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

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

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

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Send articles to:

Director of Defence Studies (RAF)
Joint Doctrine and Concepts Centre
Shrivenham
Swindon, Wiltshire
SN6 8RF
Email: defs-raf@netcomuk.co.uk

Cover picture

41 Squadron Jaguar enforcing the no-fly zone over Northern Iraq

Picture courtesy of AHB (RAF)

FOREWORD

In this edition of Air Power Review we have an eclectic mix of articles ranging from joint operations in Palestine in 1917 to the potential nature of air warfare in 2030. Whilst some of the articles may not seem directly related to the employment of air power, all contain very valuable lessons concerning it. However, maintaining this level of articles, both in quantity and quality, requires contributors, and I would encourage anybody who has a particular interest or hobby—horse concerning air power to contribute to the RAF's professional journal.

In the first article I look at the effect of air power in the recent conflict in Afghanistan. This is very much a first look, and from unclassified sources. However, there are some definite lessons to be drawn from the campaign, some of which are unique but others are enduring. What stands out, however, is what I would call the 4 Rs: that is reach, range, rate and repetition which capture the essential differences between air power and land and maritime power.

The next article, by John Mordike, looks at General Sir Edmund Allenby's joint operations in Palestine. Although not primarily an air power article, it examines a joint operation involving land and air forces, and initially naval gunfire support, and an information campaign, which had an integrated planning process. The squadrons under Allenby's command would in today's parlance be called an expeditionary air force, which covered the gamut of air power roles. The article contains an important lesson about the value of written and widely published doctrine: why did the forces in Palestine have to learn the skills of artillery co-operation from square one in 1917 when such techniques and procedures had been well practised by the air forces on the Western Front by the time of the Somme offensive a year earlier?

In the next article, Colonel (Retd) Phil Meilinger USAF, who is a well-known advocate of air power, takes a different approach to highlighting its potential. He does this by an excellent exposé of the traditional 'charges' against air power and the possible rebuttals to those charges. However, his historical examples also contain more general lessons about the application of air power.

The next article, by Lieutenant Commander Wise, is taken from his defence research paper written on last year's Advanced Command and Staff Course. As the author says, "It is timely to take a step back from the hype and present an analysis of network centric warfare's claims and prospects". Although written from a naval perspective, the deductions in the article are wholly applicable to all environments, and especially air power, in view of its ability to achieve a high tempo of operations over a vast battlespace. His view that speed of command, in other words decision making, is essential to achieving a tempo of operations that the manoeuvrist approach to warfare demands, is particularly pertinent in view of the command and control issues in my analysis of the Afghanistan campaign.

Dr Benjamin Lambert's article was previously published in our sister journal, the USAF's Air and Space Power Journal, which was taken from his excellent recent book reviewing the air campaign over Kosovo. This is a very timely article remembering that, unlike recently in Afghanistan, in other conflicts we have, and in the future will have, to fight to achieve and

maintain a desired level of control of the air against a non-co-operative enemy. The article is also timely with respect to the current debate in the UK on how best to suppress or destroy enemy air defences.

The next article, by Flight Lieutenant Craig White, is also very topical and is a good overview of the nature of modern terrorism. The article concludes with some perhaps obvious conclusions concerning the applicability of air power against 'new wave' terrorist threats.

The final article is an extract of a report by Captain James McCudden on the events of a 'morning after his own heart' when in the space of 20 minutes he destroyed 3 German aircraft over the Western Front. It was published in Tee Emm in 1941 to highlight the need for an aggressive determination to succeed in air combat. Such determination is equally applicable today and is an essential part of the manoeuvrist approach to warfare.

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AIR POWER Review

Editor

Jay Myers

Assistant Editor

Wg Cdr (Retd) David Jones

Production Editor

Harvey Grainger

Studio

John Griffiths
David Mitchinson

RAF MAGAZINES

**Floor 1, Zone A
St George's Court
2-12 Bloomsbury Way
London WC1A 2SH
Tel: 0207 305 2166
Fax: 0207 305 4145**

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The Employment of Air Power in Afghanistan and Beyond

By Gp Capt Chris Finn RAF

Northern Alliance troops look on as US B-52s bomb Taliban positions

It has been suggested that the use of air power in Afghanistan was fundamentally different from its use in previous campaigns, so much so that even senior army officers noticed. A detailed analysis of the operational and tactical lessons is undoubtedly going on in all the air forces that participated in Operation ENDURING FREEDOM. The initial combat elements of Operation ENDURING FREEDOM and Operation VERITAS, the UK's contribution to that, are not long over, and we will perhaps have to wait a couple of years for more detailed analysis on the lines of the Gulf War Air Power Survey, or Owen's case study of Operation DELIBERATE FORCE. But that should not preclude an initial look at the effect that campaign may have on our broad perceptions of the employment of air power or the initial implications for the employment of air power in any future operation.



Northern Alliance fighters on patrol after taking Kabul

It had taken just 78 days to remove the Taliban and Al Qaeda from power in Afghanistan

The events of 11 September 2001 will be etched in the memory of the readers of this article. The speed of the international response to those events may not be so obvious. On 1 October, General Tommy R Franks, Commander in Chief US Central Command, briefed Secretary Rumsfeld on his mission analysis and recommendation of a military course of action. This was briefed to President Bush the following day and he directed that combat operations should begin on 7 October, 26 days after the attacks on New York and the Pentagon.¹ On 22 December a ceremony was held in Kabul to mark the inauguration of the Afghanistan Interim Government. It had taken just 78 days to remove the Taliban and Al Qaeda from power in Afghanistan. This paper will therefore look at the application of air power in Afghanistan over those 78 days, then identify the key aspects of that application, then compare the use of air power in Afghanistan with the previous operations in Kosovo, Bosnia and the Gulf War, then seek to identify fundamental differences in the application of air power whilst also highlighting those determining factors which are unique to the Afghan campaign. Finally it will draw conclusions on the impact of Operation ENDURING FREEDOM on the fundamental principles upon which we believe the most effective use of air power is based.

At the strategic level the military campaign was but one line of operation in the 'war against terrorism': others being diplomatic, financial, law enforcement and humanitarian.² The aim of the joint campaign, to use UK parlance, was from the outset to seize the initiative and 'eliminate the support to Al Qaeda, primarily the Taliban, and ... eliminate the Taliban'³ whilst keeping in mind the lessons of the Soviet defeat in Afghanistan. At the operational level, the military lines of operation⁴ were direct attack of the leadership of Al Qaeda and the Taliban, destroying the Taliban military, and humanitarian aid. The primary mechanisms were operational fires and the use of Special Operations Forces (SOF) in reconnaissance and direct action roles. The employment of conventional land forces in an operational manoeuvre role was not ruled out. Given the timescales outlined above, and the size and location of Afghanistan, overflight, turn round and basing rights were an essential prerequisite for the employment of air power in any meaningful quantity. A considerable diplomatic effort ensured that by the end of the campaign,⁵ US military

aircraft had overflight authority for 89 countries, landing rights for 76, and 23 countries had agreed to host US forces directly involved in offensive operations.

From General Franks' statement to the Senate Armed Services Committee,⁶ one can identify 5 lines of operation at the tactical level. Those are: control of the air; direct attack on the leadership of Al Qaeda and the Taliban; destroying the Taliban military forces; information operations; and humanitarian relief.



...control of the air was achieved within 2 weeks, and enabled the US to use more vulnerable platforms such as the AC-130 Spectre gunship, with only a limited amount of ongoing suppression of enemy air defences (SEAD)...

CONTROL OF THE AIR

Unlike the opposition in the Gulf War, Bosnia or Kosovo, the Taliban and Al Qaeda had only a limited number of surface-to-air missiles and had little training in the use of AAA or man-portable surface-to-air missiles. Thus control of the air was achieved within 2 weeks,⁷ and enabled the US to use more vulnerable platforms such as the AC-130 Spectre gunship, with only a limited amount of ongoing suppression of enemy air defences (SEAD). However, whilst the bombers and fast-jets could operate with relative impunity that was not so for helicopters. On the 4th of March 2003, during Operation ANACONDA, two helicopters were hit; one by a rocket-propelled-grenade which failed to explode, and one by machine gun fire. Furthermore, large aircraft and helicopters were more vulnerable to ground fire when operating at low level in periods of strong moonlight.

