "The Balkans Air Campaign Study," *Airpower Journal*, in two issues, Summer 1997, pp 4-24 and Fall 1997, pp 6-26. The one aircraft lost was a French Mirage 2000. Prior to the air campaign, UN peacekeeping ground forces had suffered eighty killed and 628 wounded.
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- 6 Possible new weapons are the laser radar-guided Low-Cost Autonomous Attack System (LOCAAS), and a 500 lb JDAM. Robert Ware, "New Munitions Needs Spark Funding Uncertainty," *Aviation Week & Space Technology* (AWST), 8 November 1999, p 60; Steven Lee Myers, "Something New in the Iraqi Conflict: Concrete Bombs," *New York Times*, 7 October 1999, p 1.
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- 9 The unseemly spat between the Army and the Air Force over tasking of Apache helicopters in Kosovo was a regrettable exception. The fear of risking the Apaches in combat finessed this potential problem. "Shelton: Risk was the Key in Decision Not to Use Apaches," *Defense Daily*, 10 September 1999, p 2.
- 10 This was clearly illustrated in the summer of 1999 when the US Congress seemed poised to cancel funding of the F-22, the USAF's new air superiority fighter. The USAF had simply not made a compelling case to Congress as to why the new plane was required.
- 11 Gary Hart and William S. Lind, *America Can Win: The Case for Military Reform* (NY: Adler & Adler, 1986), passim. Other members of this group were Norman Polmar, Steve Canby, and John Boyd.
- 12 Daniel G. Dupont, "Despite Losses, Backers Say Unmanned Systems Excelling over Kosovo," *Inside the Pentagon*, 10 June 1999, p 1; Jeff Cole, "Unmanned Jets May Someday Fly as Bombers," *Wall Street Journal*, 10 May 1999, p B1; Mark Hewish, "Coming Soon: Attack of the Killer UAVs," *Jane's International Defense Review*, September 1999, pp 30-38.
- 13 The Pentagon has not revealed what happened to the F-117. One report states that a surface to air missile (SAM) hit the aircraft due to luck, repetitive flight patterns, the movement of SAM sites that had not been reported by intelligence, and lack of effective jamming aircraft. David A. Fulghum, "Pentagon Gets Lock on F-117 Shootdown," *AWST*, 19 April 1999, p 28.
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- 15 Even stealth aircraft benefit from electronic jamming and SEAD aircraft armed with anti-radiation missiles, so these air assets will continue to be essential for the foreseeable future.
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- 17 David A. Ochmanek, et. al., "Find, Hit, Win," *Air Force Magazine*, April 1999, pp 50-59. One study concludes that ten fighter wings equipped with sensor fuzed weapons could stop a force of ten armored/mechanized divisions in approximately one week. Chris Bowie, et. al., *The New Calculus: Analyzing Airpower's Changing Role in Joint Theater Campaigns* (Santa Monica: RAND, 1993), p 61. Note: JDAM = Joint Direct Attack Munition; JSOW = Joint Standoff Weapon; JASSM = Joint Air to Surface Standoff Missile; WCMD = Wind-Corrected Munitions Dispenser; and SFW = Sensor Fuzed Weapon.
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- 22 Thomas A. Kearney and Eliot A. Cohen, *The Gulf War Air Power Survey, Summary Volume* (Washington: Government Printing Office, 1993), pp 83, 90. For continuing difficulties on this problem, see Bryan Bender, "Allies Still Lack Real-Time Targeting," *JDW*, 7 April 1999, p 4.
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 - 29 Daniel Gouré and Christopher Szara, *Air and Space Power in the New Millennium* (Washington: CSIS, 1997), p 101; Craig Covault, "Military Space Dominates Air Strikes," *AWST*, 29 March 1999, pp 31-33.
 - 30 Thomas G. Behling and Kenneth McGruther, "Satellite Reconnaissance of the Future," *Joint Force Quarterly*, 18 (Spring 1999), p 24.
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 - 32 IISS, *The Military Balance, 1998/99* (London: Oxford University Press, 1998). Because the Chinese and Russian air arms are aging, US air dominance is even more pronounced than the numbers would indicate.
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RAF Chinook HC2



THE FUTURE OF AIRPOWER?



Phil Meilinger's excellent article on The Future of Air Power highlights many of the current factors which influence both the strategic analysis of how air power might develop in the foreseeable future and its possible place in the hierarchy of forces. However, as the article itself makes clear from the outset, it is essentially a US view of the issues. Not surprisingly, therefore, it is based on an analysis of likely future US military capabilities and an analysis of likely US political and individual reactions to future conflicts. As close allies within NATO and for a host of historical, cultural and political reasons, much of what Phil Meilinger puts forward as a US view finds an echo in the UK. For example, the trends and characteristics he gives as relevant to future US involvement in military operations (such as '[national] vital interests will not normally be at stake, or that 'future intervention will generally not be predictable either by location or scale') are no less relevant to the UK.



...powerful though it is, a US view on the future of air power cannot necessarily be practically accepted as the definitive view of the all our futures...

I recognise that it is possible to consider the future of 'pure air power' in a non-national and theoretical way. However, most mature air power nations will need to take account primarily of 'applied air power', applying their own unique perspective. This is because there are important differences of scale, doctrine, capability and national character which mean that, powerful though it is, a US view on the future of air power cannot necessarily be practically accepted as the definitive view of the all our futures, except perhaps in a 'pure' sense, which assumes that all force elements are available in sufficient quality and quantity to align theory and practice. For the UK and all other nations, the divergence between theoretical and actual capability will be significant. Therefore, when considering the future of air power for the UK, we must from the outset be alive to the constraints which our more limited resources will place on the way in which we will use air power, including being realistic as to whether air power will indeed be the military option of first resort for the UK. This is not to say that



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Phil Meilinger is wrong in any of the conclusions he reaches, but the purpose of this short commentary on his views is to point out some of the areas in which a different perspective might be more relevant to the UK. For the purposes of this commentary, I shall concentrate on 3 broad areas; scale, technology and national character.

SCALE

The UK retains a highly professional and balanced air power capability. The next few years will see the introduction into service of several new platforms and weapons, which in many cases will represent a substantial increase in capability; there are also a number of upgrade programmes which will enhance the capability of existing assets. In addition to the hardware itself, organizational and doctrinal improvements such as the creation of JF2000 and the arrival of Apache will provide opportunities to exploit new air power. No less importantly, the strength of our air power capability is built on a firm foundation of rigorous training, which not only teaches the hard skills necessary for the optimum use of aircraft and ground systems, but also provides a breadth and depth of education which places a high value on ingenuity, analysis and leadership. As a result, (and I know we can all think of exceptions) we buy good kit and we get the most out of it.

However, none of us are under any illusions about the limits imposed on the UK's application of air power imposed by the size of our forces and the lack of capability in certain areas; ingenuity can only take us so far, but it will not get a Challenger tank into the back of a C-130 or make a Tornado GR4 stealthy. For the US, the situation is markedly different; by virtue of the size of their investment, industrial base and population, the gap between the

theoretical possibilities which air power offers and their capabilities is small. Put simply, assuming political will and no concurrent major conflicts, a US JFACC is in a position to formulate a plan, effectively unhindered by equipment constraints, and able to match roles and missions closely to the theoretical ideal. His UK counterpart will seldom have that luxury and will have to scale his plan to match the available capabilities, which might well be some way removed from the theoretical ideal.

In terms of air power delivery, this difference of scale could well make itself felt in a number of areas, all of which could pose challenges for a UK JFC. In comparison with the US in particular, these challenges are likely to include intelligence gathering, analysis and transmission, seizing and retaining air superiority, lack of airlift capability and CSAR. These challenges certainly do not mean that the UK does not have an effective and broad spectrum autonomous air power capability. However, what they do mean is that UK commanders and their staffs will be more exercised by capability gaps, roulement issues during protracted operations and hard decisions over the apportionment of forces.

In the 2 theatres on which Phil Meillinger concentrates (the Gulf and FRY) the UK gaps have been filled by (principally) the US and have therefore not affected the outcome. On the positive side, the UK has been able to provide niche expertise which the US, for all its assets, did not possess. The issue for the UK is therefore not to be seduced by the theoretical capabilities of air (and space) power to such an extent that, when formulating our doctrine, we begin to forget the practical limits which our own more modest capabilities will impose on us, for national or coalition operations not involving the US. Just as we would be foolish to predict our enemies, so we would be unwise to assume that UK and US interests will always coincide so closely to guarantee that the US will always be our ally in the field, even if it were to remain a benign observer.

The Prime Minister has made clear one way in which the issue of scale could be addressed for European nations, by strengthening the European Defence Identity (EDI) within NATO. Whilst this would not improve national capabilities, it would

allow eradication of some European capability gaps, assuming that more cost-effective expenditure in the military aerospace arena was not simply translated into a reduction in national defence budgets, or the pursuit of nationalistic procurement agendas. In addition to the hard procurement decisions that would have to be overcome, it is still unclear how a EDI would, in practical terms, either detach itself from, or gain access to, US C3I capabilities embedded in NATO. Furthermore, even if we assume unity of command could be achieved, unity of purpose to embark on warlike action is not a given. For example, if OPS SOUTHERN WATCH and NORTHERN WATCH were EDI operations, the political differences between France and the UK would make unity of purpose and selection of the aim extremely difficult. All these difficulties were brought into sharp relief during the Kosovo air campaign where US

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capabilities dominated. The campaign vividly illustrated that Europe needs to do more, but we should not delude ourselves that the EDI option, however desirable, will be easy or cheap. There is a long and hard road between 'Something must be done' and practical capability.

There is one further significant result of the difference between the US and UK's relative sizes which deserves to be highlighted and that is our different approaches to jointery. Phil Meilinger points out the difficulty a potential enemy will face because of the redundancy of US forces, a redundancy that encompasses not only substantial air arms of all 4 Services, but also redundancy

of capabilities within them. At this scale, true jointness is seen as a drawback, because it reduces options by reducing redundancy. The focus is therefore an effective collaboration and advantages accrue from cumulative effect, rather than true synergy.

Thinking in the UK could hardly be more different. Much of the UK's air power capability will in future be controlled in peace and war by joint formations; for example, battlefield helicopters by JHC, Harrier and Nimrod MR by JF2000, and 38 Gp assets are already tasked by MOD. This creates an absolute requirement for a depth of joint understanding, which we are making good progress towards, but have yet to fully achieve. It also creates the possibility for substantial disagreement at Joint Targeting Board (JTB) level and below over how limited assets should be used to best effect. Air staffs will therefore have to be extremely well educated in the effective application of air power doctrine, if they are to contribute effectively to the JTB process. Type knowledge, however deep, will no longer be enough. For today's airman, the superstructure of joint knowledge cannot be heavier than can be supported

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by the foundation of air power knowledge on which it rests, a fact which has been recognised and acted upon. Therefore, whilst redundancy is a positive benefit for the US, lack of redundancy is an issue for the UK and brings with it a greater training burden, if joint synergies are to be identified and exploited.

TECHNOLOGY

In many ways, improved technology is also an issue of scale and the resources that a nation or organization is prepared to (or simply has available to) devote to development. As Phil Meilinger correctly states, it is the huge increase in computing power which has allowed such rapid advances in capability, allowing, for example, not only the design of aerodynamically unstable aircraft but the on-board computing resources to actually keep them in the air. However, nowhere is the technology gap between the US and UK more evident than in the

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exploitation of space. Even if we consider space only in respect of reconnaissance, intelligence and communications, the range of assets deployed by the US dwarfs that available to any other nation. Once again the capability difference is mitigated if we (the UK) are able to share in the benefits of this capability as a preferred coalition partner, but for the reasons given above we would be unwise to rely on this in all circumstances.

The technology gap is also beginning to impose real constraints on the interoperability of US air forces with those of other nations. Understandably, the US seeks to exploit its technological advantage by producing equipment which will give its forces the greatest chance of success, at minimum risk to themselves. Such technological advances, such as secure communications and JTIDS/Link16 bring with them not only a hardware gap but, more significantly, a doctrinal and operating procedures gap. Technology allows forces to fight smarter and, frankly, the US does not want less advanced allied nations degrading its technological advantage in combat. This is a significant difference between the issue of scale and the issue of technology; a difference in scale means we can only contribute to part of the campaign, a difference in technology might mean we are not even invited to the fight.

One technological factor which is common to both the US and the UK is that most cutting edge technological development is now undertaken to meet civilian commercial needs, unlike the Cold War period when military requirements often forced the pace of technological change. Whilst this removes a large R&D burden from the military defence budgets, it often means that the technology we procure is not unique to us and is available to others. An example of the consequences of this change, which does not relate to a weapons system, is that commercial news gathering companies have equipped themselves with real time satellite transmission equipment which can and does beam the war into our homes. This real time imagery and instant reaction, which often prefers immediacy of comment to analysis, does not of itself cause casualties, but it does accelerate the pace of decision making to a degree which risks allowing the news agenda to drive military and political decision making. The reluctance or inability to match such resources means that we become, in turn, dependent on them, with all the attendant risks of inaccuracy, bias and speculative comment which they bring. The image of casualties around a still smoking hole in the ground, accompanied by the statement 'NATO did this' is a powerful message to have to counter, whether or not the statement later proves to be accurate.

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...superior technology is not always synonymous with superior battlefield performance, and as support for this I would refer readers to Dr Kenneth Freeman's article in the June 1999 edition of the RUSI journal, in which he compares the relative combat effectiveness of the low-tech A-10 and the high-tech Apache in the Gulf war

However, before UK readers despair, superior technology is not always synonymous with superior battlefield performance, and as support for this I would refer readers to Dr Kenneth Freeman's article in the June 1999 edition of the RUSI journal, in which he compares the relative combat effectiveness of the low-tech A-10 and the high-tech Apache in the Gulf war. We must also match the technological means to the desired combat outcome. For example, the US dominated the electromagnetic spectrum in Mogadishu, but the investment was futile as the 'enemy' were not using electromagnetic means to pass their messages. Also, the successful policing of the Iraq no fly zones does not mean that they have become no persecution zones, so there are limits to what airborne technology can achieve. Therefore, although I would not wish to be accused of making a virtue of a necessity, a lack of access to technology can lead to greater ingenuity and success in some circumstances.

NATIONAL CHARACTER

The combined effect of scale, technology and national character is that the US and the UK approach the use of force from very different standpoints. For example, the way in which the police forces of both countries are equipped and operate is a clear, non-military, indication of that difference. Therefore, Phil Meilinger's image of a 'cop on the beat' will conjure up a different image for a US citizen than that of a 'bobby on the beat' would do for a Brit. Whilst both nations operate strictly within the law of armed conflict, the US approach, particularly following Weinberger/Powell, is essentially one of overwhelming force, compared

with the British approach of minimum force. Again, issues of scale and availability of forces are a factor, but national character plays an important part here. The US's ability to muster and deploy overwhelming force has also contributed to the intolerance of casualties which Meilinger describes. In the UK, whilst everything is done to minimize unavoidable casualties, there is perhaps a difference between the 2 nations in what 'unavoidable' means, in that there is a greater acceptance of casualties by the UK population, provided they are convinced that the plan is sound and the cause is just. Although the circumstances were different, the smaller UK population was more tolerant of the 252 UK Service fatalities during the Falklands war than the US was of its 18 fatalities in Somalia.

The US's ability to muster and deploy overwhelming force has also contributed to the intolerance of casualties which Meilinger describes

Both the US and UK will apply similar criteria of legality, political risk and 'national interest' when assessing a situation. However, on the use of force, the UK, particularly in the case of a national operation, might well apply the same criteria as the US, but be forced to reach rather different conclusions. This might be due not only to a greater military risk, or non availability of forces, but also to perceived greater adverse diplomatic or commercial consequences. We can punch above our weight, but only up to a point.

THE FUTURE FOR UK AIR POWER

Given the differences between the US and the UK, is the future for UK air power that it 'will be increasingly viewed as the weapon of first resort', at least when all but the military options have been tried and failed?

For many of the reasons cited by Meilinger, the answer must be yes. Air power can make a rapid and powerful statement of intent almost anywhere on the globe (and this definition of air power includes, for example, the carrier borne elements of JF2000). It also offers a degree of commitment which can be increased or decreased with greater speed and less logistic implications than a ground force of consequence and avoids at least some of the complex legal and practical difficulties of

committing ground forces into a hostile third country. Furthermore, air power does not mean uniquely combat power, but embraces reconnaissance, intelligence gathering and airlift for humanitarian or evacuation tasks, all roles which can provide leverage to de-escalate a situation without resort to combat power. Ships, Royal Marines and soldiers can also undertake some of these roles and it would be nonsense to claim them all as the unique prerogative of air power. However, there is no doubt that the rapid deployment of air power in adequate strength will remain as attractive an option to domestic political leaders as it is unattractive to potential adversaries.