In practical terms the operations against the Taliban and Al Qaeda command and fielded forces can be considered as one. The targets grouped broadly into command, military infrastructure and fielded forces, although in many cases targets such as training camps could encompass all 3 categories. Attacks against

these target sets commenced at the same time as attacks against the limited Taliban air defences but became the primary target sets after only 48 hours. However, as Secretary Rumsfeld said, 'It is not a country that is rich in targets'.⁸ So it is not surprising that, whilst the 15 planned target areas for 19 October included AAA sites, anti-aircraft sites with dispersed armour and radar, ammunition and vehicle storage depots and military training facilities, including armoured vehicles, trucks and buildings⁹ the briefing given only 2 days later, on 22 October, identified greater emphasis being placed on the fielded Taliban forces rather than fixed structures.

In addition to fielded forces the Taliban and Al Qaeda leadership were directly targeted, including an attack on the residence of Mullah Omar in the middle of Quandahar, the Taliban capital.¹⁰ One system used for this was the Predator UAV, armed with Hellfire air-to-ground missiles.¹¹ Unusually, the system was operated by the CIA¹² who borrowed the aircraft from the USAF and fired dozens of Hellfire missiles at the Taliban and Al Qaeda leaders. However, leadership targets were implicit in the targeting of C2 facilities, the Taliban defence ministry in Kabul as well as military bases and terrorist training compounds.¹³

In his statement to the Senate Armed Services Committee, General Franks said 'precision guided munitions ... have resulted in unprecedented low levels of collateral damage'. This is borne out by a summary of collateral damage incidents which showed that from 24 October to 6 December 2001 there were 5 incidents of targeting errors or possible weapon malfunction causing loss of civilian life and damage to civilian property. There was also an incident on the 11th of October 2001 where the Taliban claimed that 200 people had been killed at Karam, and one on the 13th of October where the wrong co-ordinates had been programmed into a bomb (JDAM) causing the death of up to 4 civilians.

Whilst carrier-based aircraft flew 75% of the offensive missions they delivered only 43% of the PGMs dropped; land-based 'fighters' dropped 10% and the heavy bombers 47%...



Between the 10th of October and the 31st of December a total of 21,000 sorties were flown on Operation ENDURING FREEDOM, 12,500 of which entered Afghan airspace and of which 6,546 were offensive sorties.¹⁴ The USAF and USN each flew approximately 45% of the sorties and coalition partners the rest.¹⁵ A total of 17,471 weapons were delivered of which 9,987 were PGMs. The majority of the unguided bombs were Mk 82s dropped by B-52 bombers. Whilst carrier-based aircraft flew 75% of the offensive missions they delivered only 43% of the PGMs dropped; land-based 'fighters' dropped 10% and the heavy bombers 47%.¹⁶ However, what these statistics do not show is the effectiveness of the missions. A measure of this is in General Franks' comment: 'during DESERT STORM we averaged 10 aircraft per target, in ENDURING FREEDOM we averaged 2 targets per aircraft'.¹⁷ Given the sortie numbers outlined above, this would imply that some 13,000 DPIs (Designated Point of Impact) were struck, to achieve which each of the nearly 10,000 PGMs dropped would have to have been targeted on individual DPIs. That is not unreasonable given that in Operation ALLIED FORCE the PGM to DPI ratio was 1.22:1.¹⁸ How this significant improvement in effectiveness was achieved requires examination of the inter-related areas of information gathering and management, and command and control philosophy.

In terms of rate of effort more than 3,000 weapons had been dropped by 19 October¹⁹ and some 6,000, ie an average of 300 per day, after 20 days of operations.²⁰ This in turn means that the remaining 11,500 weapons were dropped in the next 71 days: an average of 162 weapons per day. Whilst it is not possible to isolate from the DoD briefings exactly when the rates of effort changed one can broadly deduce that the first half of the conflict was twice as intensive as the second. Furthermore, 6,344 of the weapons dropped were unguided Mk 82 bombs²¹ which would have taken only 125 B-52 sorties, or even less if the B-1s were involved.²² So we are left with 11,124 weapons to be dropped in 6,421 sorties: an average of only 1.7 weapons per sortie. Given that the B-1 and B-52 carried 24 and 21 JDAMs respectively²³ and pictures of F-18s involved showed them generally loaded with 3 LGBs that figure is not valid. So assuming the remaining B-1 and B-52 sorties dropped the remaining JDAMs some 5,600 fast jet sorties delivered the remaining 6,624 PGMs. But that would only require 2,208 sorties so up to 3,400 fast jet sorties did not deliver any weapons. Now that is just one way the distribution of weapons could have occurred but, when taken with the weapon rate analysis above, and given that sortie rates remained fairly constant, one can conclude that at least 65% of the sorties in the latter half of the campaign did not deliver any weapons.

...aircraft who could not engage a primary (fixed) target would be re-targeted onto an emerging or mobile target...



LEVEL OF INFORMATION

A key facet of this campaign was the Americans' ability to achieve a level of information superiority far greater than in previous campaigns and to shorten the 'sensor – decision-maker – shooter' process. This was achieved through the use of multiple systems such as Predator and Global Hawk UAVs, RC-135 Rivet Joint signals intelligence aircraft, U-2 reconnaissance aircraft and E-8 JSTARS, plus the intelligence and targeting information from Special Forces on the ground, using Link 16 and other datalinks.²⁴ Furthermore, such links enabled aircraft to be re-targeted en-route. This flexibility was evident as early as 17 October when 'flex-targeting' began to feature in the routine DoD briefings. As Rear Admiral Stufflebeem (Deputy Director for Operations, Current Readiness and Capabilities) explained it:²⁵ aircraft who could not engage a primary (fixed) target would be re-targeted onto an emerging or mobile target. In his brief of 28 November²⁶ he went further to refer to 'more aircraft being brought to bear on 'on call engagement' and close air support missions'. However, he had earlier referred to 'engagement zones' being a tactic of interdiction²⁷ in which pre-determined types of targets were located and identified by a (forward air) controller who then brought in aircraft to engage those targets.

The confusing aspect of this is the general use of the term 'close air support' (CAS) to describe all the offensive operations which were targeted in some way from the ground. In fact there was a clear difference between those attacks which were in direct support of the indigenous Afghan forces or coalition special forces and those which were against both fixed and emerging targets that were not in contact. What we were actually seeing was the use of FACs, both ground and airborne, providing targeting information for both CAS and AI missions, and indeed those which in UK doctrine would be classified as 'strategic effect' ones as well. What is quite clear though²⁸ is that at no time were offensive aircraft allowed to roam free in designated areas on 'armed recce' type missions. Even the AC-130 Spectre gunships carried FACs to authorise the crew to engage targets.²⁹

... 'excessive caution and micromanagement was hampering military operations' and that up to 10 opportunities to attack senior Taliban leadership 'did not receive clearance to strike in time'

Having covered the integration of the sensor and shooter, what of the decision maker? Obviously fixed targets were pre-approved and in the case of engagement zones authority to engage was delegated to a FAC. But the decision making process for the 'emerging', ie neither fixed nor CAS type targets, is more confused. In a report to the house Armed Services Committee in July this year, Major General Randall M Schmidt, Assistant Deputy Chief of Staff, Air and Space Operations stated that along with technological improvements 'organising, training and equipping the Combined Air and Space Operations centre (CAOC) as a 'weapon system' resulted in an unprecedented speed of execution'.³⁰ This would imply that the CAOC was executing a 'hands on' air campaign. However, General Franks was quite clear that the operation was 'commanded and controlled from Tampa, Florida and stated that the 'Tomahawk targeting cycle had been reduced from 101 minutes during ALLIED FORCE to 19 minutes during ENDURING FREEDOM'.³¹ In fact there was concern that control of the campaign was overly centralised in the hands of General Franks and his legal advisors with the Telegraph's Washington correspondent reporting that 'excessive caution and micromanagement was hampering military operations' and that up to 10 opportunities to attack senior Taliban leadership 'did not receive clearance to strike in time'.³² General Kellog, the Director of Command, Control, Communications and Computers within the J6 division of the Joint staff was quite clear in an interview given in April 2002 that 'the CENTCOM commander was able to direct the battle from his

headquarters in Tampa, Florida, at a level that is unprecedented compared to DESERT STORM'.³³ It therefore seems clear that the CAOC, at Prince Sultan Air Base in Saudi Arabia, performed the tasking and mission management functions whilst targeting decisions were delegated either to the lowest level or retained at CENTCOM.

As the figures quoted earlier show, 69% of all sorties were non-offensive and, furthermore, 50% of the sorties which entered Afghan airspace were conducting Combat Support Air Operations (CSAO). Reconnaissance assets, including the UK's venerable PR 9 Canberra and Nimrod R1 aircraft contributed significantly to the information gathering referred to above. But the most significant CSAO categories were strategic and tactical lift, the latter both fixed and rotary wing, and AAR. The 701 long range bomber missions were flown mostly by just 10 B-52s and 8 B-1s with the B-1s flying 1,200 miles to remain on station for 2 hours and the B-52s flying 2,500 miles.³⁴ The B-2s flew just 6 missions, but they were to and from continental USA. However, more than 50% of the AAR sorties flown were dedicated to the USN³⁵ who flew 4,900 offensive sorties. This latter task fell mostly to the RAF's Tri-stars and VC10s due to their operating a compatible probe and drogue system as opposed to the USAF tankers with their boom and receptacle system.

HUMANITARIAN AID

The last element of the air campaign was the linked tasks of information operations and the delivery of humanitarian aid. More than 50 million leaflets were dropped to provide information for the safety of individuals on the ground as well as pointing out to them what they were suffering under al Qaeda and the Taliban although there was no obvious yardstick by which their effectiveness could be measured.³⁶ At the same time similar radio broadcasts were being made from EC-130 Commando Solo aircraft.³⁷ Finally, 2.5 million daily rations, 1,700 tons of wheat, 328,200 blankets and over 5,000 radios were distributed to the Afghan people.³⁸

The following table shows the different lengths and sortie totals for the 4 major air campaigns since the end of the Cold War:

	No of Day	Total sorties	Offensive sorties	Offensive sorties/day	Percentage of Offensive sorties
DESERT STORM ³⁹	43	109,867	44,145	1,027	40%
DELIBERATE FORCE ⁴⁰	17	3,535	2,159	127	61%
ALLIED FORCE ⁴¹	78	38,004	10,484	134	26%
ENDURING FREEDOM ⁴²	78	21,000	6,546	83	31%

DIFFERING CONFLICTS

The first area of difference is the expeditionary nature of the conflicts. Both the Bosnia and Kosovo operations involved the deployment of aircraft from their home bases but were fought from well-found NATO main operating bases. The Gulf War was a major regional conflict and was totally expeditionary, with many bases being developed extensively between September and December 1990. The Afghanistan campaign was also totally expeditionary with bases being developed as the conflict developed. The balance of offensive and supporting sorties is also instructive. In the Gulf War a limiting factor was the ability of the air headquarters to task and manage much more than the peak of some 1,200 offensive sorties per day. In DELIBERATE FORCE and ALLIED FORCE the air commanders, Generals Ryan and

Short, were both able to exercise personal control of the air effort. In ENDURING FREEDOM the scale was even less and, as was discussed above, the CinC US CENTCOM himself was able, in effect, to fulfil the JFACC's role. The nature of the supporting sorties is also different. In DELIBERATE FORCE 58% of the offensive sorties were dedicated to SEAD⁴³ and during ALLIED FORCE 815 SAMs were reported fired at allied aircraft.⁴⁴ However, in ENDURING FREEDOM there was a minimal air threat and the major support effort was in AAR, so much so that General Meyers, the Chairman of the US Joint Chiefs, later identified 'significant shortfalls in the total number of tankers (and) crew ratios',⁴⁵ and the UK provided the USN's AAR support.

This table shows the breakdown of weapons used:

	No of Weapons	Cruise missiles	Non-cruise PGMs	No of PGMs	Unguided bombs
DESERT STORM ⁴⁶	155,186	0.2%	7%	7,759	93%
DELIBERATE FORCE ⁴³	1,026	1%	69%	708	30%
ALLIED FORCE ⁴³	23,000	1%	34%	782	65%
ENDURING FREEDOM ⁴⁷	17,471	0.4%	57%	9,987	43%

Whilst DELIBERATE FORCE was so small an operation as to be statistically insignificant in terms of the balance of weapons used the other 3 conflicts show a steady proportional increase in the use of PGMs and in ENDURING FREEDOM an absolute increase as well. However, General Meyers also made the point to the Senate Armed Services Committee the requirement for both sufficient PGM stocks and a manufacturing base to replace them in short order.⁴⁸ The reasons for the increasing emphasis are well rehearsed but include: reduction in collateral damage, increase in individual sortie effectiveness and cost.

Other linked trends which are apparent are the increasing reliance on information networks, UAVs and UCAVs, and on 'reachback' to provide information and even the command function in combat

Predator armed with Hellfire as used in Afghanistan



Other linked trends which are apparent are the increasing reliance on information networks, UAVs and UCAVs, and on 'reachback' to provide information and even the command function in combat. But, apart from the difference of scale outlined above two other factors make ENDURING FREEDOM stand out from the other conflicts. The first is the relative lack of enemy response, particularly in terms of air defence. The second is the nature of the coalition and its command structure. DESERT STORM was run in-theatre by a command structure that any NATO officer would instantly feel at home in. However, the scale of the conflict and the relative insufficiency of communication meant that the classic doctrines of mission command and for air, centralised command and decentralised execution, were followed. In both the Balkans conflicts the command structure was already in-place but there was increasing political involvement firstly in the form of the dual-key release chain for weapons prior to the decision to implement DELIBERATE FORCE. In ALLIED FORCE the tensions were inherent in the headquarters of a multi-national political organisation, NATO, becoming involved in the minutiae of targeting. Again, there is an element of scale here but another reason for political involvement is simply because it is now technologically possible. ENDURING FREEDOM was however primarily a US operation; coalition partners were welcome in terms of enhancing the legitimacy of the operation and in providing essential supporting assets. But the meat of the air combat operations was entirely conducted by the US, a lesson undoubtedly drawn from their experiences with coalition operations over Kosovo. However, as the operation was in direct response to the attacks of 11 September 2001 there were no issues of coalition solidarity and legitimacy, and the actions were backed by overwhelming US public support.

The first observation concerns the nature of the use of airpower itself in post-cold war conflicts. In the Gulf War air power did not as some have suggested merely set the conditions for a successful land campaign. Instead, by destroying the Iraqis as a fighting force airpower was the determining force in the conflict: as Dick Cheney later said 'it was crushed, I think, by the air campaign'.⁴⁹ DELIBERATE FORCE was an air-only campaign with the objective of getting the Bosnian Serbs to 'sue for cessation of military operations, comply with UN mandates and negotiate'.⁵⁰ There was also diplomatic pressure and sanctions plus the impact of the resurgent Croatian-Bosnian forces and the effect of the NATO RRF's artillery in the Mt Igman area. However, airpower provided the element of force that underpinned the other mechanisms. Similar arguments are expressed over the Kosovo conflict. In addition to the bombing Milosevic was under pressure from his cronies to do something to ease the destruction of their properties, his support from Russia was evaporating and he was indicted as a war criminal. And there was finally the possibility of a ground invasion. However, none of these mechanisms would succeed on their own or together and Lambeth's analysis in the Rand Report on the conflict that 'the bombing ultimately persuaded Milosevic that NATO would not relent and was also determined to prevail and had both the technical and political wherewithal to do so'⁵¹ makes a convincing argument for the dominant effect of air power.

In ENDURING FREEDOM fewer than 31,000 ground troops were deployed⁵² in comparison with the air effort outlined above. Land power was used to find and designate targets with the air component being, in doctrinal terms, 'supported' throughout the 78 day operation. As the result was the removal of the Taliban regime from power it could hardly be said that air power did not in this case have 'strategic effect'. But, given the paucity of fixed targets is that a valid conclusion?

The Taliban military is supporting their leadership and their leadership is supporting Al Qaeda. So we are systematically pulling away those legs underneath the stool

Where 'effects based warfare' is discussed in US reports on the conflict it is not in the context that UK military would wholly recognise. General Newbold and Admiral Szemborski⁵³ refer to it as military and inter-agency operations against the enemy's system break point to destroy his coherence and General Meyers defines it as the outcome of effective networking of sensors and shooters⁵⁴. This is more in tune with the UK concepts of manoeuvre warfare and centre of gravity analysis than the concept of deciding the effect before the mechanism. However, Admiral Stufflebeem makes it abundantly clear in the following statement 'It's in the Taliban military. The Taliban military is supporting their leadership and their leadership is supporting Al Qaeda. So we are systematically pulling away those legs underneath the stool that the Taliban leadership counts on as being able to exert their influence and power'.⁵⁵ But as referred to at the beginning of this article, the US's strategic objective was the removal of the Taliban in its entirety, so one could conclude that the Taliban, as a homogeneous organisation, was in effect its own strategic centre of gravity.

The second observation pulls together two of Meilinger's 'propositions regarding air power'.⁵⁶ The first is that air power is targeting, which is intelligence which is analysis; the second is that air power and technology are synergistically related. This is evidenced by the innovative use of sophisticated methods to link the, sometimes very unsophisticated, sensor to the shooter in particular to service emerging targets.