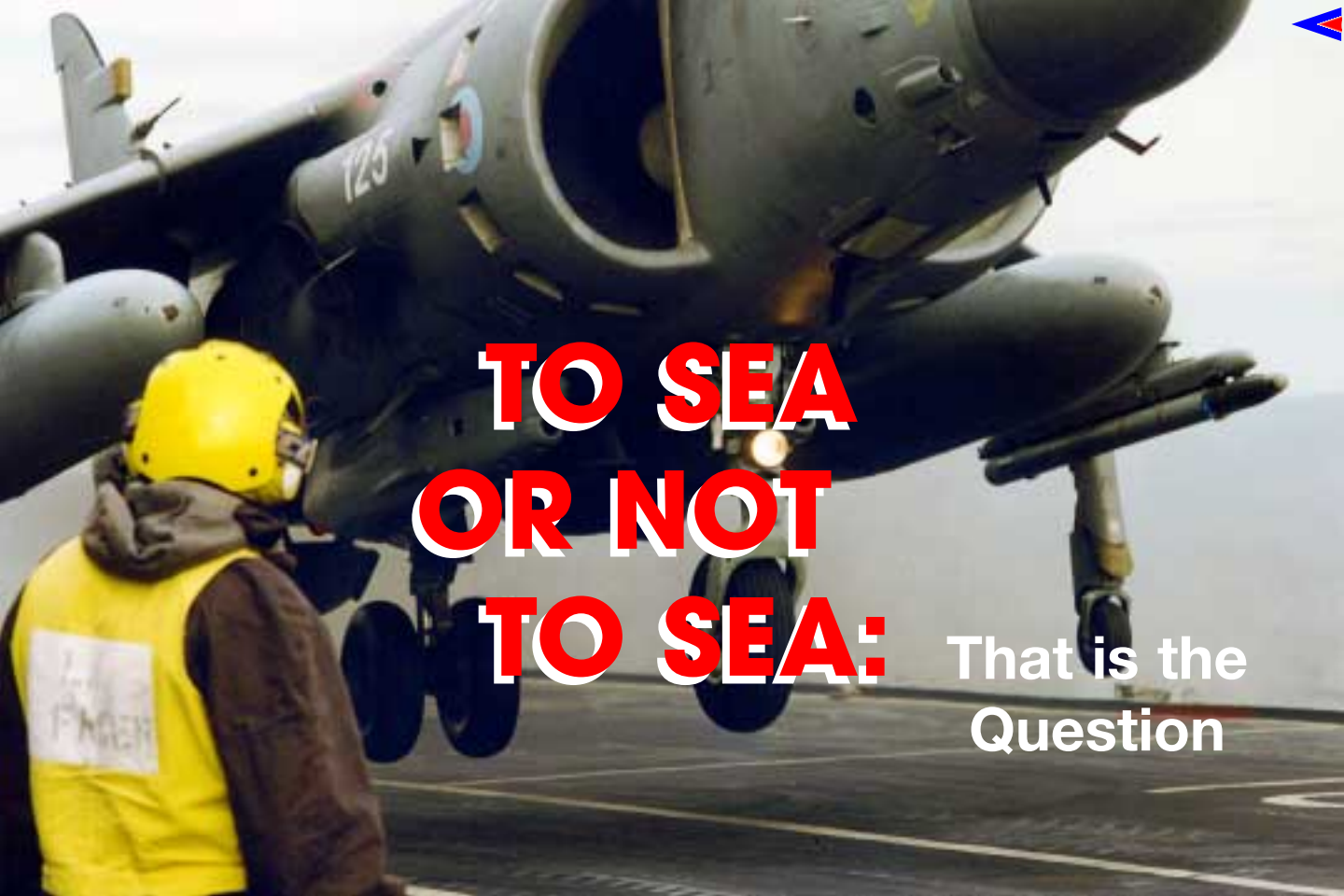
We must also remember that the inherent characteristics of air power, such as speed, reach and flexibility, remain equally applicable to the smallest and the largest air forces. These are the very characteristics which make air power such a responsive and valuable tool in a complex world of inter and intra state conflict. Air power will often be the best mechanism to display the iron fist of resolve, without removing the velvet glove of diplomacy. Whether employed as the sole response or as part of a joint force, in a benign or hostile environment, air power in at least one of its guises will certainly be in the vanguard of our future operations.



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Royal Air Force Nimrod MR2



TO SEA OR NOT TO SEA:

That is the
Question

How Should Joint Force 2000 be Deployed to Maximise its Air Power Utility in the Likely Limited Conflicts of the Future?



By Wing Commander Neil Meadows RAF

The 1998 Strategic Defence Review proposed Joint Force 2000 as a joint RAF/RN force to provide a deployable and effective offensive air capability to meet the likely expeditionary roles of the post-Cold War era. Since its inception, however, there has been much debate on the composition of the Force, its ownership and its Command & Control, but little discussion of how its air power potential might best be deployed in modern, complex emergencies. This essay uses articles in books, journals, magazines and on the Internet, as well as information obtained in interviews with key players in the Joint Force 2000 implementation process, to analyse the various strengths and weaknesses of both sea and land basing (including the likely effects of the procurement of the proposed Future Aircraft Carrier and the Future Carrier-Borne Aircraft). The essay concludes that, in terms of the efficient and effective use of Joint Force 2000's air assets, there is a direct relationship between the most appropriate deployment option and the intensity of the conflict in which the Force is likely to be involved. Therefore, to maximise Joint Force 2000's air power utility in the likely limited conflicts of the future, it should be deployed strictly according to the combat scenario, and not according to the historical (single-service) precedents or political whims which have prevailed in the past.

INTRODUCTION

In recognition of the 'new strategic realities' of the post-Cold War era, the 1998 Strategic Defence Review (SDR) structured Britain's armed forces on an 'expeditionary' basis to meet the demands of modern, complex emergencies instead of the traditional NATO European role.¹ Expounded within this expeditionary theme was the key issue of 'Jointery'² and the recognition in a 'Joint Vision Statement'³ that 'the traditional distinction between ground, sea and air theatres of operations is rapidly being replaced by a single battlespace, embracing all 3 environments'. The SDR introduced some 7 new joint ventures,⁴ including Joint Force 2000 (JF 2000), which was proposed as 'a concept for a joint RAF/RN force to be established from around the middle of the next decade',⁵ to provide a deployable and effective offensive air capability to meet the likely expeditionary roles of the post-Cold War era. It is planned that the Force will eventually operate a common aircraft type and will 'build on the success of current joint Harrier operations and gradually merge RN and RAF cultures and practices towards a properly joint force, capable of land attack and air defence operations'.⁶

Although heralded as 'a historic proposal from the First Sea Lord and the Chief of the Air Staff',⁷ the JF 2000 idea is not new. In 1961, the Minister of Defence tasked the Admiralty to 'consider the shape of Britain's future naval policy for the 1970s'.⁸ The Admiralty was 'careful to emphasise the complementary nature of carriers and land-based air power' and suggested a 'world-wide maritime strategy' and a 'truly inter-Service force'.⁹ The First Sea Lord presented the proposed aircraft carriers as 'National assets; as mobile, self-contained airfields...not in competition with shore-based air power'.¹⁰ He concluded that 'if British military power is to continue to be deployed around the world, then mobile airfields in the form of aircraft carriers ought positively to be part of this country's armoury [and] we should welcome as much flexibility between seaborne and land-based aircraft squadrons as the Admiralty and the Air Ministry together could devise'.¹¹

The Admiralty's proposals were given further weight by the independent Festing Study,¹² which recommended 'a common light bomber/strike fighter for RAF/RN use' that could be 'used in operations either from shore bases or from carriers according to the requirements of a particular operation'.¹³ Unfortunately, the vision was not realised, partly because of inter-Service rivalries,¹⁴ partly because the British attack carrier was seen in the 1960s as an instrument of power projection for only 'limited' operations,¹⁵ but mainly because of the crippling budgetary cuts associated with the 1966 Healey Defence Review.¹⁶ It is perhaps ironic, therefore, that the SDR propounded a similar joint air capability as the most cost-effective way of meeting the requirements of the 'limited' operational scenarios of the post-Cold War era whilst, at the same time, increasing the operational effectiveness of both services.

Since the announcement of the SDR, the development of the 'JF 2000 Initiative' has proceeded apace. The JF 2000 Study Team recommended in October 1998¹⁷ that the Force should form within RAF Strike Command, under command of a RN Rear Admiral (2-Star) and a RAF Air Commodore (1-Star). The JF 2000 Implementation Team formed on 1st February 1999 and

Strike Command has developed infrastructure and organisational plans for the collocation of the current RAF and RN Harrier forces at RAF Cottesmore and RAF Wittering in 2003.¹⁸ For the longer term, the Staff Requirements for the Future Carrier Borne Aircraft (FCBA) and the Future Aircraft Carrier (FAC) are being prepared. The Combined Operational Effectiveness and Investment Appraisal (COEIA) for the FCBA is due to report in 2000; both the FAC and the FCBA are expected into service in 2012.¹⁹ However, whilst the studies so far have concentrated on the composition of the Force, its ownership and its Command & Control, there has been little discussion of how its air power potential might best be employed in modern, complex emergencies. In the words of Air Commodore Probert, there has been 'too much dispute over ownership, too little about planning for roles.'²⁰

So, will 'Harriers on Carriers' be the panacea for Britain's future air power requirements, will JF 2000 operate equally effectively from aircraft carriers and land bases (as the SDR suggests), and exactly how should it be deployed to maximise its air power utility in the likely limited conflicts of the future? To answer these questions, this essay will define the composition and capabilities of JF 2000 and will discuss, in detail, the likely advantages and disadvantages (in terms of air power projection) of basing it at sea and on land. In doing so, the essay will assume (for the purposes of analysis) that a land basing option is available, but recognises that this may not always be the case.²¹ The essay will not reopen the debate about whether sea or land-based air power would best serve the National interest, nor will it revisit old arguments which challenged the procurement of the FAC. Instead, by comparing the various strengths and weaknesses of both sea and land basing (including the likely effects of the procurement of the proposed FAC and FCBA), this essay will show that *both* options are vital to the effective and efficient use of JF 2000's air power potential, and that there is a direct relationship between the most appropriate deployment option and the intensity of the conflict in which the Force is likely to be involved. The essay will conclude, therefore, that to maximise Joint Force 2000's air power utility in the likely limited conflicts of the future, it should be deployed strictly according to the combat scenario, and not according to the historical (single-service) precedents or political whims which have prevailed in the past.

FORCE COMPOSITION

Before considering its various strengths and weaknesses, it is important to define exactly what JF 2000 will be. There is a popular misconception that the Force will comprise aircraft carriers, escorts, amphibious assault ships, mine countermeasure vessels and fleet auxiliaries operating with Nimrod Maritime Patrol Aircraft in a similar configuration to an American Carrier Battle Group. However, this sort of 'hard-hitting, flexible and genuinely deployable force, able to undertake the full spectrum of short-notice missions in today's international environment.'²² describes not JF 2000, but the new Joint Rapid Reaction Force²³ (JRRF), which was also proposed by the SDR. The JF 2000 Initiative is 'simply' the amalgamation of the RAF and RN Harrier fleets and operations involving the resultant joint air wings.²⁴ Therefore, although the sea power capabilities of JF 2000's likely escorts²⁵

and its carrier are not inconsiderable, this essay will concentrate on the air power utility of JF 2000's aircraft (whether they be land or sea based).

At present, JF 2000 comprises 2 aircraft types. The RAF Harrier GR7 is a versatile surface attack and reconnaissance aircraft with a Short Take-Off and Vertical Landing (STOVL) capability. It has a sophisticated, integrated cockpit, and is capable of medium and low level attack sorties, by day and by night, and in poor weather, using Night Vision Goggles or Forward-Looking Infra-Red equipment or a combination of both. Its armaments include 2 cannons, and combinations of up to 4 Sidewinder air-to-air missiles, 7 Cluster Bombs, 2 Laser Guided Bombs (LGB) and 2 rocket pods. In addition, the aircraft carries a comprehensive self-defence Electronic Countermeasures (ECM) suite and may carry an external reconnaissance camera pod or a Thermal Imaging and Laser Designation (TIALD) pod.²⁶

The RN Sea Harrier FA2 is a capable air defence fighter with a similar STOVL capability to its RAF counterpart. The aircraft is fitted with the Blue Vixen multi-mode pulse doppler air intercept radar which, in concert with the Advanced Medium Range Air-to-Air Missile (AMRAAM), gives it an all-weather, multi-target, Beyond Visual Range look-down / shoot-down capability. The aircraft may also be fitted with Sidewinder air-to-air missiles and twin cannons in the air-to-air role, and either free-fall or LGBs in a limited air-to-ground role (although the Sea Harrier cannot self-designate its targets).²⁷

ADVANTAGES OF DEPLOYMENTS AT SEA

A fundamental consequence of the collapse of the Soviet Union (and the effective demise of the Soviet Navy) is that there is no longer any nation which can challenge Western maritime supremacy and therefore no likelihood of a sustained conflict at sea.²⁸ Whilst it would be foolish to conclude that control of the sea will never be contested, the focus of maritime operations in the post-Cold War era has inevitably shifted from 'power at sea' to 'power from the sea',²⁹ away from traditional 'blue water' operations towards what have become known as 'littoral'³⁰ (or 'brown-water') operations. Traditional 'naval' strategy has therefore become increasingly 'joint' as the capabilities of all 3 Services have been integrated to project power ashore in these littoral regions. In 1992, the US Navy and Marine Corps defined a new strategic focus,³¹ which established the 'Naval Expeditionary Force' as the basic building block for US naval operations.³² The creation of JF 2000 reflects the British Government's recognition of this need to 'focus a higher proportion of naval effort on the projection of power ashore'.³³

A fundamental consequence of the collapse of the Soviet Union (and the effective demise of the Soviet Navy) is that there is no longer any nation which can challenge Western maritime supremacy...



Embarked at sea, JF 2000 offers a potent power-projection capability throughout the spectrum of naval roles.³⁴ In high intensity 'war fighting', the Harrier FA2 and organic (Sea King) Airborne Early Warning (AEW) aircraft would form an indivisible part of an aircraft carrier's combat power in the conduct of air defence operations and Anti-Surface Unit Warfare (ASUW) tasks. Under this air defence umbrella, the Harrier GR7 could be used in a variety of land attack roles, from interdiction and offensive counter-air missions, to the close air support of amphibious landings. The Falklands campaign of 1982 provides good examples of the utility of a multi-role seaborne air capability³⁵ (and the efficacy of a joint approach). Whilst Sea Harriers destroyed some 25 Argentinean aircraft in air-to-air combat, some 500 ground attack missions were flown.³⁶ These included close air support, offensive counter air, suppression of enemy air defences and ASUW operations.

Notwithstanding these historical successes, it is in the field of 'naval diplomacy'³⁷ that JF 2000 is likely to have its greatest utility in the post-Cold War era. The Harrier GR7's ability to deliver Precision Guided Munitions will add considerable substance to coercive operations,³⁸ particularly in view of modern Western political sensitivities about the avoidance of collateral damage and civilian casualties. This coercive capability was exemplified during Operation BOLTON³⁹ in 1998 when HMS Invincible (and subsequently HMS Illustrious) joined US carriers in the Gulf to induce Saddam Hussein to accede to UN inspection demands. Despite the modest nature of the British contribution, 'the embarkation of RAF Harrier GR7s, alongside Sea Harriers allowed the carrier to show its joint credentials.'⁴⁰ Operations DENY FLIGHT and DELIBERATE FORCE in the former Yugoslavia between 1993 and 1995 exemplified JF 2000's likely utility in peace inducement and peace enforcement operations of the future. Whilst the Harrier FA2s could provide control of the air, the Harrier GR7s could strike at pin-point targets using TIALD-designated LGBs, or with their highly-accurate, high-velocity rockets. The same aircraft could also be used in the reconnaissance role in



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...Harrier FA2s could be used to patrol UN no-fly zones or to escort unarmed transport aircraft through hostile airspace

However, JF 2000 offers much more than just the combined capabilities of 2 aircraft types. Embarked on its 'floating air power platforms',⁴⁴ it will harness the 2 key maritime attributes of 'mobility' and 'sustained reach'⁴⁵ to its own environmental characteristics to provide 'the presence, flexibility and utility required for most foreseeable incidents'.⁴⁶ Because the sea covers some 70% of the Earth's surface, aircraft carriers are able to deploy (or redeploy between theatres) almost unrestricted through international waters (at some 400 miles per day) to provide mobile, self-contained airfields in areas which would otherwise be inaccessible to land-based aircraft, either because Host Nation Support (HNS) or overflight rights cannot be secured, or because of a lack of suitable airfields (the number of US overseas bases, for example, has reduced from 127 to just 25⁴⁷). Once in theatre, an aircraft carrier is constrained only by the littoral boundary and can reposition to suit the tactical situation (for example, to maximise a favourable force gradient⁴⁸) or to find more suitable operating conditions for its embarked aircraft.⁴⁹

subsequent Bomb Damage Assessment missions. In benign Peace Support Operations,⁴¹ the Harrier FA2s could be used to patrol UN no-fly zones or to escort unarmed transport aircraft through hostile airspace. Harrier GR7s could be used in a variety of surveillance roles as well as in close air support of ground forces, if required. Even in the early days of a crisis (where specific policy objectives may be unclear), JF 2000 could have a significant effect. Whilst the presence of an aircraft carrier already conveys a 'tangible commitment'⁴² in terms of diplomatic signalling, JF 2000's all-round striking power would add greater credibility to the Navy's customary 'poise' in operations of preventative diplomacy and would provide an early and high-profile message of the British Government's political and military intent. Lastly, by demonstrating the British Government's commitment to a credible expeditionary air capability, JF 2000 could assist greatly in the process of alliance building through bilateral or multilateral exercises with nations around the world, as the US Navy's UNITAS and RIMPAC exercises have ably demonstrated.⁴³

In addition to this strategic and tactical mobility, aircraft carriers can also 'loiter off an enemy coast for weeks or even months before being brought into action if and when the Government feels this is necessary'⁵⁰ without the need to ask for basing rights which may mean 'offering political or economic concessions or revealing a government's intentions in a politically embarrassing fashion'.⁵¹ Thus, in its maritime role, JF 2000 will offer the ability to 'exploit the access the sea can provide'⁵² to provide a fully manoeuvrist⁵³ and joint maritime force capable both of autonomous operations and flanking support to land-based assets. In the words of Rear Admiral Cobbold, it will meet the '6 jargon-coated criteria for operations in the new millennium: flexibility, versatility, availability, deployability, sustainability and interoperability'.⁵⁴



Once in theatre, an aircraft carrier is constrained only by the littoral boundary and can reposition to suit the tactical situation...