Harrier GR7 launching Paveway 2 missile



...less weapons achieve greater effects and hugely increase the effectiveness of individual sorties...

The next is the increasing value of precision weapons; less weapons achieve greater effects and hugely increase the effectiveness of individual sorties. This is particularly relevant in expeditionary operations in terms of maximising the effectiveness of a small force. However, this puts a significant drain on PGM stocks which is a problem even for the US military. The increasing use of PGMs also contributes greatly to the reduction in collateral damage incidents, however intelligence and targeting errors are almost guaranteed to have catastrophic results.

Then there is the issue of command and control philosophy. Network-centricity enables reach-back but it also provides the opportunity for centralised execution as well as centralised control. Whether this is a good or bad thing is a separate issue but it is abundantly clear that in small scale conflicts centralised execution and political involvement in operational, and even tactical, decisions is becoming the norm. However, when the operational level commander is physically separated from his air component commander, particularly in what was essentially an air war, by thousands of miles the JFACC can only be effective if he has delegated command authority – or mission command. But that was not the case in Operation ENDURING FREEDOM where tactical decisions were routinely made at CENTCOM, effectively taking on the JFACC's command function.

The longest USN fast jet sortie was over 15 hours and anyone who has sat on a ejector seat for a few hours can only have sympathy for that pilot...

REACH AND RANGE

The reach and range that air power brings is vital to expeditionary operations. ENDURING FREEDOM has shown that air power can be deployed, and commence operations, globally in very short timescales. Air power can be operated over long ranges or equally, by the use of AAR, for extended duration. The longest USN fast jet sortie was over 15 hours⁵⁷ and anyone who has sat on a ejector seat for a few hours can only have sympathy for that pilot. But, the corollary is that the rate of sortie generation reduces proportionally and that aircrew sustainability becomes the dominant factor. The other observation is that in higher intensity conflicts where the rate of sorties is more important aircraft may need to be based closer to the scene of conflict and the ability to loiter will be much reduced.

The increasing requirement for Combat Support Operations in expeditionary operations is also obvious. But the preponderance of AAR sorties is a function both of the range of bases from the operational area, and the relatively low number of targets with the ability to keep aircraft 'on call' for extended periods. There are obvious implications here in terms of basing, when considering how to provide AAR, strategic reconnaissance and other support for carrier based air power projection particularly when they have no organic AAR capability.

One must also be very careful with regards to some of the unique circumstances in ENDURING FREEDOM when seeking to draw lessons. Firstly air power was employed in an almost exclusively benign environment; this was not the case in the other 3 conflicts and will not necessarily be the case in future. Secondly, the bare, often rolling, and relatively uninhabited terrain allowed the free use of air power. Thirdly there was no issue of interoperability, such as Mk IV IFF and Link 16 compatibility, as the combat operations were exclusively conducted by the US. Lastly, the asset-to-target ratio was such that the campaign could be planned bottom up with respect to the available targets, rather than top down, starting from the required effects, and significant numbers of on-call sorties would not drop any weapons.

...the fundamental principles of the employment of air power that we have been developing since 1915 are as valid today as they ever were...

SCALE OF CONFLICT

The final observation concerns the scale and nature of the conflict. In Afghanistan the US were operating in an asset-rich but target-poor environment. Furthermore the scale, the command and control structures and the targeting policy indicate a merging of the levels of war in a practical sense. There was no real difference between a tactical and a strategic target and what would be considered tactical decisions were being made at the military strategic command level. Again, there is nothing inherently wrong in this and some levels of command may be redundant in small-scale operations.

So where does this lead us in considering the role of air power in the 21st Century? Firstly, air power is the weapon of 1st choice for politicians by virtue of its speed of application and its offering an alternative to major land operations; it may equally be the only option available. Secondly, Trenchard's dictum that air power is inherently an offensive force is equally true today; air power has been the dominant force in recent conflicts but never in isolation. Thirdly, the reach, range and rate of application of air power in an expeditionary context can not be achieved without the enablers: AAR, strategic reconnaissance and strategic lift. Air power also has the value of repetition; once a major land formation is deployed it is there for a single purpose and once a submarine has fired its 12 or more TLAM its reload time is measured in days or weeks; but aircraft can be repeatedly used over vast areas and at differing targets each time. However air power is inherently joint in its application and its best effects are achieved by the integration of all possible sources of information. Fourthly, information technology, political necessity in terms of legitimacy and the scale of some conflicts are driving tactical decision-making into the military strategic level and sometimes higher. Whilst this provides an opportunity to streamline command structures it also has inherent dangers in being misapplied in larger conflicts, or in the wrong structures being in place if a conflict expands. Then there are also resource issues: PGMs are becoming the desired weapon both to reduce the number of sorties required and to reduce collateral damage to the minimum. However, stocks are such that large numbers of unguided weapons will need to be used in the larger scale conflicts; this will require a conscious decision to use them wherever they are an appropriate weapon in order to conserve PGM stocks for more lucrative targets. The increasing use of PGMs also accentuates the need for accurate intelligence and targeting. Furthermore, extended missions place a premium on having sufficient, rested, crews. Lastly, every conflict is unique and one lesson that must not be drawn from ENDURING FREEDOM is that control of the air is a given; the other 3 operations and in particular the ability of the Serbs to learn from previous conflicts and provide a very hostile environment in the face of overwhelming NATO air power gives the lie to this. It therefore appears that the fundamental principles of the employment of air power that we have been developing since 1915 are as valid today as they ever were – but like all doctrine they still require judgement in their application.

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- 8 DoD briefing 25 Oct 01.
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- 11 Report of the Secretary of the Air Force: Annex to the Secretary of Defense's Annual Report to the President and Congress, 2002, page 139.
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A DH9A which equipped
squadrons in Palestine

General Sir Edmund Allenby's joint operations in Palestine, 1917-1918

By Dr John Mordike

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RAAF Base, Fairbairn, Australian Capital Territory

British Prime Minister Lloyd George was disappointed over the results of the offensive he had pressed for at Arras in April 1917. He turned his hopes from the Western Front in France to the Middle East. A victory in Southern Palestine leading to the capture of Jerusalem could serve to bolster flagging spirits on the conduct of the war and perhaps lead to the defeat of Turkey. Such an undertaking needed a capable general, one that was experienced and confident, able to inspire a force that had stagnated under the confident leadership of General Sir Archibald Murray.¹ General Sir Edmund Allenby, having been removed from his command of the 3rd British Army by Haig after Arras, was an ideal candidate.²

Sir Edmund Allenby



Briefing Allenby in London in June 1917, Lloyd George told him that he wanted Jerusalem 'as a Christmas present for the British nation'.³ But, in June 1917, this seemed to be wishing for too much. The British people were beginning to show signs of war-weariness. Some members of the government doubted that victory over Germany was possible; Lloyd George and several of his senior colleagues were convinced that they were locked into a stalemate on the Western Front. The outlook was bleak. An offensive in Palestine could help restore faith in the government and boost national morale. There were also strategic benefits to be gained. Turkey was judged to be one of Germany's most fragile supports and defeat in Palestine might be the decisive blow that could lead to Turkey's collapse. Britain's post-war stake in the Middle East also had to be kept in mind. Such was the background to Lloyd George's approach to the Middle East theatre and his decision to appoint Allenby to command the Egyptian Expeditionary Force.⁴

Allenby went through the hot, dusty camps of his army like a strong, fresh, reviving wind...