LIMITATIONS OF SEABORNE OPERATIONS

This exciting picture must be viewed, however, in the light of some significant shortfalls in JF 2000's current capability to project air power ashore due, in the main, to the limitations of the existing aircraft and their carriers. Although both variants of the Harrier are capable aircraft, they are limited in their endurance, range and load-carrying capacity.⁵⁵ The FA2 in its air defence configuration, for example, can loiter for just 90 minutes on station at a radius of only 100nm; in its anti-shipping role, it has a combat radius of only 200nm.⁵⁶ Notwithstanding the famous 'ski-jump', the take-off run available on current British aircraft carriers appears insufficient to launch the GR7 with more than one LGB, which must be dropped (or jettisoned) before recovery

to bring the aircraft's weight below the maximum permitted for a vertical landing, particularly in warmer climates (although engine upgrades are planned).⁵⁷ Lastly, whilst the Harrier GR7 is a good medium-altitude bomber, it has no 'stealth' capability and cannot therefore be used on the 'first night' of major operations against an enemy's air defence systems. As regards the carriers, the RN's INVINCIBLE Class (CVSGs) were originally designed to operate as Anti-Submarine Warfare (ASW) helicopter platforms and were only subsequently provided with a limited fixed-wing air defence capability.⁵⁸ By virtue of their limited size, therefore, they cannot mount Air-to-Air Refuelling (AAR), Electronic Warfare (EW) or Suppression of Enemy Air Defence (SEAD) missions. However, without AAR, JF 2000's short-range Harrier aircraft will lack the reach for deployment and deep missions, will be unable to be held airborne for survival or short-notice tasking, will be unable to escort other combat aircraft over long ranges and will be limited in mission endurance. Without comprehensive EW and SEAD support (including Electronic Support, Counter and Protection Measures), JF 2000's aircraft will be critically vulnerable to modern Surface to Air Missile systems and Anti-Aircraft Artillery. With only the relatively limited AEW capability provided by the Sea King W, JF 2000's commanders will lack the comprehensive air picture required to fully evaluate an enemy's air activity or to interface with friendly air, land or sea operations. As the Falklands campaign demonstrated:

'The British fleet suffered severely from its lack of AEW or AWACS capability to defend the carriers... [which] meant that warning time was restricted to the ship's radar range. The Harriers did a marvellous job in reacting rapidly, with pilots stationed in cockpits and being airborne in minutes after notice; but even this could not adequately compensate for the lack of an early warning system. Thus, the Navy operated as it did in World War II.'⁵⁹

Maintaining logistical support for a carrier-borne air offensive could also be problematical. Assuming just 4 sorties per day per aircraft (and with a single bomb load for the Harrier GR7), JF 2000 would consume some 240 tonnes of aviation fuel and 32 LGBs per day.⁶⁰ Notwithstanding planned modifications to remove the Sea Dart missile system to increase the weapons magazine capacity,⁶¹ this is likely to be beyond the capability of current British aircraft carriers to sustain without daily replenishment at sea, thus further limiting the ship's tactical flexibility and the tempo of its air operations. The size of current aircraft carriers also limits the number of aircraft embarked and the conditions in which those aircraft can be recovered. Without an arrestor capability, it is impossible to recover any aircraft which have been damaged sufficiently to preclude a vertical landing⁶² and, 'with only 18 aircraft of whatever mix, the [British] Carrier Air Group is pitifully small'.⁶³ With a likely mix of 8 FA2s, 8 GR7s and a couple of helicopters,⁶⁴ JF 2000's current air power projection capability is extremely limited. Therefore, whilst British aircraft carriers might be big ships, JF 2000 will never be part of the 'Big League',⁶⁵ unless as a coalition partner with the USA.⁶⁶



To maintain her global interests America requires a total of 14 deployable aircraft carriers

The likely size of the fleet will also restrict JF 2000's potential, particularly in response to immediate, high intensity crises. American experience has shown that a total of 3 carriers are needed to sustain one forward in an area of interest (allowing for time spent preparing for and returning from deployments, and for refitting programmes in between).⁶⁷ To maintain her global interests,⁶⁸ therefore, America requires a total of 14 deployable aircraft carriers.⁶⁹ Whilst British interests are certainly not this broad, they have been

quoted as 'abnormally vigorous for a small country lurking off the north-west coast of Europe'.⁷⁰ A 'fleet' of just 2 CVSGs, therefore, will inevitably be insufficient to meet all of the demands likely to be placed upon it. Effective interpretation of political signals might allow prior positioning of JF 2000 to excellent advantage (The USS Eisenhower and Independence, for example, were the only air power assets on hand to deter Iraqi incursions into Saudi Arabia following the invasion of Kuwait in August 1990). However, notwithstanding its ability to deploy almost unrestricted through international waters, with only 2 aircraft carriers at its disposal, it seems highly likely that JF 2000 will find itself poorly placed to respond to immediate events (the combat phase of the Yom Kippur War, for example, was over before the first US ship arrived in the area).⁷¹

Lastly, it cannot be ignored that aircraft carriers are extremely high value assets, which offer almost irresistible premiums to an opponent.⁷² The inherent vulnerability of the aircraft carrier is therefore also likely to limit JF 2000's power projection capability. The collapse of the Soviet Union has sparked the proliferation of small, conventionally-armed, diesel-powered submarines⁷³ (SSKs or 'Kilos'), which are extremely quiet and difficult to detect in the shallow waters of the littoral, and which pose a

...one of the most feared modern threats is the fast attack boat, which is cheap, expendable, difficult to counter and potentially lethal to the largest of ships

significant threat to carrier operations and thus to JF 2000 in its maritime role. Another worrying modern development is the 'horizontal proliferation' of highly-accurate, sea-skimming, smart, anti-shipping missiles which can be easily acquired and operated by third-world countries.⁷⁴ These missiles may be launched from mobile sites in a 'fire and forget' mode and may give little or no warning of their approach (as the US frigate Stark discovered when she was hit by 2 Exocet missiles in the Persian Gulf in May 1987). In littoral areas, therefore (which, by their very definition, are

within effective reach of land-based systems), anti-shipping missiles pose a considerable threat to carrier operations. Modern, plastic, anti-shipping mines are also cheap, easy to acquire, almost impossible to detect and lethal to shipping if scattered in large numbers in shallow (littoral) waters. Thus, they present an ideal weapon for relatively primitive navies to deny considerable areas to even the most sophisticated of forces.⁷⁵ However, one of the most feared modern threats is the fast attack boat,⁷⁶ which is cheap, expendable, difficult to counter and potentially lethal to the largest of ships. These small craft may be used to launch anti-shipping missiles (such as the Egyptian Komar-class vessel which sank the Israeli destroyer Eilat with a SS-N-2 'Styx' missile in 1967), may carry infra-red or laser-guided anti-aircraft missiles for use against a carrier's aircraft as they launch or recover, and may be packed with explosives and rammed against the hulls of surface vessels by fanatical suicide bombers.

Whilst the protagonists of aircraft carriers have argued that such vessels are unsinkable,⁷⁷ their opponents have argued that they are hopelessly vulnerable (particularly to modern sea-skimming weapon systems) and are useful, therefore, only in the most benign environments. In reality, the truth lies somewhere between these 2 extremes. However, even the Americans (who view their aircraft carriers as invulnerable floating citadels⁷⁸) recognise the seriousness of the threat in the littoral environment,⁷⁹ which is frequently characterised by confined and congested waters and airspace, occupied by friends, potential adversaries and neutrals alike, making identification (and protection of the carrier) profoundly difficult. In these conditions, a ship on station



cannot lightly engage incoming 'contacts', even in a war zone, and it is impossible to differentiate a civilian motor yacht from a 'fast attack boat' until the vessel is well within launch range. Unfortunately, however, 'only the big [American] carriers can carry aircraft capable enough to support the fleet against all plausible threats.'⁸⁰ Thus, as the intensity of a conflict increases, the risk to JF 2000's aircraft carriers from submarines, land-based missiles, mines and fast-attack craft is likely to become increasingly unacceptable. In modern 'conflicts of choice', therefore, given the real penalties involved in the sinking of an aircraft carrier, it is difficult to envisage Britain *choosing* to put one of its vessels as far 'into harm's way' as war games and operational analysis might suggest. Thus, the basic premise of British carrier operations is likely to remain as it was in the Falklands War⁸¹ that 'no greater disaster could occur than the loss of an aircraft carrier'.⁸² Therefore, as the threat to its sea platform increases, JF 2000 is most likely to be deployed in a position to ensure maximum protection of its carrier, rather than to maximise the effectiveness of its aircraft. Furthermore, if the carrier were to be threatened such that the FA2s were required to concentrate on air defence or defensive sea control, the Force's land attack capability would be degraded even more. 'In these situations, a small carrier may – just about – be able to control the water in which it operates with its accompanying group, but be unable to extend its influence any further.'⁸³

...as the intensity of a conflict increases, the risk to JF 2000's aircraft carriers from submarines, land-based missiles, mines and fast-attack craft is likely to become increasingly unacceptable

ADVANTAGES OF LAND BASING

By deploying to a land base (if available), JF 2000 could arrive rapidly in theatre in numbers limited only by aircraft availability, with its initial weapon outload and logistical support provided by Air Transport aircraft. Prepared runways would allow the Harrier GR7 to launch with its maximum weapon complement, and undertake deep incursions into enemy territory with the full panoply of combat support (including AAR, EW, SEAD and AWACS). In these scenarios, JF 2000's Harrier FA2s could also provide an inherent fighter sweep and escort within the overall Force package. In terms of air power alone, therefore, deploying JF 2000 to a land base would appear to offer the maximum advantage, as even the most ardent proponents of aircraft carriers agree. 'Land bases, where available, correctly sited and adequately supplied, will almost certainly permit air operations on a greater scale.'⁸⁴

DISADVANTAGES OF LAND BASING

So, in the light of the prospective disadvantages of carrier-borne operations, and the scale of air operations that are possible only from a land base, it might appear that JF 2000 should be based almost exclusively on land in order to maximise its air power utility. However, to enable an airfield to 'generate and recover air power missions',⁸⁵ a considerable number of functions

are required. These comprise operations support (including Air Traffic Control, command and control, intelligence exploitation facilities, firefighting and rescue services), logistics (including flight line, air movements, fuel, storage and motor transport facilities) and administration (including personnel, resource and financial management, medical infrastructure, accommodation, catering and training facilities). In addition, static airfields are vulnerable to enemy attack and, although it seems highly unlikely that a single (conventional) weapon could close an airfield for a protracted period, there remains a significant threat to deployed forces, particularly from 'asymmetric' attack. The threat could be passive in the form of covert observation and reporting, or it could be active in the form of air, ground, information or Nuclear, Biological and Chemical (NBC) attack. There is a fundamental requirement, therefore, to provide physical protection at deployed operating bases for aircraft, airfield surfaces, people, equipment and information. Protection measures would include Ground-Based Air Defences, Battle Damage Repair teams and the use of organic ground combat units to provide enhanced perimeter security. Therefore, land-based operations (even from a well-found operating base) are likely to involve the deployment of several hundreds of people (in addition to the aircrew and engineers directly involved with the generation of Harrier sorties) at considerable economic, human and political expense. Conversely, an aircraft carrier's crew complement are trained to provide all of these support functions within the ship's operational role at no additional cost per deployment.

...land-based operations (even from a well-found operating base) are likely to involve the deployment of several hundreds of people (in addition to the aircrew and engineers directly involved with the generation of Harrier sorties) at considerable economic, human and political expense

APPROPRIATE DEPLOYMENT

Analysis of the aforementioned advantages and disadvantages of both sea and land-based operations suggests that JF 2000's air power utility depends both on its deployment platform and the intensity of the conflict in which it is likely to be involved. To determine JF 2000's optimum deployment, therefore, it would be useful to compare its sea and land-based attributes against an appropriate model of conflict which reflects the Defence Missions outlined in the SDR. Current Air Power Doctrine shows that 'the linear, graduated model of conflict used during the Cold War.....is of limited relevance in the current environment'.⁸⁶ Therefore, to cater for the multi-faceted nature of complex emergencies⁸⁷ 'in the turbulent inter and intra-state relations of the new millennium',⁸⁸ a new circular spectrum has been proposed:⁸⁹

Ser	Mission
(a)	Peacetime Security
(b)	Security of the Overseas Territories
(c)	Defence Diplomacy
(d)	Support to Wider British Interests
(e)	Peace Support and Humanitarian Operations
(f)	Regional Conflict Outside the NATO Area
(g)	Regional Conflict Inside the NATO Area
(h)	Strategic Attack on NATO

Table 1 – SDR Defence Missions



Figure 1 – The Circular Spectrum of Conflict

credible part in peace enforcement operations, their current range and weapon loads are significantly curtailed by the aircraft carrier's inherent limitations. Furthermore, if the threat to the carrier were to increase (from stronger opponents, or those willing to engage in 'asymmetric' activities) then an increasing amount of JF 2000's capabilities would be absorbed in protecting the ship, which would

In the likely peacetime operations envisaged by the SDR, there will be an increased requirement for cooperation with other nations (for example, in the evacuation of British and other citizens caught up in overseas crises⁹⁰), and for participation in multi-national exercises with the aim of fostering international good will and deterring conflict. This 'preventative diplomacy' will form part of the wider Mission of 'Defence Diplomacy' and will include various activities 'undertaken to dispel hostility, build and maintain trust and assist in the development of democratically accountable armed forces, thereby making a significant contribution to conflict prevention and resolution'.⁹¹ The aircraft carrier seems the ideal platform on which to base JF 2000 in support of these activities. Not only could the Force's aircraft partake in exercises in most parts of the world without first securing basing or overflight rights, but the arrival of a British aircraft carrier bedecked with JF 2000's

aircraft would send considerable political signals in terms of Britain's 'presence' in the world. 'Impressible countries will find JF 2000 very impressive!'.⁹² Carrier-borne operations could also be maintained, almost indefinitely, without the prohibitive human, economical and political costs of an open-ended, land-based deployment.

In benign peace support or peacekeeping operations (especially in regions where suitable airfields are not readily available or HNS is neither offered nor desirable), the aircraft carrier would also be the ideal platform for JF 2000, combining the key naval attributes of strategic and tactical mobility, poise and sustained reach, synergistically, with the key air power characteristics of reach, flexibility, ubiquity and responsiveness. In these situations, JF 2000 would maintain Britain's standing as a 'serious player' in any coalition force, with the perceived ability to 'punch above its weight' if necessary. However, as the likely intensity of the conflict (and the likely belligerence of the opposition) increases, so the suitability of JF 2000's sea platform decreases. Although Harriers have taken a

Although Harriers have taken a credible part in peace enforcement operations, their current range and weapon loads are significantly curtailed by the aircraft carrier's inherent limitations

have to withdraw to a safe operating area, thus degrading its operational independence and denying its aircraft much of the 'reach' that naval operations are meant to provide. In high intensity conflict, therefore, JF 2000's ability to project air power ashore from current British aircraft carriers is likely to be minimal at best.

Conversely, the utility of land bases in providing an appropriate air power response increases with the scale of the response required. In benign peacekeeping operations, the cost of a permanent land-based deployment is unlikely to be justified (or even necessary). However, where large-scale, intensive or rapid responses are required, then no sea-based force can match the air power projection capability of a properly constituted airfield. In these situations, not only could JF 2000's aircraft operate with their full fuel and weapon loads, but they could also take advantage of the full panoply of air support to maximise their range, effectiveness and survivability. Thus, for war fighting, it would seem that JF 2000 should be deployed without its carriers, to a properly-prepared, coalition land base. In accordance with the 'circular' spectrum of conflict for modern, complex emergencies, therefore, there appears to be a distinct relationship between the most appropriate deployment option for JF 2000, and the intensity of the conflict in which it is likely to be involved:

...the utility of land bases in providing an appropriate air power response increases with the scale of the response required

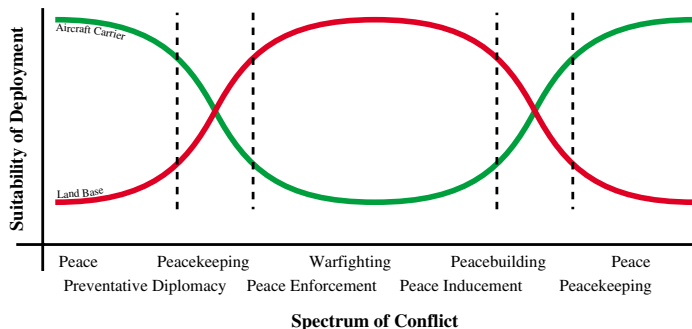


Figure 2 – Deployment of JF 2000

This paradigm has 3 obvious exceptions: firstly, in peacetime exercises where JF 2000 may be deployed to either sea or land bases with equal effectiveness (and must practice both eventualities to maintain its proficiency); secondly, in full-scale war (such as the 'Strategic Attack on NATO' envisaged in the SDR Defence Missions) where the otherwise disproportionate risk to the aircraft carrier becomes very much less significant in the overall scenario; and, thirdly, when HNS (and therefore a land base) is not available, as was the case in the Falklands campaign.⁹³ In the latter case, the carrier provides the only option for a British air power response. However, in

high intensity conflict, the likely restrictions on JF 2000's air power projection capability inherent in current carrier-borne operations suggest strongly that, if land basing is either non-existent or marginal, then the Force should not be deployed at all.

However, where the choice of a land base exists, the analysis suggests that JF 2000 should be deployed at sea for peace support and peace keeping operations, and to land bases for peace enforcement and warfighting scenarios. In conflicts where the most appropriate solution is not clear, some radical thinking will be required. In certain circumstances (as the US Marine Corps' Concept of Operations suggests,⁹⁴ it might be appropriate for JF 2000 to deploy initially by sea, to provide air support for amphibious and follow-on forces to establish a bridgehead and prepare a Deployed Operating Base (DOB) to which JF 2000 would then deploy to conduct high-intensity air operations (leaving the carrier to retire out of harm's way). Alternatively, JF 2000 could deploy rapidly (as part of the JRRF, for example) to a land DOB, to be followed later by the aircraft carrier which could then act as a second basing option to maximise the Force's manoeuvrist potential with its tactical mobility (and could provide other functions, such as that of a floating joint headquarters or as a base for diplomatic discussions between protagonists). The recent Operation DESERT FOX exemplifies the flexibility of this approach. Whilst medium-intensity bombing raids on Iraqi targets were mounted from well-found land bases (albeit by Tornado aircraft in this case), an aircraft carrier and its Harrier complement were deployed to undertake the subsequent (low intensity) monitoring task. However, no 2 situations will be the same, and many variations on the overall theme are possible (given JF 2000's inherent flexibility) provided that current operating procedures, traditions and political expectations do not preclude the necessary innovation. However, to ensure the most efficient use of JF 2000's air power attributes, RAF personnel will have to become accustomed to lengthy deployments at sea on aircraft carriers and, similarly, naval personnel will have to accept protracted periods of operations from land bases. More significantly, the Naval Staff might have to entertain the deployment of historically organic air assets, whilst leaving their host carriers in port. Some 'sacred cows' may therefore be at risk.

THE FUTURE

The current INVINCIBLE Class of aircraft carriers is due for replacement in 2012, at which time the FCBA is also due into service. Operational analysis suggests that it would be more cost-effective to replace the current fleet of 3 CVSGs with 2 larger, more versatile ships capable of operating the largest possible range of aircraft in the widest possible range of roles. However, a primary driver for the FAC will be the number and type of FCBA, and the sortie generation rate required.⁹⁵ There are 3 generic combinations of FAC and FCBA:⁹⁶ STOVL (as per the current fleet); Short Take-Off But Arrested Recovery (STOVAR); and Conventional Take-Off and Landing (CTOL). Whilst studies are still ongoing, it would seem that the winning design is most likely to be either a STOVL or CTOL variant,⁹⁷ the choice of which will have significant implications for JF 2000's likely air power utility.

In economic terms, the STOVL combination presents the most cost effective option. A STOVL ship requires only one runway, has a faster turnaround capability and does not need to provide as stable a platform as its CTOL counterpart for aircraft recoveries.⁹⁸ It would therefore be smaller (and cheaper) than a CTOL equivalent. Similarly, a STOVL FCBA would need to be small and light (some 30,000 lbs instead of 70,000 lbs for a conventional aircraft) and would therefore be cheaper than a CTOL variant. Although the COEIA for the procurement of the FCBA is not due until 2000, a primary contender is the STOVL version of the US Joint Strike Fighter (JSF),⁹⁹ currently under development by 2 competing contractors: Boeing and Lockheed Martin. Although technical specifications will undoubtedly change, the companies' proposals suggest that the JSF will be a formidable fighting machine.¹⁰⁰ Both the Boeing and Lockheed Martin variants will be single-seat, single-engined, supersonic, all-weather, multi-role aircraft with aerodynamic performance in excess of the F-16, enhanced lethality, greater survivability and considerable interoperability with their land-based counterparts. Designed with the proven stealth technology of the F-117 and the F-22, they will be extremely capable 'Day-One strike aircraft', able to handle the 'deep target sets' (such as Integrated Air Defence Systems) in any modern conflict.¹⁰¹ To enhance its stealth capability, the JSF's ECM and laser designator will be fitted internally, and the aircraft may also utilise the 'off-board sensor' concept.¹⁰² The JSF will have a likely range of some 600nm, and its internal (stealth) bomb bay will likely house 2 advanced 900 kg stand-off munitions or LGBs and 2 AMRAAMs. For land-based operations, additional fuel tanks and weapon stores may be carried externally, with an associated reduction in the aircraft's stealth capability. A retractable AAR probe will also be fitted.

Whilst a CTOL FAC/FCBA combination would be larger (and therefore more expensive), it would, however, offer considerably more in terms of air power projection capability than its STOVL equivalent. An electromagnetic catapult¹⁰³ could launch aircraft of all-up weights in excess of 70,000 lbs, thus permitting combat operations by modified versions of most land-based fighter aircraft at their full operational loads.¹⁰⁴ It would also enable the use of more capable, fixed-wing AEW aircraft (such as the E-2 Hawkeye) and small AAR tankers. The CTOL carrier's arrestor capability would also permit the recovery of its aircraft in most configurations and with significant battle damage.

So, how do the proposed FAC and FCBA affect the analysis of how JF 2000 should be deployed? As regards the FAC, future technological advances will undoubtedly improve the ship's on-board defence capabilities. However, similar advances in ASUW weaponry (in the so-called 'dynamic of technology'¹⁰⁵) are likely to balance the equation.¹⁰⁶ In both CTOL and STOVL variants, therefore, the inherent vulnerability of the aircraft carrier is likely to remain a limiting factor. Whilst the FCBA (in whatever its final form) would considerably enhance JF 2000's air power projection potential, any technological advances would be equally applicable to land and sea-based operations. Therefore, neither factor (on its own) will change significantly the relative advantages and disadvantages previously described.

In the STOVL configuration, a complement of 50 aircraft would allow the conduct of defensive counter air and defensive sea control operations without absorbing all of JF 2000's power projection capability. Furthermore, the procurement of the FCBA would eliminate many of the Harrier GR7's current operating limitations and would increase JF 2000's effective range, particularly if the carrier was forced to withdraw out of harm's way. However, notwithstanding the JSF's likely ability to carry twice the Harrier's current bomb load, the procurement of a STOVL FAC/FCBA combination would perpetuate the inherent air power limitations previously described, which would continue to restrict ship-borne air operations to a far smaller scale than would be possible from a land base. Therefore, whilst a STOVL FAC/FCBA combination would increase the utility of seaborne operations at the lower end of the intensity scale, it would not significantly affect the overall paradigm, which would therefore remain substantially as proposed:

In medium to high intensity conflict, one of the most significant limitations to JF 2000's carrier-borne air power potential is the inability of current British aircraft carriers to provide combat support for the Force's core air power missions, without assistance from the very land bases which the carriers are meant to obviate. In its CTOL form, however, a FAC/FCBA combination could radically alter JF 2000's air power utility in favour of sea-based operations. The ability to launch and recover combat aircraft of similar operating weights to their land-based counterparts would allow the aircraft carrier to mount comprehensive packages of heavily-armed attack aircraft, with SEAD and fighter escort, on missions appropriate to even the most intense of conflicts. The ship's complement of 50 aircraft would also permit simultaneous air defence operations if circumstances dictated, supported by

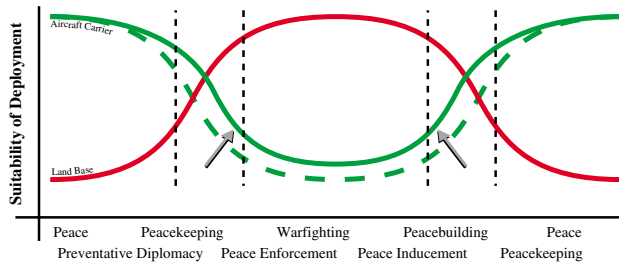


Figure 3 – Deployment of STOVL FAC/FCBA

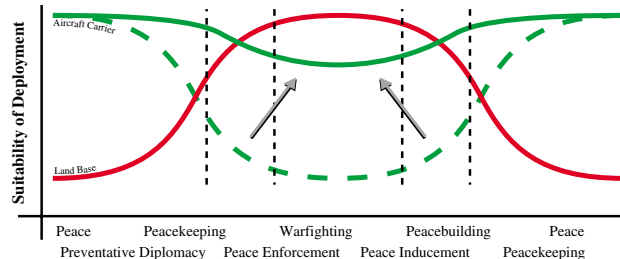


Figure 4 – Deployment of CTOL FAC/FCBA

the enhanced AEW capability of a fixed-wing aircraft, if also procured.¹⁰⁷ In terms of air power projection, therefore, a land base would offer few significant advantages over the CTOL FAC/FCBA combination, except in the most intense of conflicts, where the increased availability of AAR and greater logistical support would still permit operations on a greater scale and over increased ranges. The procurement of a CTOL FAC/FCBA combination would therefore make seaborne operations for JF 2000 much more appropriate throughout the circular spectrum of conflict:

CONCLUSION

The formation of JF 2000 represents a bold move away from the historic extremes of both the RAF and the RN and formalises a previously ad-hoc arrangement for the operation of a truly joint capability. In a gradual, pragmatic bringing together of the ways in which each service does business, it will provide (as the SDR suggests) a potent offensive air capability to meet the likely expeditionary roles of the post-Cold War era.

Embarked at sea, JF 2000 will be particularly suited to operations traditionally associated with 'naval diplomacy' such as peacekeeping, peace building and preventative diplomacy. In these circumstances, the Force will combine, synergistically, the speed, reach, ubiquity, flexibility and responsiveness of its air assets with the poise, mobility and sustained reach of its floating air platforms to provide an air power projection capability fully in keeping with Britain's tradition of 'punching above its weight'. The deployment of JF 2000 on its aircraft carrier will be an impressive demonstration of Britain's role as a 'serious player' on the modern, international stage (particularly in coalition operations as part of an overall force package) and will allow the Government to keep its options open in confusing and uncertain modern crises.

However, the limitations of current British aircraft carriers significantly restrict JF 2000's air power projection capability. Thus, as the likely intensity of a conflict increases away from the benign, the suitability of deploying JF 2000 by sea diminishes. Furthermore, as the intensity of the likely conflict increases, the inherent vulnerability of aircraft carrier (and the need to protect such a high-value asset from the likely threats in the littoral environment) further limits the Force's air power utility. Not only must the carrier be withdrawn substantially 'out of harm's way' (thus reducing the effective range of its aircraft), but the aircraft themselves must play an ever-increasing role in defending their ship. Ultimately, in very high threat scenarios, it is likely that JF 2000's entire air capability could be absorbed in protecting the aircraft carrier on which it is based. Thus, from an air power perspective, JF 2000 should not be deployed at sea for high intensity conflict, irrespective of other basing options.

Deployed operations from land bases also have their own, particular disadvantages. To provide operations and logistical support, administration and force protection for even a small detachment of aircraft requires the deployment of many hundreds of people at potentially enormous human, economic and diplomatic cost. To deploy JF 2000 to a land base to conduct benign

'Defence Diplomacy' missions (which may be of indeterminate length) is therefore highly inappropriate, especially when the enhanced air power capability afforded by the land base is unlikely to be used. However, as the likely intensity of the conflict increases, the cost of deployed, land-based operations becomes less significant in the light of the scale of air operations which the land base can support. Furthermore, there can be little argument that land bases (where available) will permit air operations on a far greater scale than are possible from aircraft carriers. For high intensity conflicts, therefore, a land base is the only deployment platform from which JF 2000 will be able to operate at its maximum air power potential.

The current aircraft carriers and their Harrier aircraft are due to be replaced in 2012, by either a STOVL or CTOL combination of FAC and FCBA, each of which offers considerable technological advances to JF 2000's air power projection capability. However, whilst a STOVL combination is likely to be smaller and cheaper than its CTOL counterpart, in terms of air power it would perpetuate many of JF 2000's current carrier-borne limitations. Thus, whilst the likely technological advances would confer an increase in capability, the relative advantages and disadvantages of sea and land bases would not differ, significantly, from those of today. Conversely, the procurement of a CTOL FAC/FCBA combination would allow the aircraft carrier to mount all but the most intensive of air combat operations and would thus radically alter JF 2000's deployment considerations in favour of sea-borne operations. Only in its prospective CTOL form, therefore, would JF 2000 become the 'deployable and effective offensive air capability' which the SDR envisaged, fully able to fulfil the expeditionary roles of the post-Cold War era as a true instrument of political choice, and able to operate equally effectively from aircraft carriers and land bases in all but the most intense of conflicts.

In all cases, however, analysis of the various strengths and weaknesses of land and sea deployments shows a direct relationship between the most appropriate deployment option and the intensity of the conflict in which JF 2000 is likely to be involved. For benign peace building and peacekeeping operations, preventative diplomacy, and operations in immature, austere theatres, JF 2000 should be deployed only on its aircraft carrier. For warfighting operations, it should be deployed only to a land base and (from an air power perspective) if a land base is not available then it should not be deployed at all. For medium-intensity operations where the situation is unclear, careful consideration should be given to the most appropriate deployment option. JF 2000 might best be deployed by carrier at the outset, but then on to a forward operating (land) base, leaving the carrier to withdraw to relative safety. Conversely, the Force might deploy on its own to a land base, to be followed later by the carrier, which could then provide a second, manoeuvrist basing option. Many variations on this theme will be possible (given JF 2000's inherent flexibility), provided that the Force is always deployed in a manner most appropriate to the likely combat scenario. In sum, both land and sea basing options will be vital to the efficient and effective use of JF 2000's air assets. However, to maximise its air power utility in the likely limited conflicts of the future, JF 2000 should be deployed either on an aircraft carrier or to a land base ('to sea, or not to sea'), not according to the historical (single-service) precedents or political whims which have prevailed in the past, but strictly according to the intensity of the conflict in which it is likely to be involved.

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NOTES

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- 4 Details of the 7 joint ventures are contained in Supporting Essay 8 to the SDR.
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- 9 *Ibid.*, p. 228.
- 10 *Idem*.
- 11 PRO:ADM 205/192, folio 43 cited in *Idem*.
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- 13 *Idem*.
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- 15 Michael Codner, 'Aircraft Carriers: The Next Generation?', *International Security Information Service Briefing* No. 70, June 1998.
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- 19 Interview with Captain N Harry, RN: Assistant Director Future Aircraft Carrier, MOD(PE) Abbey Wood, 2nd February 1999.
- 20 Air Commodore Probert, RAF (Ret'd) in Lecture on *Air Power History* at the RAF Museum Hendon, 19th November 1998.
- 21 The likely absence of Host Nation Support formed a major part of the argument to justify the procurement of the FAC. Harry, *Op. Cit.*
- 22 The Strategic Defence Review: Supporting Essays, *Op. Cit.*, Supporting Essay 8.
- 23 *Idem*.
- 24 The Harrier Force currently comprises 58 GR7s and 28 FA2s. Interview with Commodore S R Meyer, Team Leader Joint Force 2000 Study Team, 25th November 1998.
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- 26 *Jane's All The World's Aircraft*, 1997-98, Edited by P Jackson, Jane's Information Group Ltd, 1997, pp. 210-215.
- 27 *Jane's All The World's Aircraft*, 1996-97, pp. 505-507.
- 28 Professor Geoffrey Till, 'Maritime Strategy and the Twenty-First Century', in *The Journal of Strategic Studies*, Vol 17 No 1, p. 186.
- 29 *Idem*.
- 30 The 'littoral' is defined as the interface between the land and the sea where the proximity of one influences operations on the other. Approximately two-thirds of the world's population and capital cities lie within littoral regions; some 122 countries have coastlines. Lt Cdr Jeremy Stocker, 'Carrier Decisions' in *RUSI Journal*, October 1997, p. 47.
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- 33 Till, *Op. Cit.*, p. 186.
- 34 *Ibid.*, p. 180.
- 35 *Military Lessons of the Falkland Islands War: Views from the United States*, edited by Bruce W Watson and Peter M Dunn (Boulder, Colorado: Westview Press, 1984), p. 129.
- 36 Anthony H Cordesman and Abraham R Wagner, *The Lessons of Modern War Volume III: The Afghan and Falklands Conflicts* (Boulder, Colorado: Westview Press, 1990), pp. 300-323.
- 37 Till, *Op. Cit.*, p. 190.
- 38 Coercive operations aim to deter a possible aggressor, or to compel him to comply with a particular course of action through the use (or the threat of the use) of force.

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- 40 Codner, 'Aircraft Carriers' *Op. Cit.*, p. 2.
- 41 Ministry of Defence, *Peace Support Operations: Joint Warfare Publication 3-50* (Northwood, England: The Permanent Joint Headquarters, J7 Division, Undated), Chapter 5, Section VI.
- 42 Kelso, *Op. Cit.*, p. 81.
- 43 Till, *Op. Cit.*, p. 191.
- 44 Dr Philip Towle, 'The Distinctive Characteristics of Air Power' in *The Dynamics of Air Power*, Edited by Group Captain Andrew Lambert and Arthur C Williamson (London: Her Majesty's Stationery Office, 1996), p. 11.
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- 47 Dr C J M Goulter in Lecture on *Air Power Theorists* at the JSCSC Bracknell, 17th November 1998.
- 48 Dr Philip Sabin's article on 'Force Gradients and the Offence-Defence Balance' may be found in *The Dynamics of Air Power, Op. Cit.*, p. 23.
- 49 At one time during Operation DENY FLIGHT, HMS Ark Royal's Harriers were the only British aircraft able to undertake offensive counter air patrols because fog had grounded all land-based aircraft. Conversely, carrier operations are susceptible to high sea states and wind strengths that are usually more severe than on land. Eric Grove, 'Navies in Peacekeeping and Enforcement: The British Experience in the Adriatic Sea' in *International Peacekeeping*, Vol. 1, No 4, Winter 1994, p. 464.
- 50 Towle, *Op. Cit.*, p. 11.
- 51 *Idem.*
- 52 Codner, 'Aircraft Carriers' *Op. Cit.*, p. 3.
- 53 Manoeuvre warfare seeks to defeat an enemy by shattering his cohesion and will to fight through a series of rapid, violent, simultaneous and unexpected actions that create a turbulent and rapidly-deteriorating situation with which he cannot cope. Ministry of Defence, *British Defence Doctrine (Joint Warfare Publication 0-01)* (London: Her Majesty's Stationery Office, 1997), pp. 4.8-4.9.
- 54 Rear Admiral Richard Cobbold, RN, cited by The Honourable John H Dalton in 'Navies and World Events in the 21st Century' in *RUSI Journal*, October 1998, p. 9.
- 55 Codner, 'Aircraft Carriers' *Op. Cit.*, p. 8.
- 56 *Jane's All The World's Aircraft 1997-98, Op. Cit.*, p. 507.
- 57 Figures extracted from *Jane's All The World's Aircraft* show that (at 32°C), there is just 2408 lbs difference between the Harrier GR7's empty weight (15,542 lbs) and its maximum vertical landing weight (17,950 lbs). This must cater for fuel, stores, ammunition and water injection for the engine, as well as weapons.
- 58 Malcolm Bird, 'Learning from Experience' in *Defence Review, Autumn 1997*, p. 32.
- 59 Cordesman and Wagner, *Op. Cit.*, p. 341.
- 60 Figures extracted from *Jane's All The World's Aircraft*.
- 61 Harry, *Op. Cit.*
- 62 The value of an arrestor capability was demonstrated during Operation BALBUZARD (the French contribution to Operation SHARP GUARD in the former Yugoslavia), when 2 Etendard IVPs were hit by Surface-to-Air Missiles, the most severely damaged of which landed safely on the carrier despite a badly damaged tail and the loss of its flaps. Gert Kromhout, 'A Bright Future for French Carrier Aviation' in *Air International*, March 1997, p. 159.
- 63 Codner, 'Aircraft Carriers' *Op. Cit.*, p. 8.
- 64 Meyer, *Op. Cit.*
- 65 *Idem.*
- 66 Even so, British aircraft carriers were not used in the Gulf War when, compared with the vast US effort, they would have contributed very little to the strategic bombing and interdiction campaigns. Codner, 'Aircraft Carriers' *Op. Cit.*, p. 2.
- 67 N Friedman, *The US Maritime Strategy* (London: Jane's Publishing Company Limited, 1988), p. 80.
- 68 The key areas where the US feels its interests threatened are the Mediterranean, the Gulf, the Indian Ocean and the North-east Pacific region. *Idem.*
- 69 John Pay, 'Full Circle: The US Navy and its Carriers, 1974-1993' in *The Journal of Strategic Studies*, Vol 17 No 1, p. 135.
- 70 Rear Admiral Richard Cobbold, RN, 'A Joint Maritime-Based Expeditionary Capability' in *RUSI Journal*, August 1997, p. 24.
- 71 Wing Commander Andrew Brooks, RAF, 'Above and Beyond? – Capabilities of Out-of-Area Air Power' in *RUSI Journal*, October 1993, p. 30.
- 72 Dr Philip Sabin in Lecture on *Air Superiority* at the JSCSC Bracknell, 17th November 1998.
- 73 The Russian submarine force still presents a formidable threat. However, some 20 Third-World countries now operate SSKs, a third of which are designated 'countries of concern'. During 1996-97, nine SSKs were delivered to these countries (including Iran, China and Pakistan); North Korea and China also launched their own indigenous SSKs. Office of Naval Intelligence, *Worldwide Submarine Challenges* (1997), pp. 6-7 and Statement for the Senate Select Committee on Intelligence, *Global Threats and Challenges: the Decade Ahead*, January 1998, p. 11.
- 74 More than 60 non-NATO countries now possess cruise missiles. 'Carrier Questions' in *The Economist*, May 31st 1997, p. 25.
- 75 During the Korean War, sampans and junks laid some 3000 mines which delayed a US amphibious operation by several weeks. More recently, a small field laid by a Libyan cargo ship closed the Red Sea for about 6 weeks). Friedman, *Op. Cit.*, p. 77.
- 76 Meyer, *Op. Cit.*