Allenby arrived in Cairo on 28th June, just two weeks after the former commander, General Sir Archibald Murray, had learnt of his dismissal. Murray had mounted two unsuccessful attacks on Turkish defences at Gaza, then ordered his men to dig-in. Months of static warfare had followed.⁵ Allenby's appointment was the turning point for the Egyptian Expeditionary Force, a force described as being tired and listless, pleased to be rid of the remote and hesitant Murray. Field-Marshal Viscount Wavell recorded that the force 'was in the doldrums, becalmed and dispirited, held between failure and success. It needed the wind of Allenby's tremendous personality to fill the sails and give it steerage-way'.⁶ Allenby's most recent biographer Lawrence James wrote that the Egyptian Expeditionary Force's intelligence officer, Colonel Richard Meinertzhagen, now 'looked forward to working under a decisive general known for his "energy and push", which would be welcomed in a torpid army where staff thinking had become stuck in a narrow "trench warfare" groove'.⁷ One of Allenby's first actions was to move his headquarters from the Savoy Hotel in Cairo to the operational area in Kelab. The Australian official military historian, Henry Gullett, recorded that: 'The army applauded the move.' They were even more appreciative of 'the resolution of the Commander-in-Chief' to learn about his own forces and those of the enemy. '[Allenby] went through the hot, dusty camps of his army like a strong, fresh, reviving wind,' Gullett wrote, '... At last they had a commander who would live among them and lead them.'⁸

Murray had never inspired his men like Allenby would. Richard Williams, who commanded No. 1 Squadron, Australian Flying Corps, in the Middle East – and was soon to be promoted to command the Fortieth (Army) Wing – commented that: 'We had never seen the previous Commander in Chief. The only time we were aware of his presence in the area was when we had to provide a patrol over his special train.' 'Allenby stopped all that,' Williams explained approvingly.⁹

The new commander was not without his faults. Allenby was given to outbursts of rage which could only be destructive in personal relationships – behind his back his troops referred to him as 'the Bull', a nickname acquired during 'the grim, dark days on the Western front' where his 'fiery, impulsive, driving temperament ... was ill-suited for leadership'.¹⁰ But it is clear that he had decided to exercise a positive leadership role in the Middle East. Wavell observed that: 'his temper was under better control than in France ... Still, there were occasional explosions ...'¹¹ Despite these outbursts, the new commander was just what the Egyptian Expeditionary Force needed. Within three weeks, Allenby had kindled an air of optimism in the force. 'Allenby breathes success,' Meinertzhagen noted after their first meeting, 'and the greatest pessimist cannot fail to have confidence in him.'¹² On meeting the new commander shortly after his arrival, T.E. Lawrence also noted that he was 'physically large and confident', adding that Allenby was 'morally so great that the comprehension of our littleness came slow to him'.¹³

The new commander also harboured ideas on how he intended to fight in Palestine. Originally a cavalry officer, Allenby was now free of the constraints he had experienced on the Western Front where trench warfare had stifled the conduct of military operations. Instinctively, he wanted to fight in the way that the cavalry would like to fight, in battles 'where boldness and dexterity of manoeuvre held the keys to victory'.¹⁴ And there was no doubt about what Allenby intended to do. 'What had hitherto been a rather casual military adventure with no definite goal,' wrote Gullett, 'was suddenly converted into a stern, clear-cut campaign with nothing short of the complete destruction of the Turkish force in Palestine and the capture of Jerusalem as its immediate objective.'¹⁵

This paper will examine Allenby's joint operations in Palestine from late 1917 to late 1918. The paper will progress in the following stages:

- The Opening Round
- The Prelude to the Final Battle
- Plans for the Final Battle
- The Battle Begins
- Concluding Comments

THE OPENING ROUND

Allenby's offensive to drive the Turks from their defences on the southern frontiers of Palestine began in late October 1917. By this time, he had reorganised the Egyptian Expeditionary Force and had 80,000 front-line troops at his disposal. His force consisted of three corps, one mounted and two infantry. The Desert Mounted Corps, which included Australian, New Zealand and British cavalry, was commanded by Lieutenant-General Sir Harry Chauvel, an Australian officer. XX Corps of three infantry divisions was under the command of Lieutenant-General Sir Philip Chetwode and XXI Corps of three infantry divisions was under the command of Lieutenant-General Sir Edward Bulfin.

...the opposing forces had enjoyed air superiority, largely due to the quality of their machines: German Rumpler and Fokker aircraft

German Fokker Dr.I aircraft





SE5a's serving in Palestine 1918

Now, for the first time, after 17 months in the field, we had aircraft with which we could deal with our enemy in the air

Allenby's force also included an air power component. Lawrence James noted that Allenby was an air power enthusiast. He well understood that in the period before his arrival in the Middle East theatre the opposing forces had enjoyed air superiority, largely due to the quality of their machines: German Rumpier and Fokker aircraft. So, in preparation for the coming battle, Allenby requested more aircraft to eliminate Turco-German air supremacy as well as balloon observation detachments and wireless detachments to assist in the provision of accurate air-to-ground direction of artillery fire.¹⁶ Other vital roles were air reconnaissance and photography. Allenby requested the War Office to bring his aircraft strength to seventy-two machines, which would give his force one more aircraft than the estimated Turco-German total.¹⁷

With an increased strength in air assets, Allenby formed the Palestine Brigade, Royal Flying Corps, on 4 October.¹⁸ It was comprised of two wings. The 5th (Corps) Wing was dedicated to air cooperation and direct support tasks for the surface force. The 40th (Army) Wing was dedicated to counter-air missions and operations in the rear area, such as bombing the enemy's support infrastructure (in the terminology of the time, these were described as strategic operations). One of the 40th Wing's squadrons was No. 1 Squadron, Australian Flying Corps. Towards the end of 1917, the Palestine Brigade started to acquire more advanced aircraft designs. One of its squadrons received the new SE5a and No. 1 Squadron received some Bristol Fighters, obviously because of 40th Wing's counter-air function. Richard Williams, commander of the Australian squadron, recalled that: 'Now for the first time, after 17 months in the field, we had aircraft with which we could deal with our enemy in the air.'¹⁹ The new machines proved to be a vital step forward in achieving air superiority over the enemy.

The attainment of air superiority was only one function for aircraft, and, as Major-General Geoffrey Salmond, Air Officer Commanding RAF Middle East, explained, once air superiority was achieved 'a whole field of operational activities became open to us which until then had been a closed book'.²⁰ Aircraft were to be utilised in many ways for the coming operations. One way was to exploit the aircraft's perspective of the battlefield to acquire information and then to use the aircraft's speed to pass the information to cavalry forces below for a speedy response. Alec Hill wrote about this in his 1978 book on Chauvel of the Light Horse. Hill referred to two early contacts between the light horse and Turkish troops in March and April 1916, just after the force had moved into the theatre. One of the valuable outcomes of these contacts, Hill observed, was the opportunity to practise cooperation between the mounted force and aircraft. 'In both operations,' Hill wrote, 'aircraft reconnoitred far ahead, dropping written reports at the very feet of the troops, while Chauvel was able to keep in touch with his little columns by wireless, carried at this stage on camels.'²¹

Wireless was developed as the war progressed, but the number of sets was limited. Transmitters were placed in some aircraft and new operational procedures were introduced. At the beginning of 1917, the air component of the Egyptian Expeditionary Force was allocated men and wireless sets to develop and to practise what was called 'Artillery Co-operation', that is the procedure of using an airborne observer to call for and adjust artillery fire support. 'It was fully realised that the question of Co-operation between Aircraft and Artillery was one which was destined to have a great influence on the future conduct of operations,' a report on the activities of the Palestine Brigade noted. An intensive training program was established with practice shoots being carried out on an 'almost daily' basis in the Wadi El Arish. During these shoots 'numerous difficulties were experienced and prejudices had to be overcome'. Few observers had any experience with artillery and 'had to be trained from the start'. The gunners were also reported to be 'sceptical as to the value or reliability of Aeroplane Observation'. While there were many other demands on the use of aircraft, sufficient artillery practices had been conducted by the end of March to ensure that 'every Battery of the Front (Field, R.H.A., Heavy and Siege) had carried out practice shoots'. It was reported that the practices demonstrated 'the value of Aerial Observation' and the 'mutual confidence established' brought 'results in subsequent operations which cannot be over-estimated'. In addition to the training of aerial observers, gunners had to be trained in the use of wireless. Signallers were also transferred to the Royal Flying Corps, becoming operational 'before serious operations commenced in October'. This was the time when the 5th Wing was established; two of its squadrons were 'to specialise in Artillery Work'. 'These Squadrons carried out thorough and systematic registrations and destructive shoots before the attack on the Gaza-Beersheba Front,' it was noted. These developments were an indication of the importance of these procedures to the coming operations.²²

Aerial photography was another important function for aircraft. It served two purposes: mapmaking and intelligence. At the beginning of 1917, the existing maps of the area 'were purely small scale topographical charts, shewing [sic] the position of the scattered villages and ruins; the approximate courses of wadis, roads and tracks; together with some spot levels and hachuring'. 'None of these maps,' it was recorded at the time, 'contained sufficient details for modern military purposes, and it was, of course, practically impossible to locate even the approximate position of any photographs on them.' To rectify this shortcoming, aerial photography during 1917 became a function of 'steady progress and expansion'.²³

The use of aerial photography for intelligence purposes was also developed significantly in 1917. At the start of the year, 'no regular system existed for the study of aeroplane photographs, and for circulating the info [sic] obtained from these'. But the information acquired through photography became a valuable resource for planning operations. 'During the period preceding and including the attack on the Gaza-Beersheba line,' it was recorded by staff officers at headquarters, Palestine Brigade, 'photographs were taken daily of all the sectors of importance.' A streamlined process was also developed for distributing the results of the photographic missions. Information was quickly transferred to a map which was itself copied by photography. 'In this way,' it was recorded, 'the latest information as to enemy organisation was placed in the hands of the Corps within four or five hours of the time when the photograph was taken.' In January

1917, 277 photographic exposures were made with 2,493 actual prints being processed. In October, the month of the start of Allenby's operations against the Gaza-Beersheba line, there were 894 exposures and 24,113 prints, a tenfold increase in the use of this method of acquiring and disseminating information.²⁴

The real object of Allenby's attack was Beersheba. It was in this location that water could be found in established wells and this was essential for further operations to the north

The Turkish Eighth Army under the command of Freiherr General Friedrich Kress von Kressenstein occupied the Gaza-Beersheba line, a distance of about 30 kilometres. Von Kressenstein expected that, in mounting an offensive, Allenby would follow Murray's example and make his major thrust against Gaza. Allenby wanted von Kressenstein to believe that this was exactly what he intended to do. Allenby's Wireless Intelligence Unit had intercepted and deciphered a Turkish signal which explained: 'The enemy's commander, General Allenby, was on the Western Front this year. It's understood he is wont to attack after a violent, but short bombardment.' Therefore, Allenby reasoned that an opening artillery barrage on Gaza would lead von Kressenstein to believe that Gaza was the objective. Steps were also taken to ensure that the Turks acquired misleading intelligence that pointed to Gaza as the prime object of Allenby's interest. Bogus wireless transmissions provided further misinformation to reinforce this view.²⁵

The real object of Allenby's attack was Beersheba. It was in this location that water could be found in established wells and this was essential for further operations to the north. Access to water supplies was a major issue for operations in this theatre. By mid-1917, a system had been built to pump water from the Nile and the pipeline and rail link had been extended from Cairo to the southern boundaries of Palestine. Water could be transported and distributed by motor lorries and 30,000 camels dedicated to the task, but the limit at this stage was Beersheba. A cavalry division required some 120,000 gallons a day and an infantry division 60,000 gallons.²⁶

The operation started on 27 October with a heavy bombardment on Gaza by land-based artillery and naval gunfire from sea. This was part of the deception plan to make the Turks believe that Gaza would then be attacked. The move against Beersheba and its water wells started three days later.²⁷ Chetwode's XX Corps approached from the south while Chauvel's Desert Mounted Corps executed an outflanking approach to the east.²⁸ The town was quickly taken on 31 October by a daring charge of the 4th Australian Light Horse. Most of Beersheba's precious water supply was still intact. 'It was a smart little battle,' Allenby wrote to his wife next day, 'Achieved by careful preparation and good staff work. The Cavalry made a 25 mile night march, to turn the Turks' left flank; and the infantry did 15 miles and a battle at the end. All this was based on water supply and ammunition supply – development of wells and pumps, and pushing in of roads, trains and railways; combined with secrecy and feints – all worked well.'²⁹

From Beersheba Allenby's mounted force moved northward engaging withdrawing Turkish forces which fought a series of resolute rearguard actions. Simultaneously, the Turkish positions in Gaza were then engaged by accurate artillery fire which was directed by airborne observers. The artillery fire was not only from land-based batteries. Naval gunfire was also used with the assistance of the airborne observers.³⁰ Pressure was applied to Gaza by advancing infantry from XXI Corps and, under heavy artillery fire, von Kressenstein took the decision to withdraw from the garrison. 'The Turks have had an awful hammering,' Allenby informed his wife, 'We attacked Gaza, early this morning; and got it almost without opposition.'³¹



Allenby was clearly impressed by the terror and destruction caused by his air force; on 25 November he asked the War Office for a further twenty-five machines, up-to-date Nieuport Scouts, to be sent from France

As the Turkish Eighth Army withdrew across the coastal plain, it was engaged by mounted forces and, more destructively, by aircraft that bombed and strafed the retreating forces. As the Turkish forces moved beyond the range of land-based artillery, naval gunfire using aerial observation was also used to engage them.³² Allenby's aircraft executed these functions free from the fear of interference by enemy aircraft, because simultaneous air attacks were made with forty fighters and bombers against two German aerodromes and storage facilities at Iraq el Menshiye and es Tine. It seems that only one enemy aircraft had been able to conduct air reconnaissance during the period of the battle and it had been chased and destroyed before it could report back to its base.³³ Lawrence James noted that 'Allenby was clearly impressed by the terror and destruction caused by his air force; on 25 November he asked the War Office for a further twenty-five machines, up-to-date Nieuport Scouts, to be sent from France.'³⁴

As von Kressenstein's force continued their fighting withdrawal to the north, the New Zealand Brigade rode into Jaffa on 16 November without opposition. The road and rail links between Jerusalem and the coast had been cut.

What was happening in this operation was quite remarkable. In a period of less than three weeks, the Turks had given up their positions on the Gaza-Beersheba line and, as they withdrew some one hundred kilometres north and north-east, suffered punishing attack from mobile surface and air forces.³⁵ Allenby's force now stood ready to take Jerusalem by Christmas, as Lloyd George had wished. But some two weeks of determined fighting remained.

Allenby's force turned inland from Jaffa with a push which put most weight on the Jerusalem-Nablus road, (see map page 24) a move designed to isolate Jerusalem and avoid damage to significant religious sites in the ancient town. There was strong resistance from Turkish forces, but in the end Allenby's forces prevailed through simple weight of numbers. In the final push against Jerusalem on 8 December, the Turks quickly withdrew all their forces and, on 9 December, Jerusalem belonged to Allenby. But Lloyd George, seeking to exploit the achievement for political reasons, wanted the pleasure of announcing the achievement of the taking Jerusalem himself. 'I informed the W[ar] O[ffice];' Allenby wrote to his wife, 'but was not allowed to publish the news before the P.M. had announced it in the House.'³⁶

In a carefully orchestrated piece of theatre, Allenby, flanked by his staff officers, walked into Jerusalem through the Jaffa gate at midday on 11 December. He was to appear as a liberator, not a conqueror. It was a sunlit day and the event was filmed by a crew from the War Office.³⁷

...the complete defeat of the Turkish forces in Palestine and the elimination of Turkey from the war, and it was to this aim that Allenby now turned his attention

Lloyd George had his Christmas present for the nation, but, as H.A. Jones observed in the British official history, after the capture of Jerusalem 'it was impossible for General Allenby to halt'. 'Jerusalem and Jaffa were still within range of Turkish artillery, and it was necessary that the Turks should be pushed back as soon as possible, on either flank of the British Front, far enough to ensure the security of these two towns.'³⁸ Behind these immediate needs lay the more important strategic goal of the complete defeat of the Turkish forces in Palestine and the elimination of Turkey from the war, and it was to this aim that Allenby now turned his attention.

THE PRELUDE TO THE FINAL BATTLE

Allenby established his general headquarters at Bir Salem on the Jaffa-Jerusalem road, about 15 kilometres from Jaffa and 50 kilometres from Jerusalem. The road was the principal artery of communication from east to west. His headquarters was also near the railway. The main aerodrome was close at hand at Ramleh.³⁹

After Allenby's forces had taken Jerusalem, the Palestine Brigade's aircraft were involved in some work with the artillery and a few bombing raids were made against the enemy, but the main focus of activity was reconnaissance of the country to the north. There were many inconsistencies and inaccuracies in existing maps; aerial photographs were required. This work was done by No. 1 Squadron, Australian Flying Corps, which photographed some 1,000 square kilometres of territory in the last two weeks of January 1918. German pilots, flying out of aerodromes at El 'Affule and Jenin were active but the Bristol Fighters and SE5a's were able to maintain air superiority while the photographic work continued.⁴⁰

Allenby concentrated on consolidating his position and in particular making his right flank safe, an area made more threatening by the Judaeian hills to the east. He had to drive the Turks across the Jordan River to prevent them from raiding his positions west of the Dead Sea. Allenby needed a secure base from which to continue his offensive and to make an attack against the Hejaz railway. On 21 February his mounted forces rode into Jericho to find that the enemy had already deserted the town. The main object of securing the right flank had thus been achieved. One important lesson from these operations was that movement in this area was quite slow because of the nature of the land. It was considered to be the most difficult country yet encountered in the campaign. This made the value of aerial photography and reconnaissance all that more important.⁴¹

In the period 8 March to 12 March, the XX Corps executed a general advance through the hills along the Nablus road. This was to gain more room to the north before the next phase of operations.⁴² Allenby then started planning operations east of the Jordan River with the object of taking Es Salt and destroying the Hejaz railway at Amman, a move that would isolate Turkish troops to the south.⁴³ This would assist Emir Feisal and Major T.E. Lawrence with Arab operations against the Turks in the region east and south-east of the Dead Sea.⁴⁴