- 77 John Lehman, a former US Secretary of the Navy, argued that 'The carrier is the least vulnerable ship to destruction or sinking because of its large size in relation to the warheads constituting the threat, greater relative compartmentalisation, massive protection of propulsion and ordnance, and its structural strength necessary to handle the stress loads of catapulting and arresting 35 ton aircraft.' Eric Grove, *The Future of Sea Power* (London: Routledge, 1990) p. 124.
- 78 The Americans protect their aircraft carriers with a multi-layered defence comprising long-range fighters, air-to-air refuellers, electronic reconnaissance and countermeasures aircraft, ASW patrol aircraft, missile engagement zones, close-in weapon systems and built-in survivability measures (such as compartmentalisation and armour plating). Even then, they will operate with 2 carriers per group to ensure that at least one is capable of launching and recovering aircraft. Friedman, *Op. Cit.*, p. 104.
- 79 During recent operations in the Gulf (and despite the Americans' considerable ASW and ASUW capability), US naval commanders demanded minute-by-minute updates on the whereabouts of 3 (neutral) Iranian 'Kilos'. When the position of just one submarine was lost, the Americans withdrew their Carrier Air Group to the south, out of any possible danger. The carriers were withdrawn in a similar manner on the approach of any small, unidentified, fast-moving surface contacts. Meyer, *Op. Cit.*
- 80 Friedman, *Op. Cit.*, p. 77.
- 81 Most analysts agree that if a carrier had been sunk, the war would have ended immediately.
- 82 Cordesman and Wagner, *Op. Cit.*, p. 341.
- 83 Codner, 'Aircraft Carriers' *Op. Cit.*, p. 8.
- 84 Stocker, *Op. Cit.*, p. 47.
- 85 Ministry of Defence, *British Air Power Doctrine* (AP 3000 – 3rd Edition Final Study Draft) (JSCSC Bracknell: Department of Defence Studies (RAF)), 1998, Chapter 9.
- 86 *Ibid.*, p. 1.2.
- 87 The UN definition of a complex emergency is 'a humanitarian crisis in a country, region or society where there is a total or considerable breakdown of authority resulting from internal conflict and which requires an international response that goes beyond the mandate or capacity of any single agency and/or the ongoing UN country aid programme'. John Mackinlay and Randolph Kent, 'Complex Emergencies Doctrine: The British are Still the Best' in *RUSI Journal*, April 1997, p. 39.
- 88 Group Captain A Lambert, RAF, 'Air Power and Coercion' in *Perspectives on Air Power – Air Power in its Wider Context*, Edited by S Peach (London: The Stationery Office, 1998), p. 266.
- 89 Group Captain Stuart Peach, RAF, 'Coalition Air Operations' in *Ibid.*, p. 50.
- 90 *The Strategic Defence Review*, *Op. Cit.*, p. 14.
- 91 The Strategic Defence Review: Supporting Essays, *Op. Cit.*, Essay Four: 'Defence Diplomacy', p. 4-1.
- 92 Meyer, *Op. Cit.*
- 93 However, the intense air operations of the Gulf War could not have been sustained from aircraft carriers alone: without HNS, therefore, the war could not have been fought.
- 94 United States Navy, *Forward...From The Sea* (Washington DC: Department of the Navy, 1994), pp 6-7.
- 95 Operational analysis also suggests that 50 aircraft will be required to ensure campaign success in medium-intensity scenarios. This requires a ship of some 30,000 to 40,000 tons displacement, operating 50 aircraft in overload capacity. Harry, *Op. Cit.*
- 96 Codner, 'Aircraft Carriers' *Op. Cit.*, p. 5.
- 97 CTOL and STOBAR hulls require 2 runways to enable simultaneous launch and recovery. They are therefore larger than STOVL ships. The STOBAR design, however, requires a longer runway for launch than the CTOL variant does for catapult operations and is therefore larger (and more expensive). STOBAR therefore combines the take-off limitations of STOVL with the cost disadvantages of CTOL and is unlikely to be chosen. Harry, *Op. Cit.*
- 98 *Idem.*
- 99 Meyer, *Op. Cit.*
- 100 Further details of the Boeing and Lockheed Martin contenders may be found in *Jane's All The World's Aircraft 1998-99* (pp. 559-560 and 671-672) and the companies' Internet web-sites (see Bibliography).
- 101 Graham Warwick, 'Joint endeavour' in *Flight International*, 3 – 9 July 1996, p. 26.
- 102 The 'off-board' sensor concept envisages the use of remote sensor aircraft (such as AWACS) connected to individual fighters by datalink. Because the fighter has no on-board equipment, its electromagnetic emissions and its weight are minimised. The fighter cannot, however, be used autonomously except for visual engagements.
- 103 The electromagnetic catapult is emerging technology which promises to provide smooth, controlled and continuous acceleration for carrier-launched aircraft, instead of the current 'explosive' force of the steam catapult. The aircraft therefore do not need extensive strengthening to withstand the launch shock and can thus carry greater payloads. Harry, *Op. Cit.*
- 104 Current contenders include the Rafale, the F-18E/F, a marinised EFA and the CTOL version of the JSF (which offers the technological advantages described above, but at much greater operational weights than its STOVL counterpart). A CTOL carrier would also accommodate the RAF's proposed Future Offensive Air System, and could therefore generate considerable 'economies of commonality'. Harry, *Op. Cit.*
- 105 Goulter, *Op. Cit.*
- 106 Likely future ASUW weapon developments include longer range, stealthy anti-ship missiles with dual seeker (IR and active/passive radar) heads, which will use mid-course way points and evasive manoeuvres during the terminal phase. They will fly at sea-skimming heights or will use semi-ballistic trajectories with supersonic, near-vertical impact profiles. Future torpedoes will feature wake homing and stealth technology. Harry, *Op. Cit.*
- 107 Tim Ripley, 'Invincible Ideas?' in *Flight International*, 26 March – 1 April 1997, p. 32.

A high-angle, top-down photograph of a Lockheed Raptor F-22 fighter jet in flight. The aircraft is dark grey and features a highly stealthy, angular design. It is positioned centrally in the frame, flying over a dry, brown desert landscape with visible tracks and sparse vegetation. The aircraft's wings are swept back, and its tail fins are prominent. A small white insignia is visible on the left wing. The background shows a clear sky and a distant horizon.

Lockheed Raptor F-22 over Edwards AFB
Photo: Lockheed

A black and white aerial photograph showing a USAF B-17 bomber in a steep climb, trailing a large, dense plume of white smoke and fire from its rear section. The aircraft is viewed from a high angle, showing its wings and tail. The wings feature a white cross insignia. Below the aircraft, a cityscape is visible, with a large, dark, rectangular structure, possibly a factory or warehouse, being targeted. The overall scene depicts a dramatic aerial attack.

TARGET BERLIN

USAAF B-17 breaks up in
flames over German target

The US bomber offensive against Germany sparked off some of the hardest-fought air actions in history. On 6 March 1944 the 8th Air Force launched its first maximum effort daylight attack on Berlin. That action would prove to be the hardest-fought of them all, with heavy losses on both sides.

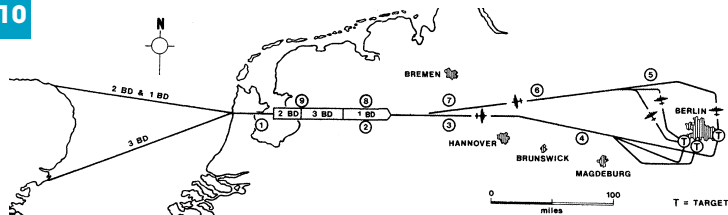
By March 1944 the US 8th Air Force based in England considered itself sufficiently strong to take on the ultimate challenge, a daylight maximum-effort strike on the most heavily defended target in Germany – Berlin. After a couple of false starts, the first large scale daylight attack on the enemy capital took place on 6 March.

A total of 563 B-17 Flying Fortresses and 249 B-24 Liberators were assigned to the Berlin mission. The 1st Bomb Division, with 301 B-17s in five Wing formations, was to attack the V.K.F. ball-bearing factory at Erkner, the third-largest plant of its kind in Germany. The 2nd Bomb Division, with 249 B-24 Liberators in three Wing formations, was to bomb the Daimler-Benz works at Genshagen turning out more than a thousand aero engines per month. The 3rd Bomb Division, with 262 B-17s in six Wing formations, was to strike at the Bosch factory at Klein Machnow manufacturing electrical equipment for aircraft and military vehicles.¹

For such a lengthy penetration into enemy airspace, 600 miles from the Dutch coast to Berlin and back, much would depend on the ability of the escorting fighters to ward off the inevitable attacks by German fighters. Fifteen Groups of P-38 Lightnings, P-47 Thunderbolts and P-51 Mustangs of the US 8th Air Force, four Groups of Thunderbolts and Mustangs of the US 9th Air Force and three squadrons of R.A.F. Mustangs – a total of 691 fighters – were to support the operation. After they had covered the bombers' initial penetration, the plan called for 130 Thunderbolts to return to the base, refuel and re-arm, then return to eastern Holland to cover the final part of the bombers' withdrawal.²

The B-17 Flying Fortress made up the bulk of the raiding force during the attack on Berlin, and units operating the type suffered the heaviest losses.





The Escort Plan

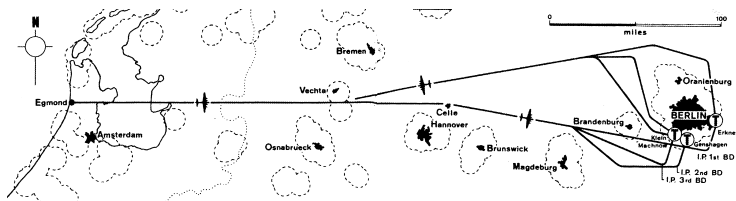
The plan for escorting the bombers on 6 March, using a total of nearly 700 P-38s, P-47s and P-51s. The 94-mile long bomber stream, to be flown during the route to the target, is drawn to scale and shows the order of the three bomb divisions. During the return flight the bomb divisions were to fly in line abreast. In each case the fighters flew with the bombers approximately 100 miles along the route.

1. Two groups of P-47s were to join the bombers at this point and escort the 1st and 3rd Divisions.
2. Two groups of P-47s were to join the bombers at this point and escort the 1st and 2nd Bomb Divisions.
3. Two and a half groups of P-47s were to join the bombers at this point, one group escorting the 1st Bomb Division, one escorting the 3rd and a half group escorting the 2nd Bomb Division.
4. Three groups of P-51s were to join the bombers at this point, one escorting each bomb division.
5. Three groups of P-38s were to join the bombers in this area, one escorting each bomb division.
6. Three squadrons of Royal Air Force P-51 Mustangs were to join the bombers at this point.
7. Two and a half groups of P-47s were to join the bombers at this point.
8. Three groups of P-47s, one flying its second mission of the day, were to join the bombers at this point.
9. Two groups of P-47s, both flying their second mission of the day, were to join the bombers at this point.

ESCORT DIFFICULTIES

Numerically the escorting force was formidable, but various factors conspired to limit the number of escorts in position to protect the bombers at any given place or time. The first constraint was the limited radius of action of the escorts: with drop tanks the fighters could penetrate deep into Germany, but only if they flew in a straight line. When they accompanied bombers the escorts had to maintain fighting speed while matching their rate of advance with that of their slower charges. That meant flying a zig-zag path, which added greatly to the distance flown. Also, the escorting fighters had to retain a reserve of fuel in case they needed to go into combat. Those factors limited the time a fighter Group could spend with bombers over Germany to about half an hour, or 100 miles of the bombers' penetration. Then, hopefully, another Group of fighters would relieve it. Thus the escort of a deep penetration attack resembled a relay race, with some fighter units moving out to join the bombers, some with the bombers and others heading for home after completing their time with the bombers. At any one time only about 140 Allied fighters would be flying with the bombers, less than one-sixth of the number of sorties flown that day.³

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The Planned Route, 6 March 1944, Showing the Flak Zones

As was usually the case, the bombers were routed to avoid flak zones wherever possible, without having to make too many turns on the way to the target. Apart from the target area, the planned route crossed only one flak zone, the moderately defended area round Vechta. The raiding force was to cross the Dutch coast at Egmond and fly due east to Celle, then east southeast to the Initial Points each 18 miles down-wind of the targets at Erkner, Klein Machnow and Genshagen. At the Initial Points the bombers were to turn into wind for their bomb runs. After attacking, the bombers were to leave the Berlin flak zone as quickly as possible, then reassemble with the other bomb divisions northwest of the city for the return flight.

The second major constraint on the escorts was the huge length of the bomber stream: 94 miles during this attack. Had the 140 available escorts been spread out evenly throughout that distance, there would have been just three fighters to cover every two miles of the bomber stream. Tactically that would have been a useless distribution. The solution was to concentrate about half of the escorts around the one or two Combat Bomb Wings at the head of the bomber stream, the part most likely to come under attack from German fighters. The remaining escorts were split into eight-plane flights that patrolled the flanks of the rest of the bomber stream.⁴ This arrangement meant that at any one time most bomber Wing formations had no escorts in a position to respond immediately, if they came under attack from German fighters. Until help arrived, the bombers had to rely on their own defensive fire power to hold off their attackers.

THE RAIDERS ASSEMBLE

Starting at 0750 hours⁵ the bombers of the 8th Air Force began taking off from their bases in eastern England. Once airborne they assembled into Group formations then the Groups joined up to form Combat Bomb Wings. As the Bomb Wings crossed the coast of England at designated places and times, they slotted into position to form Divisions. At 1053 hours the vanguard of leading Bomb Division, the 1st, crossed the Dutch coast a little over three hours after the first plane had taken off.⁶

As they assembled into formation, the bombers came under the attentive gaze of *Mammut* and *Wassermann* long range early warning radar stations in Holland and Belgium. Their reports were passed to the fighter control bunkers from which the air defence of the German homeland was managed. The action about to open would be controlled from headquarters 3rd Fighter Division near Arnhem in Holland, that of 2nd Fighter Division at Stade near Hamburg and the headquarters 1st Fighter Division at Döberitz near Berlin.⁷

With the three Bomb Divisions in line astern, the 1st and the 3rd with B-17 Flying Fortresses then the 2nd with B-24 Liberators, the bombers thundered eastward over Holland at three miles per minute at altitudes around 20,000 feet. The aerial armada took more than half an hour to pass a given point on the ground. To those watching from the ground, it presenting an awesomely impressive spectacle of military might.

Some commentators have likened the US heavy bomber actions over Germany to those fought over England during the Battle of Britain in the summer of 1940. Both led to large scale daylight actions, in which a numerically inferior defender strove to protect their homeland against attacks by enemy bombers with strong fighter escorts. However, the far greater distances to the targets in Germany meant that the later campaign was quite different in character. The defenders had far more time to assemble their forces, and they could deliver a more measured response than had been possible for the RAF in 1940. During the Battle of Britain the German raiding forces took half an hour to reach London, one of their more distant targets, from the south coast. In 1944, the US bombers had often to spend four times as long over hostile territory to reach their targets in Germany. In contrast to the hectic British fighter scrambles of 1940, the German fighter controllers had ample time to prepare their riposte and direct their fighters into position. Certainly that would be the case on March 6, 1944.

At airfields throughout Germany, Holland, Belgium and northern France, fighter units were brought through the different stages of alert, until the pilots were at cockpit readiness awaiting the order to take off. As the raiding force headed due east across Holland, the German fighter controllers could see that it was probably heading for a target in northern Germany.

Messerschmitt 110G was the main type of bomber destroyer operated by the Luftwaffe. This example carried two 30-mm cannon, four 20-mm cannon and four launchers for 21-cm unguided rockets under the outer wings.



On this day the Luftwaffe had just over nine hundred serviceable fighters available for the defence of the Reich. The heavyweights were the eighty twin-engined Messerschmitt 110s and Me 410s, specialized bomber destroyers armed with batteries of heavy cannon and launchers for 21-cm unguided rockets. In addition there were nearly six hundred Messerschmitt 109 and Focke Wulf 190 single-engined fighters. Also there were more than two hundred night fighters, Messerschmitt 110s and Junkers 88s, that could be sent up to assist with daylight air defence operations.⁸

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Just as there were operational constraints limiting the proportion of the escorting fighters available to protect U.S bombers at any one time, so other constraints limited the proportion of the defending fighter force that could be put into action against them. The tyranny of distance imposed its will on attacker and defender alike. The defending fighters had to be disposed to protect a huge area of France, Holland and Belgium as well as almost the whole Germany. To bring into action those units based far from the bombers' route, for example in eastern France or southern Germany, called for a degree of prescience on the part of the fighter controllers. Moreover, although the twin-engined bomber-destroyers had the range to reach any part of Germany, these large and unwieldy machines were liable to suffer heavy losses if they were caught by the escorts. Because of this, the twin-engined fighters were limited to engagements east of the line Bremen – Kassel – Frankfurt. The night-fighters, slowed by the weight of their radar equipment and the drag from its complex aerial arrays, were to be used only to pick off wounded stragglers.

The fact that the bombers were accompanied by escorts presented a severe problem for the German fighter pilots. The answer was for the defenders to deliver their attack *en mass*, to overwhelm the escort at a chosen time and place. Also, to reduce effectiveness of the bombers' return fire, the defending fighters were to deliver their initial attack from head-on. That required careful direction from the ground controllers, and skilful tactical handling from the formation leader.

At 1100 hours, seven minutes after the leading bombers crossed the Dutch coast, the first German fighter units began taking off: one hundred and seven Messerschmitt 109s and Focke Wulf 190s drawn from 1st and 11nd Gruppen of Jagdgeschwader 1, 1st, 11nd and 111rd Gruppen of Jagdgeschwader 11 and 111rd of Jagdgeschwader 54.⁹ Once airborne, the fighters assembled into Gruppe (25-30 plane) formations then commenced their climb to altitude. As they did so they headed for Lake Steinhuder near Hannover, the designated assembly point for the battle formation. Although this German 'Big Wing' was twice as large as any that Douglas Bader had led during the Battle of Britain in 1940, it would not suffer the same shortcomings of the earlier tactic. For one thing the American bomber formations occupied a much larger volume of



The Messerschmitt 109G formed the bulk of the defending fighter force on 6 March 1944. This example was armed with three 20 mm cannon and two 13 mm machine guns.

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airspace than their Luftwaffe counterparts in 1940. Also, the fighters would make their initial attack from head-on. These factors would ensure that defending fighters would rarely get into each others' way during the actual attack.

Escorting the bombers during the initial part of their penetration into Germany were one hundred and forty Thunderbolts from the 56th, 78th, and 353rd Fighter Groups.¹⁰ Although the escorts outnumbered the German fighters now preparing to engage the bombers, the arithmetic of the ensuing engagement was not on their side. The German fighter pilots would focus their attack on one Combat Bomb Wing formation, but until the last minute the escorts would be ignorant of where the blow would fall. As was pointed out earlier, about half the escorts were concentrated at the leading Bomb Wing formations, with the remainder divided along the rest of the force.

Soon after the vanguard of the attacking force crossed the Dutch coast, the pathfinder B-17 at the head of the attack force suffered a radar failure (at this time only a few pathfinder bombers carried ground-mapping radar). As a result the leading formation flew a heading that took it a slightly south of the planned route.¹¹ The rest of the bombers in the 1st Bomb Division followed it, as did those at the head of the 3rd Division. Before the leader had deviated 20 miles from the planned track the error was discovered, and the pathfinder edged on to a more northerly heading to regain the planned route.¹² But by then the damage had been done. The 13th Wing, situated mid-way along the bomber stream, was a couple of minutes late at the Dutch Coast and it had lost visual contact with the 4th Wing ahead of it. Ignorant of the deviation from the briefed route by the bombers ahead of it, the 13th adhered to the flight plan. The unlucky 13th Wing would soon pay a terrible price for this accumulation of relatively minor errors.