The force to take Amman set out on the night of 21 March. The first obstacle to be encountered was crossing the Jordan River which had become swollen with torrential winter rains. Normally, these rains should have ceased before the end of March, but for the last half of the month the rains were almost incessant. It was judged that speed was essential element in this operation, but it was not until the 23 March that the main body was across the Jordan.⁴⁵ The wet and cold weather also hampered progress across land, exhausting Allenby's troops and preventing the forward deployment of artillery support. Es Salt was taken with slight opposition, but this was not the case when an attempt was made to take Amman. The delay in crossing the Jordan had given the Turks valuable time to reinforce and strengthen their defences around the town. By 30 March it had become clear that the move against Amman was a failure and the order was given to withdraw. Es Salt was evacuated and the force withdrew across the Jordan. It was the first reversal suffered since Allenby had taken command of the Egyptian Expeditionary Force. ⁴⁶ It was not to be the last. At the end of the first week of April, Allenby attempted to capture Tul Karm. The Turks proved to be too strong and a halt was called to operations.⁴⁷

General Allenby decided to make another, and stronger, raid east of the Jordan. The operation was planned to begin on 30 April. It failed, partly because the Beni Sakhr tribe, who had promised help, failed to participate, but chiefly owing to the surprise intervention of favourably placed Turkish reinforcements. The German commander-in-chief had also positioned the forces which had defended Amman a month earlier across the approach road to Es Salt, strengthening the defensive capabilities in this region. After reviewing the situation, Allenby gave orders for a withdrawal. By the evening of 4 May the force had withdrawn across the Jordan.⁴⁸

In reviewing these operations, Wavell noted that Allenby had suffered another tactical defeat in his second push across the Jordan River, but he claimed that Allenby had at the same time achieved a 'strategical objective', 'since from now onwards about one-third of the whole Turkish forces were maintained east of the Jordan'.⁴⁹ This was to be an important part of the defensive posture adopted by the German commander-in-chief, who had been appointed a few weeks earlier on 1 March to replace General von Falkenhayn. The new commander-in-chief was General der Kavallerie Liman von Sanders. And it is knowledge of this appointment which gives an insight into the way in which the Turkish forces were starting to operate and, as a result, what would happen in closing months of war in this theatre.

In the British official history of the war, H.A. Jones noted that where the previous enemy commander-in-chief 'had a lively belief in the value of manoeuvre for defence as well as for offence', Liman von Sanders 'had more rigid qualities which induced him to pay a strict attention to the value of ground'. As a result, Liman von Sanders developed plans 'aimed at keeping a firm grip on the front' (in other words, holding ground). He deployed his reserves well forward to strengthen his hold on the ground but he lost his ability to manoeuvre. From the time of von Sanders' appointment 'there was a notable stiffening in the quality of the Turkish defence'. This was to be a key development for operations in Palestine. Jones pointed out that, as Allenby's final offensive was executed in the coming months, 'the inflexibility of the strategy of Liman von Sanders contributed to the disaster which overtook the Turkish armies'.⁵⁰ The idea of taking and holding ground was to be confronted with the challenge for which it had no answer: the mobility of cavalry forces when used in concert with the speed, reach, and perspective of aircraft suddenly started a transformation in the way in which battles could be fought. The overwhelming impact of this way of fighting was made all that more devastating for surface forces when they were exposed to an unhindered, punishing application of combat power from the air.

Aerial reconnaissance had revealed that the defences around Tul Karm were being developed as early as March. It was also noticed that the enemy forces were starting to move into the Nablus area. Defences around Amman were receiving attention. These were the first signs of the defensive line being developed by von Sanders. He deployed the Eighth Turkish Army in the area of Tul Karm. The Seventh Turkish Army was deployed to Nablus and the Fourth Turkish Army was deployed to Es Salt.



Deployment of British (blue) and Turkish (red) forces, March 1918

There was little surface activity in Palestine between the failed Es Salt raid in early May and the start of the final offensive in September. This was due mainly to the oppressive heat of the summer months, a factor of some concern because there was no real knowledge of the likely impact on Allenby's force. As the British official Intelligence handbook explained in a reference to the conditions in the Jordan valley: 'Nothing is known of the climate in summer-time, since no civilized [sic] human being has yet been found to spend summer there.'⁵¹ Yet, while the surface forces were largely immobile, the air forces were exerting

a relentless pressure on the German aircrews and gaining unquestioned air superiority. Williams recorded that No. 1 Squadron had continued to receive new Bristol Fighters until March when it possessed a total of eighteen. 'As the squadron obtained additional Bristol Fighters the German aircraft were more frequently sought out and punished,' Williams wrote, 'We were now in the position of being able to make and break contact with the Germans at will and they often did not stand up to it.'⁵² This pressure on German aircrews continued through the summer. Jones wrote in the British official history that: 'It is beyond dispute that during the hot months the German pilots and observers had had a sorry time.' The German aircrews faced 'aeroplanes superior in performance and number, piloted by officers imbued almost to the point of recklessness with the offensive spirit'. The enemy 'could seldom take to the air without being fiercely attacked'.⁵³ The improved technology was certainly a factor but the aggressive spirit of the airmen was also necessary to win the air superiority that was so critical to the coming operations. 'This position was not attained without hard fighting,' Salmond reflected after the war, 'but by August over ninety hostile machines had been destroyed.' 'I want

The German aircrews faced 'aeroplanes superior in performance and number, piloted by officers imbued almost to the point of recklessness with the offensive spirit'. The enemy 'could seldom take to the air without being fiercely attacked...'

to make this point clear, Salmond continued, 'in order to explain how it came about that we were permitted to use the Royal Air Force to such great advantage in the campaign that was shortly to open up.' But Salmond thought that the 'fighting qualities' of the pilots and the 'better machines' were not the only important factors. He emphasised that the other important factor was 'organisation', and by this he meant that the air force had 'complete repairing bases' in Egypt as well as 'large supplies of machines and personnel'.⁵⁴

During the summer, there was also a need for continued reorganisation of Allenby's force due to the higher demands for troop transfers as a result of the threatening conditions on the Western Front. But one positive outcome was the strengthening of the Palestine Brigade in August. The Fortieth (Army) Wing, under command of Williams, incorporated two new elements. One addition was No. 144 Squadron equipped with DH9s. The other addition was 1 Flight, No. 145 Squadron, equipped with SE 5a's. In August, No. 1 Squadron had also received a new Handley Page bomber. 'It was huge by the standards of that time,' wrote Williams, 'a biplane fitted with two Rolls-Royce Eagle VIII engines each of 365 horsepower, the largest engines we had yet heard of, and the only twin-engined aircraft yet seen in that part of the world.'⁵⁵ This bomber was to play an important role at the start of the coming battle. Since the end of 1917, one other squadron, No. 142 had also been added to the Fifth (Corps) Wing.⁵⁶ Liman von Sanders was not so fortunate. During the summer, his force had been sent two shipments of replacement aircraft, but they had been too damaged in transit to be used. The results of the relentless battle for air superiority also fell heavily upon his force. In the months before the final battle his four flight detachments lost many pilots and observers and received no replacements because the German offensive on the Western Front took priority.

It was Allenby's air superiority that turned defeat into disaster for the Turkish armies

Allenby went into the final battle with air superiority and this was to have a profound impact on the outcome. It was Allenby's air superiority that turned defeat into disaster for the Turkish armies.

PLANS FOR THE FINAL BATTLE

The three Turkish armies were spread in defensive positions across a 140 kilometre front from the Mediterranean coast to Amman. They had a total effective fighting strength of about 33,000 men, but it was known that their morale and strength had declined over the summer months. The Turkish forces possessed only two anti-aircraft guns.⁵⁷ The men were not well fed and their animals were short of forage. There had been a number of deserters.⁵⁸

At first Allenby planned on a limited campaign against the Turks. But he had determined that mobility was to be the key feature. As a result of earlier operations in the Judean hills, Allenby had come to the firm conclusion that, if he were to punch through the Turkish line and exploit the mobility and speed of his cavalry in follow-through operations, he would have to do it on the coastal plain.⁵⁹ Therefore, he planned that XXI Corps would break through on the coast and the cavalry would then make for the railway junction, about half-way between Tul Karm and Nablus. The XXI Corps and the XX corps would then advance to the Tul Karm-Nablus line. This strategy meant that the Fourth Turkish Army was not, in the first instance, to be engaged by Allenby's forces.