The unlucky 13th Wing would soon pay a terrible price for this accumulation of relatively minor errors

Vectored by controllers at the Luftwaffe 3rd Fighter Division at Stade, the leader of the German battle formation caught sight of the incoming enemy formation at 1155 hours. The ground controllers had done their work well: the raiders were almost exactly in front of the defenders, and far enough away to allow a few small corrections as the defending fighters lined up for the attack.

It was sheer bad luck for the American bomber crews involved that the formation now under threat was not that leading the bomber stream, where more than half of the escorting Thunderbolts were concentrated. It was the 13th Wing, that was heading the detached second half of the bomber stream and which was almost devoid of such protection. Lieutenant Robert Johnson of the 56th Fighter Group, flying a P-47, was to one side of the Wing when he suddenly noticed the enemy formation closing in fast:

"I was on the left side of the bombers and going 180 degrees to them when I noticed a large box of planes coming at us at the same level. There were about forty or fifty to a box, and I saw two boxes at our level and one box at 27,000 or 28,000 feet. I called in to watch them, and then that they were FW 190s. There were only eight of us..."¹³

The Thunderbolts attempted to disrupt the attack but the German pilots simply ignored them as they streaked for the bombers. The opposing forces met at noon, 21,000 feet above the small German town of Haselünne close to the Dutch border.

A head-on attack on an bomber required a high degree of skill from the fighter pilot if it was to succeed. Closing at a rate of 200 yards per second, there was time only a brief half-second burst from 500 yards before he had to ease up on the stick to avoid colliding with his target. For experienced pilots like Hauptmann Anton Hackl, the fighter ace leading the Focke Wulfs of IIIrd Gruppe of Jagdgeschwader 11 that day, that was quite sufficient. As he later commented:

“One accurate half-second burst from head-on [on a four-engined bomber] and a kill was guaranteed. Guaranteed!”¹⁴

Feldwebel (Sergeant) Friedrich Ungar of Jagdgeschwader 54, flying an Me 109, saw his rounds exploding against the engine of one of the bombers and pieces fly off:

“There was no time for jubilation. The next thing I was inside the enemy formation trying to get through without ramming anyone. Nobody fired at me then, they were too concerned about hitting each other. When we emerged from the formation things got really hot; we had the tail gunners of some thirty bombers letting fly at us with everything they had. Together with part of our Gruppe I pulled sharply to the left and high, out to one side. Glancing back I saw the Fortress I had hit tip up and go down to the right, smoking strongly.”¹⁵

Sergeant Van Pinner, a top turret gunner in a B-17 of the 100th Bomb Group, recalled that he had far more targets than he could possibly engage:

“There were fighters everywhere. They seemed to come past in fours. I would engage the first three but then the fourth would be on to me before I could get my guns on him. I knew our aircraft was being hit real bad – we lost the ball turret gunner early in the fight...”¹⁶

The initial head-on attack was over in much less than a minute. Then, almost in slow motion, a succession of mortally wounded heavy bombers began sliding out of formation. The 13th Wing comprised A and B formations flying almost in line abreast with a mile between them. The B formation comprised thirty-eight Flying Fortresses from the 100th and 390th Bomb Groups and its Low Box, with sixteen B-17s at the start of the action, suffered the worst. All six bombers of its High Squadron were shot down, as were two of the six in its Lead Squadron and two of the four in its Low Squadron.¹⁷

Lieutenant John Harrison of the 100th Bomb Group, captain of one of the bombers, gazed in disbelief as planes began to go down around him:

“The engine of one Fort burst into flames and soon the entire ship was afire. Another was burning from waist to tail. It seemed both the pilot and copilot of another ship had been killed. It started towards us out of control. I moved the squadron over. Still it came. Again we moved. This time the stricken Fortress stalled, went up on its tail, then slid down.”¹⁸

Following the initial firing pass, the German fighters split into twos and fours and curved around to deliver re-attacks on the same formation. Some overtook the bombers and sped ahead of them preparatory to moving into position for a further head-on attack. Other German fighters attacked the bomber formation from behind, yet others dived after damaged B-17s that had been forced to leave the formation and were trying to escape to the west.

Lieutenant Lowell Watts, captain of a bomber in the next formation in the stream, was an unwilling spectator to the unequal battle:

"About two or three miles ahead of us was the 13th Combat Wing. Their formation had tightened up since I last looked at it. Little dots that were German fighters were diving into those formation, circling, and attacking again. Out of one high squadron a B-17 slowly climbed away from its formation, the entire right wing a mass of flames. I looked again a second later. There was a flash – then nothing but little specks drifting, tumbling down. Seconds later another bomber tipped up on a wing, rolled over and dove straight for the ground. Little white puffs of parachutes began to float beneath us, then fall behind as we flew toward our target."¹⁹

"Out of one high squadron a B-17 slowly climbed away from its formation, the entire right wing a mass of flames. I looked again a second later. There was a flash – then nothing but little specks drifting..."

From the moment the German fighters had first been sighted, the 13th Wing put out desperate radio calls to summon the escorts. Colonel Hub Zemke, commander of the 56th Fighter Group and heading an eight-plane flight of Thunderbolts, arrived at the beleaguered unit just as Oberleutnant Wolfgang Kretschmer of Jagdgeschwader 1 was lining up for another firing pass on the bombers. Zemke spotted the lone Focke Wulf below him and ordered one section of four aircraft to remain at high altitude to cover him, while he led his section down to attack.²⁰

Kretschmer hauled the Focke Wulf into a tight turn to the left get out of the way but it was too late. By then Zemke was in a firing position and .5-in rounds from his accurate burst thudded into the wings and fuselage of the German fighter

Before opening fire at the bomber he had selected as a target, Kretschmer glanced over his own tail to check that the sky was clear. It was not. The German pilot was horrified to see Zemke's Thunderbolt closing in rapidly on him followed by three others. Kretschmer hauled the Focke Wulf into a tight turn to the left get out of the way but it was too late. By then Zemke was in a firing position and .5-in rounds from his accurate burst thudded into the wings and fuselage of the German fighter. As the Zemke pulled up to regain altitude he glanced back and saw the enemy fighter falling out of the sky enveloped in flames.²¹

Kretschmer extricated himself from the cockpit of his blazing aircraft, and jumped clear. He landed by parachute with moderate burns to his hands and face and splinters embedded in his thigh.

The main part of the initial action lasted about ten minutes. Then, as the German fighters exhausted their ammunition, they dived away from the fight to avoid the escorts.

Even as the initial action petered to its close, a second German battle formation was already moving into position to engage the raiders. From their bunker at Döberitz near Berlin, the controllers of the 1st Fighter Division had assembled every available fighter in that part of Germany. The core of the battle formation comprised the bomber destroyers, forty-two Messerschmitt 110s and 410s from IIInd and IIIrd Gruppen of Zerstörergeschwader 26 and Ist and IIInd Gruppen of ZG 76. Providing cover for these, though they were also expected to engage the bombers, were seventy Me 109s and FW 190s from Ist, IIInd and IVth Gruppen of Jagdgeschwader 3, Ist of JG 302 and Sturmstaffel 1.²²

Again a large force of German fighters charged almost head-on into a couple of formations of Flying Fortresses flying in line abreast. The 1st Combat Wing comprised fifty-one B-17s drawn from the 91st and 381st Bomb Groups. The 94th Combat Wing, with sixty-one Flying Fortresses from the 401st and 457th Bomb Groups, flew a couple of miles to the right of it. But these two Wings were in the vanguard of the bomber stream and were protected by a large proportion of the available escorts: eighty Mustangs from the 4th and 354th Fighter Groups.²³

This time the escorts were in the right place, at the right time and in sufficient numbers to blunt the German attack. Watching from his P-51, Lieutenant Nicholas Megura of the 4th Fighter Group described the approach of the German formation:

"Twelve-plus smoke-trails were seen coming from twelve o'clock and high, thirty miles ahead. 'Upper' [the Group leader] positioned the Group up sun, below condensation height, and waited. Trails finally positioned themselves at nine o'clock to bombers and started to close. Six thousand feet below the trails were twenty-plus single-engine fighters line abreast, sweeping the area for twenty-plus twin-engine rocket-carrying aircraft. 'Upper' led Group head-on into front wave of enemy aircraft."²⁴

The Mustangs' spoiling action forced several bomber destroyers to abandon their attacks, but others continued doggedly on to launch their hefty 21 cm calibre rockets into the bomber formations.

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The superlative P-51B Mustang had the range to escort US bombers as far east as Berlin, and the performance to outfly the defending fighter types.



Either accidentally or deliberately, an Me 410 collided with or rammed head-on into a Flying Fortress of the 457th Bomb Group and tore away a large section of the bomber's tail. The stricken bomber, which had been flying on the right side of the High Squadron, went out of control and entered a steep diving turn to the left. After narrowly missing several bombers in the formation, it smashed into the aircraft on the far left of the Low Squadron. Only one man survived from the three crews involved in the incident, the tail gunner from the last aircraft to be struck.²⁵

As the bomber-destroyers emerged from the rear of the bomber formation, other Mustangs pounced on them. The nimble single-seaters did great execution, shooting down fourteen of the twin-engined fighters in quick succession.

Hard on the heels of the heavy fighters came the main body of the attack formation, seventy single-seat Messerschmitts and Focke Wulfs. Leutnant Hans Iffland of Jagdgeschwader 3, flying a Messerschmitt Bf 109, recalled:

Hard on the heels of the heavy fighters came the main body of the attack formation, seventy single-seat Messerschmitts and Focke Wulfs

"During the firing run everything happened very quickly, with the closing speed of about 800 kilometres per hour [500 mph]. After firing my short burst at one of the B-17s I pulled up over it; I had attacked from slightly above, allowing a slight deflection angle and aiming at the nose. I saw my rounds exploding around the wing root and tracers rounds from the bombers flashing past me. As I pulled up over the bomber I dropped my left wing, to see the results of my attack and also to give the smallest possible target at which their gunners could aim. Pieces broke off the bomber and it began to slide out of the formation."²⁶

The action around the leading formations lasted little over ten minutes and, thanks to the efforts of the Mustangs, the bombers's losses were much lighter than during the earlier attack: seven bombers destroyed immediately, or forced to leave the formation to be finished off as stragglers.

As the bomber formations closed on the capital and entered the inferno of flak, the German fighters broke off the action

Now, shortly after 1300 hours, the raiding units were moving into position to begin their bomb runs. Defending Berlin was the 1st Flak Division comprising the 22nd, 53rd, 126th and 172nd Flak Regiments with more than four hundred 8.8 cm, 10.5 cm, and 12.8 cm guns. As the bomber formations closed on the capital and entered the inferno of flak, the German fighters broke off the action.²⁷

As they approached their targets the bombers split into their three divisions and lined up for their bombing runs. The first to feel the gunners' wrath were the Flying Fortresses of the 1st Bomb Division. Captain Ed Curry, a bombardier with the 401st Bomb Group, never forgot that cannonade:

"I'd been to Oschersleben and the Ruhr, but I'd never seen flak as heavy as that they had over Berlin. It wasn't just the odd black puff, it was completely dense; not just at one altitude, but high and low. There was a saying that you see the smoke only after the explosion; but that day we actually saw the red of the explosions. One shell burst near us, and we had chunks of shell tear through the radio room and the bomb bay."²⁸

Now, however, the weather intervened to protect the primary targets more effectively than the defences ever could. At first it had seemed the lead bombardiers at the head of each Wing formation could make visual bomb runs on the targets through breaks in the clouds. But, at the critical moment, the aiming points were obscured and by then it was too late to revert to radar-controlled bomb runs. No planes hit the 1st Division's primary target at Erkner, and the attackers released their bombs on the Köpenick and Weissensee districts of the city which were clear of cloud.²⁹

It was a similar story for the 3rd Bomb Division, whose Flying Fortresses missed the primary target at Klein Machnow and bombed the Steglitz and Zehlendorf districts instead. Lowell Watts was established on his bomb run when the gunners zeroed in on his formation.

"They didn't start out with wild shots and work in closer. The first salvo they sent up was right on us. We could hear the metal of our plane rend and tear as each volley exploded. The hits weren't direct. They were just far enough away so they didn't take off a wing, the tail or blow the plane up; they would just tear a ship half apart without completely knocking it out. Big ragged holes appeared in the wings and the fuselage. Kennedy, the co-pilot, was watching nothing but the instruments, waiting for the tell-tale indication of a damaged or ruined engine. But they kept up their steady roar, even as the ship rocked from the nearness of the flak bursts... The flak was coming up as close as ever, increasing in intensity. Above and to the right of us a string of bombs trailed out from our lead ship. Simultaneously our ship jumped upwards, relieved of its explosive load as the call 'Bombs away!' came over the interphone. Our left wing ship, one engine feathered, dropped behind the formation. That left only four of us in the low squadron. A few minutes later the flak stopped. We had come through it and all four engines were still purring away."³⁰

Only a few Liberators of the 2nd Bomb Division, the last to attack, put their bombs on their primary target, the Daimler-Benz aero-engine works at Genshagen; the rest of the attack also fell on secondary targets in and around the capital.

The vicious bombardment from the flak batteries knocked down only four bombers, but damaged several others sufficiently to force them to leave formation. Nearly half of all bombers that reached Berlin collected flak damage of some sort.

As the bombers emerged from the flak zones, a few German single-seat fighters tried to press home attacks. Also, fourteen Messerschmitt 110 night fighters from Nachtjagdgeschwader 5 closed in bent on finishing off stragglers. The American

The vicious bombardment from the flak batteries knocked down only four bombers, but damaged several others sufficiently to force them to leave formation. Nearly half of all bombers that reached Berlin collected flak damage of some sort

escorts quickly took charge of the situation, however. They pounced on the night fighters and the latter, too slow to escape from their pursuers, lost ten of their number within the space of a few minutes.³¹

For the time being the German fighters had spent their force, and during the next half there was a lull in the fighting.

Relieved by fresh squadrons of Thunderbolts, the Mustangs peeled away from the bombers headed for home. As they were running out past Bremen, a section of Mustangs of the 357th Fighter Group came upon a lone Messerschmitt 109 and Lieutenants Howell and Carder shot it down. The German pilot, Oberleutnant Gerhard Loos of Jagdgeschwader 54, a leading ace credited with ninety-two victories, was killed.³²

The air action around the bombers resumed at 1440 hours, with attacks by Me 109s and FW 190s that had landed, refueled and re-armed after taking part in the noon action near Haselünne. Other fighters came from units based in France and Belgium, that had missed the raiders on their way in.

The formation hardest hit during this engagement was the 45th Combat Bomb Wing. Once again Lowell Watts of the 388th Bomb Group takes up the story:

"The interphone snapped to life: 'Focke Wulfs at 3 o'clock level!' Yes, there they were. What seemed at a hurried count to be about 30 fighters flying along just out of range beside us. They pulled ahead of us, turned across our flight path and attacked from ahead and slightly below us. Turrets swung forward throughout the formation and began spitting out their 50 calibre challenge. Some Focke Wulfs pulled above us and hit us from behind while most dived in from the front, coming in from 11 to 1 o'clock to level, so close that only every second or third plane could be sighted on by the gunners. Still they came, rolling, firing and diving away, then attacking again."³³

He watched two bombers fall out of the formation, then his own aircraft came under attack:

"Brassfield called from the tail position 'I've got one, I've got one!' Then, almost with the same breath 'I've been hit!' No sooner had the interphone cleared from that message when an even more ominous one cracked into the headsets: 'We're on fire!' Looking forwards I saw a Focke Wulf coming at us from dead level at 12 o'clock. The fire from our top and chin turrets shook the B-17. At the same instant his wings lit up with fire from his guns. The 20 mm rounds crashed through our nose and exploded beneath my feet amongst the oxygen tanks. At the same time they slashed through some of the gasoline cross-feed lines. The flames which started here, fed by the pure oxygen and the gasoline, almost exploded through the front of the ship. The companionway to the nose, the cockpit and the bomb bays was a solid mass of flame."³⁴

Watts struggled to hold the bomber level while his crew abandoned the machine. The flames prevented him from seeing ahead and he could not know that his aircraft was edging towards another in the formation. With a crash of tortured metal the

bombers smashed together, then broke apart. Shedding pieces, the two planes began their long fall to earth.

Unaware that there had been a collision, Watts knew that his bomber was no longer under his control. Also, seemingly for no good reason, almost the whole of the cabin roof above his head had suddenly vanished. He struggled clear of the plunging bomber and parachuted to safety.³⁵

During this sharp engagement the 388th Bomb Group lost a total of seven aircraft. The losses were not all on one side, however. Hauptmann Hugo Frey of Jagdgeschwader 11, a fighter ace credited with the destruction of twenty-six US heavy bombers, was killed when his FW 190 was shot down by return fire from the bombers.³⁶

THE RECKONING

On 6 March a total of 814 Flying Fortresses and Liberators set out from England, of which 672 attacked primary or secondary targets in the Berlin area. Sixty-nine B-17s and B-24s failed to return, including four planes with serious damage that put down in Sweden. A further sixty bombers landed at airfields in England with severe damage, and 336 more returned with lesser damage.³⁷ Of the bombers that failed to return 42 were certainly or probably lost to fighter attack, 13 to flak, five to fighters and flak, and five in collisions with friendly or enemy planes. The causes of the remaining four losses cannot be ascertained.³⁸ A total of 691 escorts took part in the operation, of which eleven were destroyed and eight returned with severe damage. Ten escorts fell to fighter attack and one to flak.³⁹ Of those US aircraft that penetrated into enemy territory, one bomber in ten and one fighter in 75 were lost.

The hardest hit unit, the 100th Bomb Group, lost fifteen of the thirty-six aircraft that crossed the Dutch coast; most of those during the initial clash near Haselünne

In a concentrated fighter-versus-bomber action of this type, it was usual for the heaviest losses to be confined to a few unfortunate units. As luck would have it on this occasion, all of them flew B-17 Flying Fortresses. The hardest hit unit, the 100th Bomb Group, lost fifteen of the thirty-six aircraft that crossed the Dutch coast; most of those during the initial clash near Haselünne. The 95th Bomb Group, which with the 100th made up the 13B Wing formation, lost eight bombers. The 388th Bomb Group lost seven planes and the 91st lost six planes.⁴⁰ Those four unlucky Groups lost more than half of the heavy bombers that failed to return.

By its nature, an account such as this focuses on the areas of heaviest fighting and the units that took the heaviest losses. To put things into perspective, it should be noted that the remaining thirty-three bomber losses were spread evenly across nineteen Bomb Groups. Six Bomb Groups flew the mission without suffering a single loss.⁴¹

Of the US personnel engaged in the raid, 701 men failed to return immediately or at all. Of these, 229 were killed or missing and 411 were taken prisoner. Thirteen men came down in Holland, made contact with the resistance and evaded capture. Eight men were picked up from the North Sea by the RAF rescue service. Finally, the forty men aboard the four planes that landed in Sweden were all repatriated during the next few months.⁴²

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...the Luftwaffe lost forty-four aircrew killed, including two leading aces. A further twenty-three aircrewmembers were wounded

That day the Luftwaffe flew 528 fighter sorties, of which 69 probably made contact with the raiders.⁴³ Sixty-two German fighters, 16 per cent of those that made contact, were destroyed and thirteen damaged. The twin-engined fighter units took the heaviest losses. Nachtjagdgeschwader 5 lost ten of the fourteen Messerschmitt 110 night fighters it sent up. Zerstörergeschwader 26 lost eleven of its eighteen Messerschmitt 110 and Me 410 bomber-destroyers. Altogether the Luftwaffe lost forty-four aircrew killed, including two leading aces. A further twenty-three aircrewmembers were wounded.⁴⁴

As an attempt to curtail production at the three primary targets in Berlin, the 6 March attack was a failure. None of those objectives was hit effectively. Only the Genshagen aero engine plant came under attack at all, from a quarter of the force assigned to it, and there the bombing was scattered and ineffectual.⁴⁵

From other viewpoints the attack on Berlin was a resounding success, however. It demonstrated that from now on there was no target in Germany, no matter how far it lay from England or how strong its defences, immune from daylight bomber attack accompanied by a powerful fighter escort.

The 8th Air Force was quick to drive home that lesson. Two days later, on 8 March, it sent 539 bombers to Berlin. It did so yet again on the 9th (490 bombers) and the 22nd (657 bombers). And on those occasions the weather did not shield the German capital. Altogether, during March 1944, the US 8th and 9th Air Forces in England, and the 15th Air Force in Italy, mounted eighteen large scale incursions to attack targets in German-held territory at a cost of just over four hundred bombers and fighters.⁴⁶ Yet, thanks to the well-resourced US supply and aircrew training organisations, these losses were immediately made good.

During the same period Luftwaffe units defending the homeland lost 356 fighters destroyed and 163 damaged.⁴⁷ With difficulty, those could be replaced also. The loss of 219 aircrew killed and missing, and 103 wounded,⁴⁸ almost all of them pilots, was a quite different matter. The Luftwaffe flying training organisation was short of aircraft, flying instructors and fuel. Even by sacrificing quality for quantity, it was quite unable to replace losses on that scale.⁴⁹

Early in May Generalmajor Adolf Galland, the Inspector of Fighters, was forced to write, in a grim report to the Reich Air Ministry:

“Between [the beginning of] January and [the end of] April 1944 our day fighter units lost over 1,000 pilots. They included our best *Staffel*, *Gruppe* and *Geschwader* commanders. Each incursion of the enemy is costing us some fifty aircrew. The time has come when our [force] is in sight to collapse.”⁵⁰

When Allied troops stormed ashore in Normandy on D-Day, 6 June 1944, the Luftwaffe fighter arm was a spent force that was quite unable to intervene effectively. The air supremacy over France, necessary to secure the invasion, had been won during the hard-fought campaign of attrition over Germany itself during the preceding five months.

Taken from “Target Berlin, Mission 250, 6 March 1944”, by Jeffrey Ethell and Alfred Price, published by Arms and Armour Press, London, 1981.

NOTES

1. Headquarters 8th Air Force, Field Order Operation No 250, 6 March 1944.
2. VIIIth Fighter Command Narrative of Operations, 6 March 1944.
3. Ibid.
4. Ibid.
5. Times are given in British Summer Time, in use by the USAAF in Britain. This coincided with the Middle European Time in use in Germany and in the Luftwaffe.
6. 8th Air Force Narrative of Operations, 6 March 1944.
7. Air Ministry ACAS(I) “The Rise and Fall of the German Air Force”, London, 1948, p 295.
8. Einsatzbereitschaft der deutschen Jagdverbände, 5. 3.44, Freiburg document RL2/1704; also Genst.Gen.Qu.6 Abt, Stand der Einsatzbereitschaft am 29.2.44; Freiburg document RLIII/729.
9. Freiburg document Kart 44/1632-1633 gives the times of take-off, number and type of planes and airfields of each air defence units taking part in the action on 6 March 1944.
10. VIIIth Fighter Command Narrative, op cit.
11. 1st Bombardment Division, Report of Operations, 6 March 1944.
12. Ibid.
13. Personal Combat Report Lt Johnson, 56th Fighter Group, 6 March 1944.
14. Interview Anton Hackle.
15. Interview Friedrich Ungar.
16. Interview Van Pinner.
17. 100th Bombardment Group, Narrative of Operations, 6 March 1944.
18. Interview John Harrison.
19. Transcript of day's events written by Lowell Watts, made available to writer.
20. Interviews Hub Zemke and Wolfgang Kretschmer.
21. Ibid.
22. Freiburg document Kart 44/1632- 1633, op cit.
23. VIIIth Fighter Command Narrative, op cit.
24. Personal Combat Report, Lieutenant Nicholas Megura, 4th Fighter Group, 6 March 1944.
25. Narrative of Operations 457th Bomb Group, 6 March 1944.
26. Interview Hans Iffland.
27. Correspondence Goetz Bergander.
28. Correspondence, Ed Curry.
29. 8th Air Force Narrative, op cit.
30. Watts transcript.
31. Kriegstagebuch NJG 5, 6 March 1944.
32. Obermaier, Ernst, “Die Ritterkreuztraeger der Luftwaffe”, Verlag Dieter Hoffmann, Mainz, 1966, p 165.
33. Watts Transcript.
34. Ibid.
35. Ibid.
36. Obermaier, p 121.
37. VIIIth Bomber Command Narrative, op cit.
38. Missing Aircrew Reports.
39. VIIIth Fighter Command Narrative, op cit.
40. Missing Air Crew Reports.
41. Operational Research Section, Headquarters Eighth Air Force, Combat Damage Report, 6 March 1944.
42. Missing Air Crew Reports.
43. Freiburg document Kart 44/1632- 1633, op cit.
44. Luftwaffe casualty figures supplied by the Deutsche Dienststelle, Berlin.
45. VIIIth Bomber Command Narrative, op cit.
46. Freeman, Roger “Mighty Eighth War Diary”, Jane's, London, 1981, p 189 et seq; also Rust, Kenn, “The 9th Air Force in World War II”, Aero Publishers, Fallbrook, 1967, p 60 et seq; also Rust, Kenn, “Fifteenth Air Force Story”, Sunshine House, Terre Haute, 1976, p 16).
47. Gruppe I (IC) General der Jagdflieger “Grosseinflüge in das Reichgebiet (Tag) Januar 1944 – Juni 1944”, copy of report in possession of the author.
48. Ibid.
49. “Rise and Fall”, op cit, p 314 et seq.
50. Quoted in Bekker, Cajus, “The Luftwaffe War Diaries”, Macdonald, London, 1967, p 351.

BOOK REVIEWS BY AIR MARSHAL SIR TIMOTHY GARDEN

These book reviews first appeared in the Times Higher Education Supplement.

WAR & LAW SINCE 1945

By Geoffrey Best
Clarendon Press, Oxford, 434pp, £25
ISBN 0-19-821991-1
published October 1994

GENOCIDE: CONCEPTUAL AND HISTORICAL DIMENSIONS

By George J. Andreopoulos (Editor)
University of Philadelphia Press,
265pp, £32.95
ISBN 0-8122-3249-6
published August 1994

CHILD SOLDIERS

By Ilene Cohn and Guy S. Goodwin-Gill
Clarendon Press, Oxford, 228pp,
£25 and £10.95
ISBN 0-19-825935-2 and 825932-8
published September 1994

There are those who question the very logic of a concept of the laws of war. War is such a violent and terrible undertaking, that it seems

beyond the calm rational structure of a legal code. In the minds of others, such a regime suggests the complex customs of ancient knights with their code of chivalry. The cynics claim that prosecutions for war crimes are always of the vanquished by the victor and that this makes for an unjust form of legislation.

The laws of war are different in nature from domestic laws, and also from the normal range of international law. There is no single legislature to agree the rules of war and no standing police force to catch the law breakers. Yet no state can afford to ignore the international consensus on the laws of war, whether as the aggressor nation or the defending power. Nor is it possible to cobble together a suitable set of rules as each war breaks out. The soldiers need guidance as to the legality of their actions, and they need long training so that the implications of the rules of war become second nature. The planners need to procure military equipment many years before it is delivered into service. It could be less than sensible to invest both time and money in the development of a weapon system, if its use would be a criminal act in the eyes of the world community. Political leaders need also to be aware of the constraints of the international laws of war.

Again, the sceptic may laugh. A statesman intent on war is unlikely to be constrained by the customs of the world community on the laws of war. A military scientist, who discovers a more effective way of incapacitating the opposition, will be able to persuade the arms manufacturers to invest in his new weapon. The military man will not wish to fight with one hand tied behind his back. Taking these three books together provides some of the answers to these doubts. The first explains the development and current compass of the laws of war, and highlights the failures as well as the successes. The other two give graphic examples of the inhumanity and needless catastrophe that flow from lack of observance of even the most basic humanitarian laws.

In the final part, covering the period from 1950, his examples are comprehensive. He sketches the increasing concern over the use of Napalm as a legitimate weapon from Korea, through Algeria, Angola, Mozambique and of course in Vietnam. This is one illustration of the difficulties of agreeing humanitarian law. Similarly, limitations on the

use of mines have become an issue as more civilian casualties occur long after wars have ceased.

In the Epilogue to the book, Professor Best gives a personal and subjective assessment of the place of international humanitarian law in the scheme of inter-State relationships today. He describes how, over twenty years of study, he has moved from being impressed by the moral and religious seriousness of the underlying ideas to a much more critical position. He now has a much more limited expectation of the efficacy of international humanitarian law.

In his wide ranging treatise, Best makes only a passing mention of the UN Genocide Convention of 1948. He faults it, as with other aspects of humanitarian law because of difficulty of enforcement. George Andreopoulos, in his edited collection of papers on all aspects of genocide, reprints the Convention in full, and his contributors examine the strengths and weaknesses. The case studies include the use of chemical weapons by the Iraqis against the Kurds, East Timor after the Indonesian invasion, and Cambodia under the Khmer Rouge. These are useful examples to explore both the definition of genocide and the utility of international law. As is often the case with such conference collections, the conclusion is provided in the editor's introduction. Andreopoulos does not disagree with Best's views on the limited effectiveness of such legislation. He does however offer the hope that the international community is now showing a willingness to rethink its approach towards a people-centred security regime rather than a state-centred system. This carries with it a need to be prepared to carry out UN-sponsored intervention to police humanitarian illegal acts.

For the reader, who has by now become thoroughly depressed over the inadequacies of international humanitarian law, the third volume *Child Soldiers* offers little comfort. Again, an area which is mentioned briefly by Professor Best is expanded into a detailed appraisal of the international law relevant to children in armed conflict, and the impact of such law. What makes this volume different is that the analytical

prose is interspersed with photographs that would move the hardest heart. Each young child, weighed down with the trappings of modern weapons, makes a convincing argument for the need for a more effective international humanitarian law regime.

Professor Goodwin-Gill and Ilene Cohn are perhaps less forceful in their conclusions. They argue for more research and upgrading of the law. They see the wider understanding of the laws about children in armed conflict, coupled with more monitoring and reporting, as being the way forward. I doubt that Professor Best would feel that this was enough.

These are three books that show clearly the need for laws of war, and also the difficulties in both agreeing those laws and enforcing them. Each highlights the lack of adherence when times get difficult, as they always do in war. That said, as Professor Best admits, international humanitarian law makes war less terrible than it would be without it. I would go further. For regular military men, it provides an important template for conduct in war. Increasingly, it provides a basis for judgement by the world's media. When an atrocity occurs, it is judged as such against the customs of humanitarian law. With sufficient international outrage, an ad hoc intervention may be mounted by the United Nations to restore the area to a tolerable state. This surely is the current development in the path to a more effective rule of international humanitarian law.

Total War arrives in 1914, and for the purposes of this book extends to 1945. This is a somewhat arbitrary period. In earlier days, the

book reviews

AIR POWER READERS – THE TOP TEN

Group Captain Peter W Gray Director of Defence Studies RAF

In the introduction to the last edition of the Air Power Review, I promised to provide an air power reading list that was somewhat more attuned to the strategic level in the United Kingdom than the titles offered by Davis Mets in his article 'To Kill a Stalking Bird'.¹ The all-time 'top ten' would inevitably include books that are now out of print and I have deliberately tried to avoid this – not because the books are not worth reading, but for ease of obtaining personal copies. To that end, I have also included current US titles as they are easily obtainable through Internet bookshops. In compiling this list, I have obviously consulted with colleagues on the Air Power Review Management Board; whilst consensus on the main entries was not too difficult to achieve, an order of merit would be impossible. The books are therefore arranged in rough reverse chronological order in an attempt to cover the complete spectrum of air power activity. Most of the titles are taken from the recommended reading list in the latest edition of AP 3000.

AP 3000 BRITISH AIR POWER DOCTRINE, THIRD EDITION, HMSO, LONDON 1999

No collection would be complete without this!

CHIEF OF THE AIR STAFF'S AIR POWER WORKSHOP SERIES

This series of collections of essays (*Dynamics of Air Power*, ed A P N Lambert and *Perspectives on Air Power*, ed S W Peach) provide an ideal vehicle for the development of air power thinking in the UK. A further book is due to be published in Summer 2000. Similar collections, but with higher proportions of American (and others!)

authors include:

R P Hallion, *Air Power Confronts an Unstable World*, Brassey's London, 1997 and

John Gooch, *Air Power Theory and Practice*, Cass, London, 1995.

ROBERT A PAPE, BOMBING TO WIN; AIR POWER AND COERCION IN WAR, CORNELL UNIVERSITY PRESS, ITHACA, 1996

In this book, Pape covers the theory and practice of attempting to coerce an enemy with the use of air power. Although some readers may find the theory slightly dense, the case studies make the effort well worth while. Pape's work is the subject of considerable controversy; a collection of essays challenging some of his conclusions is published by Benjamin Frankel (Ed), *Precision and Purpose: Debating Robert A Pape's Bombing to Win*, Cass, London.

AIR VICE-MARSHAL TONY MASON, AIR POWER – A CENTENNIAL APPRAISAL, BRASSEYS, LONDON, 1994

Professor Mason covers 100 years of air power thinking and writing starting from Major J D Fullerton's discourse on the impact of aeronautics in 1893. This book is an excellent source of material on many aspects of air power. It is not, however, mere regurgitation of old material, but has snippets of original source research such as the confirmation by Air Marshals Harris and Slessor that they had never heard of nor read [the Italian air power theorist] Douhet's ideas before World War II (page 45).

NOTE

¹ David R Mets, 'To kill a Stalking Bird: Fodder for your professional Reading on Air and Space Superiority', *RAF Air Power Review*, Vol 2, Nos 3 & 4.

This book has been produced by a veritable galaxy of US academic writers. It covers the spectrum of air power thinking from the very early air power theorists such as Douhet, Mitchell, Trenchard and Slessor through to their modern equivalents of Boyd and Warden. For the reader to whom these names mean little, this book will provide ready access to their thinking. A possible alternative would be the chapter in Peter Paret (Ed), *Makers of Modern Strategy*, PUP, New Jersey, 1986. This book also offers excellent chapters on Clausewitz, Machiavelli and the like.

ERIC ASH, SIR FREDERICK SYKES AND THE AIR REVOLUTION, 1912 - 1918, CASS, LONDON 1999

Inevitably, having said that most of the books listed were recommended in AP 3000, this last recommendation was published after the AP went to press. It has been included for several reasons. It provides an excellent review of the development of air power strategy as it evolved – not in the context of later developments or wars as has all too often been the case. Ash also provides the first proper assessment of Sykes's contribution to military aviation; many works on this period appear to have air-brushed him from history. As Seb Cox (Head of the Air Historical Branch and Editor to this Frank Cass series) points out in his preface, the existing works on some of the officers in competition with Sykes were written largely on the basis of the individual's memoirs (Andrew Boyle's Trenchard being a classic example) rather than on official papers that had not then been released.

BOOK REVIEWS BY GROUP CAPTAIN PETER W GRAY, DIRECTOR OF DEFENCE STUDIES RAF

**MISHA GLENNY, THE BALKANS 1804 - 1999,
NATIONALISM, WAR AND THE GREAT POWERS,
GRANTA, LONDON, 1999. ISBN 1 86207 050 4**

**TIM RIPLEY, OPERATION DELIBERATE FORCE: THE
UN AND NATO IN BOSNIA 1995, CENTRE FOR
DEFENCE AND INTERNATIONAL SECURITY
STUDIES, BAILRIGG STUDY 3, 1999.
ISBN 0 9536650 0 3**

Events in the Balkans over the last decade have generated a veritable rain forest of books, articles and theses from the full spectrum of society. When this reviewer first started work as an analyst attempting to specialise on this fractious part of the world, background material was very thin on the ground. Fred Singleton's *A Short History of the Yugoslav Peoples*, (Cambridge University Press, Cambridge, 1985) provided a much needed historical backdrop and James Gow's *Legitimacy and the Military: the Yugoslav Crisis* (Pinter, London, 1992) gave a useful overview of the military aspects. Care then had to be taken with the flood of material that inevitably followed as much of it had been written with the highly audible sound of axes being sharpened in the background. This was typified by the horror experienced when a young diplomat recommended, as an excellent foundation reader, an extremely partisan academic paper that had been prepared by a formal adviser to the Bosnian Serb leadership! Fortunately, neither of the two books that are the subject of this review fall into this category. Both provide valuable additions to the literature, albeit from opposite ends of the spectrum.

One of the first reliable studies to hit the streets, that was worthy of positive recommendation, was Misha Glenny's *Fall of Yugoslavia* (Penguin, first published in 1992) which was updated several times as events unfolded in the Balkans. Glenny has now gone on to produce a masterly history of the region from 1804 to present day. Although his earlier work retained some element of the journalistic tone, this latest offering very much falls into the category of genuine narrative history. Glenny's theme throughout his book centres on the balance between nationalism and great power intervention – with the inevitable outbursts of violence. It is essential reading for anyone wishing to get beyond the banal generalisations of 'religious divides' and 'ethnic conflict'. Visitors who have conducted formal talks in the region will be aware of the propensity for all discussions to be preceded by selective renderings of history accompanied by dubious

The second subject of this review article is a detailed study of Operation DELIBERATE FORCE written by Tim Ripley. This work is published as a Lancaster University Bailrigg Study where Ripley is a research associate; he is also a journalist who has covered events in the region for *Jane's Intelligence Review* and *Flight International*. The book is written very much in a journalistic, rather than academic, style with some less than choice phrases such as 'The grim reality was far from rosy for General Ratko Mladic and his army'. Similarly, the outstanding range of interviews that Mr Ripley conducted do not appear to have warranted detailed footnotes outlining times and places; a full list of interlocutors has, however, been included. These are minor criticisms and do not detract from the overall utility of the book. It will prove to be an invaluable source of reference for subsequent writers who will benefit considerably from the first hand interviews. That these have been woven into the narrative adds to the value. (Some of Ripley's interlocutors may squirm slightly at the extent to which they have been quoted directly). The rather dense nature of the narrative tends somewhat to mask some of the more valuable aspects of this Balkan saga that are well worthy of deeper analysis. An example of this is highlighted by Nik Gowing (Diplomatic Editor of Channel Four News) who notes in his foreword that the US had been waging a covert war in support of the Bosnian Muslims involving weapons drops, training and so forth. Ripley brings out further evidence of this (page 61), along with some analysis of the degree to which US negotiator Richard Holbrooke co-ordinated NATO bombing, Croatian Army advances and diplomatic efforts. Holbrooke's own book, *To End a War* (Modern Library, New York, 1999) makes an excellent companion volume for students of Balkan conspiracy theories!

**BOOK REVIEWS BY
DR CHRISTINA GOULTER, SENIOR
LECTURER, JOINT SERVICES
COMMAND AND STAFF COLLEGE
BRACKNELL**

This work is of considerable value to air power and Second World War scholars, and those who have read Stephen McFarland's earlier excellent study of the air superiority battle over Germany, *To Command the Sky*, will be interested to see how he deals with this subject. This is the first large study of the U.S.'s pursuit of precision bombing, although other scholars should be acknowledged for having made important contributions to the historiography also within the last few years, particularly Tami Davis-Biddle and Hays Parks (*Journal of Strategic Studies*, Vol.18, No.1, March 1995).

The reviewer would also have liked more discussion of the type seen in Chapter Four, where McFarland raises the fundamental question of why the U.S. opted for precision attack of industrial targets, while the Royal Air Force believed attacks on enemy morale were more efficacious. McFarland states (p.82) that 'Americans had a traditional reverence for marksmanship and a deep rooted opposition to making civilians targets in war'. Leaving aside the fact that Britain, too, had a tradition of marksmanship (as exemplified by the 'Old Contemptibles' who helped to stall the Schlieffen Plan), where did this 'deep rooted opposition to making civilians targets in war' come from? Was it, as some have suggested, because of the comparatively recent experience of the American Civil War? Did this differ substantially from Britain's own recent experience of civilians being bombed by the Germans? McFarland's treatment of these

Having said all this, McFarland makes a significant contribution to our understanding of American bombsight development during the interwar period, particularly the work done by Carl Norden. The author shows how, in spite of the advanced bombing technology offered by Norden's bombsight, the Americans were unable to achieve the desired precision, in either the European or Pacific theatres during the Second World War. McFarland does an excellent job of digesting the wartime and post-war bombing analyses, and shows how for most of the war the USAAF achieved bombing accuracy comparable to the results of the British night bombing campaign. Until the end of 1944, an average of no more than one-third of bombs dropped hit within 1,000 feet of their intended targets.

While some scholars may find the above mentioned deficiencies, and occasional lax referencing (Chapter Three's endnote 47, for example) distracting, this is still an important book. McFarland helps us to start thinking about the reasons why the need for precision has become so ingrained in U.S. military culture, and why it is dangerous to seek 'silver bullet' solutions. McFarland demonstrates that this is the period when the U.S. started to believe that technological excellence would overcome most operational problems. Although this philosophy was dented by the Vietnam war, it continues to underpin U.S. military doctrine.

This book is an essential read for air power and Second World War scholars, and also to anyone interested in today's joint service environment. Many of the issues Gooderson raises have been doctrinal and organisational stumbling blocks again since the Second World War, and, as with so many other air power facets, the lessons learned by an earlier generation remain relevant.

ROAD TO BERLIN

The Allied drive from Normandy

GEORGE FORTY



ROAD TO BERLIN THE ALLIED DRIVE FROM NORMANDY

George Forty

This book tells by photographs the story of the Allied campaign in North West Europe, in the twelve months, June 1944 to May 1945.

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A remarkable pictorial record of all the campaigns of twelve months of almost non-stop fighting. The photographs, each extensively captioned, are accompanied by a concise history of events, move-by-move, of the Allies' progress towards the heart of the German war machine.

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Lt. Col. George Forty CBE FMA is a leading authority on land warfare in the twentieth century. A former tank officer – he had command of a tank in the Korean War, and was wounded in battle – he established his reputation as Curator of the Tank Museum at Bovington, which he brought to be one of the world's leading military museums.

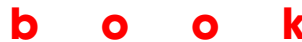
Details: Cassell Publishing, £25.00

Publication: October 1999

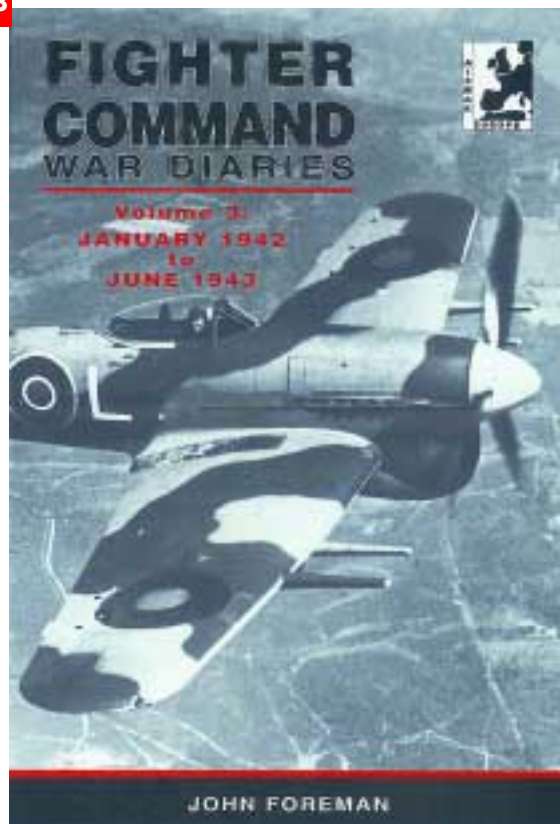
ISBN: 0-304-35306-X

b o o k

r e v i e w s



Details: Crécy Publishing Ltd, 256pp, £7.95
Publication: March 2000
ISBN: 0-947554-84-X



FIGHTER COMMAND WAR DIARIES

John Foreman

This 3rd volume of John Foreman's acclaimed series covers the period January 1942 to June 1943. It includes the air cover for the Dieppe landings, escort missions over Europe, the entry of the USAAF into the war and the defence of Britain against Luftwaffe raiders.

Drawing on his many years of research into the subject the author has been able to assemble a unique database of aircraft and crew losses and claims for aircraft shot down. Combined with a wealth of knowledge and Foreman's ability to analyse the air battles of long ago, these diverse scraps of information form a new and more complete picture of events than has previously been possible.

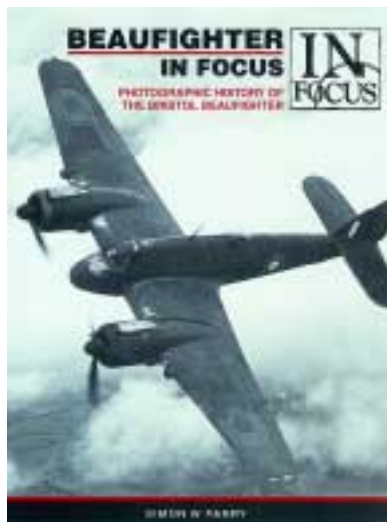
The Author: John Foreman has established himself as one of the leading experts in the air war fought over Europe in World War II. His researches began in the early 1970s and his archives now form a huge database of material covering every day of the war from 1939 to 1945. As well as two volumes in the *Fighter Command War Diaries* series, his books include *The Battle of Britain – The Forgotten Months*, *1941 – The Turning Point* (two volumes) and *1944 – Over the Beaches*. He is co-author of *The Fledgling Eagle* and the *Messerschmitt Me262 Combat Diary*.

Details: Crécy Publishing Ltd,
366pp, £24.95
Publication: Winter 1999
ISBN: 1-871187-39-7



reviews

ISBN: 0-304-35316-7



BEAUFIGHTER - IN FOCUS ***Photographic History of the Bristol Beaufighter***

Simon W Parry

The Bristol Beaufighter fulfilled many roles in the RAF during World War II, but was always overshadowed by the more famous Mosquito. Whether it be in night fighting, ground attack or shipping strikes, the Beau' served its crews well. Using photographs from several private collections, this book charts the missions flown by the Beaufighter and its crews in Europe, the Middle East and Far East.

Details: Crécy Publishing Ltd,
112pp, £19.95
Publication: Winter 1999
ISBN: 1-871187-41-9

SHOOTING STAR - IN FOCUS ***Photographic History of the Lockheed F-80/T33 Series***

Chris Ellis

The F-80 Shooting Star was the first American jet fighter to see large scale service. Designed in the closing stages of World War II, it became one of the principal jet fighters in the early days of the Korean War and was responsible for shooting down a MiG 15 in the first jet versus jet combat. Amazingly the design is still in service as a training aircraft designated the T-33 and some air forces intend to keep it flying well into the next century.

Details: Crécy Publishing Ltd, 64pp, £11.95
Publication: Winter 1999
ISBN: 1-871187-42-7





KG 55 was the only Luftwaffe bomber unit to fly the Heinkel He111 throughout World War II. The twin-engine Heinkel bombers of KG 55 carried the red Grief (Griffon) badge of the Geschwader through Poland, the Battle of France, the Battle of Britain and the Blitz and finally to defeat in Russia.

**Details: Crécy Publishing Ltd,
112pp, £19.95
Publication: Winter 1999
ISBN: 1-871187-40-0**



THE AIR LEAGUE EDUCATIONAL TRUST

encouraging air-mindedness in Britain's youth

ANNOUNCEMENT OF WINNERS AND COMPETITIONS

Once again, the Trust is launching its annual competitions for flying scholarships and bursaries, engineering scholarships and – new for 2000 – a competition for a Private Pilot's Licence (Balloon & Airship). Some 85 awards are on offer, details follow:

2000 FLYING SCHOLARSHIP WINNERS

The Trustees are pleased to announce the award of 45 flying scholarships to be flown during 2000. There are several new awards including the Joe Wheeler Scholarship for a full Private Pilot's Licence (PPL) and the Scarman 20-hour awards supported by funds from HQ Air Cadets. All other awards are for 15 flying hours.

Flying Scholarship/Sponsor

617 Squadron Aircrew Association

Aircrew Association

Aircrew Association

Andrew Humphrey

Barnett & Piercey (Flight International)

British Aerospace

British Airways

British Airways

British Telecom

Captain C A Barnes

Recipient

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Ms R M Lloyd from Bromyard, Herefordshire (CCF(RAF))

Mr M D Wight-Boycott from Burntisland, Fife (CCF(Army))

Miss S Price from Withington, Manchester (ATC)

Mr P J Amstutz from Tonbridge, Kent (CCF(RAF))

Mr R A J Wells from Dorchester, Dorset (ATC)

Miss K L Ballantyne from Bedlington, Northumberland

Mr P M Roulston from Castlederg, Co Tyrone (ATC)

Mr U H J Malik from Leicester (ATC)

Mr G D Haydon from Englefield Green, Surrey (CCF(RAF))

Commander Sam Macdonald-Hall

D G Marshall (Marshall Aerospace)

GE Aircraft Engines

GECC

GECC

Hugh Pope

Joan Angus

Joe Wheeler PPL

Lucas Aerospace

Messier-Dowty

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Mr R M Packman from Banbury, Oxfordshire

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Miss S Pollock from Fallowfield, Manchester

Mr G A Lockwood from Woodhall Spa, Lincolnshire (CCF(RAF))

Mr A E Barr from Bridlington, East Yorkshire (CCF(RAF))

Mr M A G Lee from Ettington, Warwickshire (CCF(RAF))

Miss E J Telfer from Halfway, Sheffield (ATC)

NOTICES / REUNIONS

BREITLING BALLOON SCHOLARSHIP

Applications are invited for a newly established balloon scholarship sponsored by Breitling. The award is for a PPL (Balloons and Airships) with training being co-ordinated by Brian Jones who recently circumnavigated the earth with Bertrand Piccard in the Breitling Orbiter 3, and is the UK Chief Balloon Flying Instructor. The award may be flown at any recognised centre in the UK and ideally in the summer months starting in May. Applicants must be a member of The Air League (or be applying to be a member at the time of application for the scholarship).

Closing date for completed application forms is 28 April 2000.

2001 FLYING SCHOLARSHIP COMPETITION

Applications are invited for the 2001 flying scholarship competition from young men and women who are British citizens resident in the UK and who will be over the age of 17 and under the age of 22 on 30 June 2000. Scholarship winners will be awarded 15 hours flying instruction to be flown during 2001. Air Cadets will be eligible for the award of the Joe Wheeler PPL scholarship and the Scarman 20-hour scholarships. Selection will be based on a formal application and, after short-listing, either an interview at the Trust's office in

London or on aptitude tests, medical tests and an interview to be conducted at the Officers' and Aircrew Selection Centre, RAF Cranwell, during September 2000.

Closing date for completed application forms is 30 June 2000.

ROYAL AIR FORCE HISTORICAL SOCIETY

- Formed in July 1986
- Studies the history of Air Power
- Examines the creation of Military Air Power and studies various topics including:
 - The strategic bomber offensive
 - Berlin Air Lift
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Tel: 01453 843362
- The central objective of the Society is to bring together those involved in Royal Air Force

activities in the past and those concerned today so that we can learn more about its history.

TATTOO MOVE TO TOP RAF HARRIER BASE

The Royal International Air Tattoo, the airborne supershow appearing at RAF Fairford since 1985, will this year be held over the weekend of 22/23 July at RAF Cottesmore in Rutland in partnership with BAE SYSTEMS (formerly British Aerospace). The station is home to two squadrons of Harrier GR7s. With extensive resurfacing work at Fairford due to start in May, Tattoo organisers had to find a new temporary venue.

RAF Cottesmore's Station Commander, Group Captain David Walker, says "Everyone at RAF Cottesmore is delighted that this Unit has been chosen to host RIAT 2000. The Tattoo is one of the most prestigious events in the world's aviation calendar, and it is a great honour."

RIAT 2000 will pay tribute to the 60th Anniversary of the Battle of Britain, featuring the Spitfires and Hurricanes that flew to glory six decades ago, and celebrate with the young aircrew of today as they look back at 75 years of University Air Squadrons. The giants of the aviation world will create a dramatic skyline at RAF Cottesmore as transport aircraft from across the world line up for Airlift 2000.

Director Paul Bowen says "We are extremely grateful to the Royal Air Force and RAF Cottesmore for allowing us to mount the airshow at such an

The Tattoo is staged in aid of the RAF Benevolent Fund, and this will have particular relevance in a year when the nation remembers the gallantry of "The Few".

RAF HONOURS BATTLE OF BRITAIN HEROES

The Central Band of the Royal Air Force in Concert

The spirit of those fateful few months in the Summer of 1940 will be captured through the music of the time. The Central Band will perform *Spitfire Prelude and Fugue* and *The Battle of Britain Suite* by Sir William Walton, and the programme also includes classics such as *A Nightingale Sang in Berkeley*

Re-working the new dance sensation that swept across the country in the 1940s, The Squadronaires will swing into the *Tuxedo Junction*, *Pennsylvania 65000* and *In the Mood*. Dancers will join the show band on stage to perform a sensational jitterbug routine.

Sponsored by Lockheed Martin, this Royal Air Force anniversary concert is in support of the RAF Benevolent Fund – the military charity taking care of veterans who served in World War II, together with all other personnel who have served, or are serving, in the RAF.

Tickets, ranging from £8 to £26, are available from the Barbican Centre Box Office on 0171 638 8891.



DUXFORD CALLS UP NEW RECRUITS FOR ESSENTIAL CONSERVATION WORK

The Imperial War Museum Duxford is appealing for new recruits to join the skilled volunteers already helping to conserve and restore Duxford's outstanding collection of vintage aircraft, tanks and military vehicles.

"Volunteers are at the heart of Duxford's restoration and conservation programme" says Chris Chippington, Head of Conservation. "Restoring such a large number of exhibits to top condition is an enormous challenge that we couldn't meet without the help of the volunteers."

Volunteering provides the unique and exciting opportunity to get to work with valuable machines you might only expect to see at a distance or on the television. Under the direction of permanent staff volunteers are already working on a wartime Hawke Hurricane fighter and a B-24 Liberator bomber as well as a Wessex helicopter. Duxford is of course much more than just an aircraft museum and volunteers are also working on Cromwell and Crusader tanks plus other military vehicles.

The museum welcomes volunteers with a whole range of skills but the key ingredients are enthusiasm, flexibility, an interest in the subject and a degree of commitment. Previous engineering experience is not essential. Volunteers come from all walks of life; a bus driver, a gardener, a retired policeman and a manager of a building society all find volunteering at Duxford a rewarding experience.

Some volunteers are retired but others fit time at Duxford around busy working lives so restoration work continues on Sundays as well as during the week.

Duxford, Europe's premier aviation museum, receives over 400,000 visitors every year, most of whom are fascinated to see conservation work taking place right there in front of them. If you would like to become part of the team and help preserve our heritage contact Jack Livesey on 01223 499327.

Duxford is just south of Cambridge on the M11 and is open daily from 10am. For general enquiries call 01223 835000.

THE ROYAL AIR FORCE AIR POWER CD-ROM

To support the Air Power Training Strategy for the Royal Air Force, an interactive CD-ROM entitled 'Royal Air Force Air Power' has been produced by the Air Warfare Centre, in consultation with the Ministry of Defence Air Historical Branch (Royal Air Force) and Director of Defence Studies (Royal Air Force). Produced commercially by OP&S Ltd, the 'RAF Air Power' CD-ROMs will be ready for distribution in April and May 2000 and published under Crown Copyright. All material within the CD-ROM has been scrutinised and approved by relevant specialist authorities. The CD-ROM package will contain two disks, both containing a large number of video clips.

The first disk contains:

- A historical section charting the development of RAF air power.
- A detailed timeline highlighting key events within the historical section.
- 85 pen pictures of key contributors to the development of RAF air power.
- A section on equipment, containing all current and future aircraft and weapons systems.
- A section on air power doctrine based on 'British Air Power Doctrine' and the RAF Air Operations Manual.

The second disk concentrates on RAF units and contains information on the role of each RAF station both at home and overseas.

Starting in April 2000, copies of the 'RAF Air Power' CD-ROM will be distributed free of charge to all serving RAF officers and airmen. It will also be distributed to future officer cadets, airmen recruits and to all current and future reservists.