While Allenby anticipated a successful outcome to such an operation, its scope was somewhat limited. One outcome could be that the Turkish armies might hold their positions around Tul Karm and Nablus and force him into a series of costly offensives. Alternatively, if the Turkish armies decided to retreat from their

The long Turkish domination of Syria and Palestine, and the military power on which it was founded, were to be given their death-blow in the grand manner

positions the greater part of the Turkish forces would escape to the north. But Allenby started to think on a more ambitious scale for his coming offensive. Wavell wrote that:

'One morning, not long after his announcement of the original plan, [Allenby] returned from a morning ride, strode into his office, and informed his Operations Staff that he had decided on an extension of his plan which aimed at nothing less than the complete destruction of the Turkish armies'.⁶⁰

Allenby planned that, instead of turning inland towards Tul Karm after exploiting the breakthrough, the cavalry should continue at speed up the Plain of Sharon to a point near Haifa then turn inland into the Plain of Esdraelon some fifty to sixty-five kilometres behind the Turkish armies.

This daring idea was the basis of the final battle, 'one of the most crushing strokes ever delivered in war', as Wavell put it.⁶¹ The commander left the detailed planning to his staff and the Corps commanders, but his basic idea was to be kept intact. 'The long Turkish domination of Syria and Palestine, and the military power on which it was founded,' wrote Wavell, 'were to be given their death-blow in the grand manner.'⁶²



Allenby's plan for the final battle, September 1918

0 30
Miles

The timing of the battle was simply determined. The first winter rains were due at the beginning of November and there was a possibility that, except where there were a few established roads, the Plains of Sharon and Esdraelon might become impassable for transport. Therefore, the timing of the battle was set for mid-September.

Although there had been some changes in the summer months, the essential shape of Allenby's force remained the same. He had organised the remaining divisions into the XX Corps (commanded by Chetwode) and the XXI Corps (commanded by Bulfin), the Desert Mounted Corps (commanded by Chauvel). One other component that was to operate independently was known as Chaytor's Force. It was commanded by Major-General Sir Edward Chaytor and it included the Anzac Mounted Division, an Indian infantry brigade and a few other infantry battalions.

The plan called for the covert massing of the infantry from Bulfin's XXI Corps and Chauvel's cavalry along the 12 kilometres front between the coast and the railway, an area that could be called the coastal plain. It is estimated that the Turks had a strength of 8,000 infantry supported by about 120 guns on this part of their defensive line. Allenby planned to concentrate 35,000 infantry supported by nearly 400 guns and a follow-through cavalry force of 9,000.⁶³ Sea control by the Royal Navy ensured the safety of Allenby's left flank. Naval gunfire would also support the operation, as it had in the previous year when the Gaza-Beersheba line was taken. It would be an overwhelming attack which would punch through the Turkish defence system and allow the cavalry force to use its greater mobility to move quickly to the north. XXI Corps would turn inland and head towards Nablus, but the cavalry would penetrate more deeply, pushing rapidly through to El Affule on the second day of the operation. Being only 10 kilometres south of Nazareth, the location of Liman von Sanders' headquarters, a detachment of cavalry would ride forward and attempt to capture the enemy commander-in-chief and his staff. The mounted force would also be within striking distance of Beisan. By taking Beisan in addition to El Affule Allenby's forces would deny the Turks a withdrawal route west of the Jordan River.

While this was taking place, Chetwode's XX Corps was to advance north along the axis of the Nablus road. By way of a diversion, Chaytor's Force was to conduct demonstrations in the Jordan valley east of the river with the object of leading the Turks to believe that this was where the major attack was to take place. One hundred kilometres further to the east and beyond the reach of Allenby's main force, the Arabs under Emir Feisal and Lawrence were to cut the rail links north, south and west of Der'a, thus denying the Turks a vital line of communication.⁶⁴

THE PALESTINE BRIGADE, ROYAL AIR FORCE

The Palestine Brigade consisted of the following squadrons⁶⁵ :

Fifth (Corps) Wing

Headquarters - Ramleh

14 Squadron, RAF – Junction Station: 16 RE8s, 3 Nieuports

113 Squadron, RAF – Sarona: 16 RE8s, 5 Nieuports

142 Squadron, RAF, (less 1 Flight) – Sarona: 7 Armstrong-Whitworths

1 Flight – Jerusalem: 5 RE8s



An SE5a of
111 Squadron

Fortieth (Army) Wing

Headquarters – Ramleh

1 Squadron, Australian Flying Corps – Ramleh: 18 Bristol Fighters, 1 Handley Page

111 Squadron, RAF – Ramleh: 15 SE5a's

114 Squadron, RAF – Junction Station: 13 DH9s

145 Squadron, RAF, HQ and 1 Flight – Ramleh

Fifth Wing and Fortieth Wing - Total Aircraft Numbers

RE8s: 37

Nieuports: 8

Armstrong-Whitworths: 7

Bristol Fighters: 18

SE5a's: 21

DH9s: 13

Handley Page: 1

A total of 105 machines of all types.

In addition to powered aircraft squadrons, the brigade also included No. 21 Balloon Company of three sections. The company's headquarters was at Sarona.

The Fifth (Corps) Wing was commanded by Lieutenant-Colonel Charles Burnett, who would become the RAAF's Chief of Air Staff during World War II.

The Fortieth (Army) Wing was commanded by Lieutenant-Colonel Richard Williams, an officer of the Australian Flying Corps. Williams had formerly been the commander of No. 1 Squadron, AFC. In June 1918 he was promoted to the rank of lieutenant-colonel and given command of the wing. Williams was 27 years-of-age. 'I am sure that my appointment to the command of the wing,' he later recalled, 'was the direct result not only of my length of service on that front but also of the excellence of the work of No. 1 Squadron over the preceding 12 months. Flight commanders, air crews, NCOs and men, technical and otherwise, were excellent. I could have no better.' There was one small legal difficulty, however. Williams commented that a dominion officer was unable to 'exercise powers of punishment over British personnel' and, therefore, he was 'granted a supplementary commission in the Royal Air Force'.⁶⁶

Two of the Fortieth Wing's three RAF squadrons were also commanded by Australians. Peter Drummond had No. 111 Squadron, while Edgar Percival had No. 145 Squadron.⁶⁷

ROLES ALLOCATED TO SQUADRONS FOR FINAL BATTLE

Fifth (Corps) Wing

No. 113 Squadron was designated to cooperate with XXI Corps in the coastal sector.

No. 142 Squadron (less 'C' Flight) was designated to cooperate with the Desert Mounted Corps in the coastal sector. This was the cavalry force which was to use its mobility to exploit the breakthrough by XXI Corps.

No. 14 Squadron was to cooperate with XX Corps which was to advance north on the axis of the Nablus road.

'C' Flight, No. 142 Squadron was designated to cooperate with Chaytor's Force in the Jordan valley. The primary role of this force was conduct diversionary tactics to lead the Turks to believe that a major attack could be expected in this sector. Chaytor's Force also had a role to play in the protection of Allenby's right flank.

Fortieth (Army) Wing

No. 1 Squadron, AFC, and No. 111 Squadron, RAF, No. 144 Squadron, RAF, and 1 Flight of No. 145 Squadron, RAF, were free of direct support functions and were designated to conduct strategical reconnaissance and offensive operations.⁶⁸

As commander-in-chief, Allenby issued no specific instructions to the air component for the coming battle, but the senior air staff officers were involved directly in the planning process. They were encouraged to suggest ways in which aircraft could be used to their greatest effect.⁶⁹ Air reconnaissance, aerial photography and the battle for winning and maintaining air superiority had been vital ongoing contributions, but aircraft had other significant roles to play in the battle.

'Immediately [Allenby's] general plan was received,' Salmond recalled, 'the senior Air Officers were called into conference and the enormous opportunities of realising to the full the possibilities of the air arm, to achieve results which we had dreamed of, were realised.' 'To start with,' Salmond continued, 'our

command of the air enabled us to practically guarantee the concealment from the enemy of General Allenby's plans, it enabled us to suggest plans for still further misleading the enemy, it made it possible for us to destroy his communication centres, and lastly it enabled us to contemplate the destruction of his retreating forces.'⁷⁰

Concealment and deception were important in the preparatory phase for the battle. Every attempt was to be made to convince von Sanders that the focus of the attack was in the east, not the coastal plain in the west. Therefore, it was decided that enemy air activity in the eastern sector would not be challenged, so allowing enemy observers to conduct 'fleeting reconnaissances if they attempted to do so'. It was known that enemy air reconnaissance would be conducted at an altitude above 14,000 feet as a matter of practice, so preparations were made to deceive aerial observers to believe that the cavalry force was concentrated in the eastern sector. Camps were left standing, horses dragged brushwood about to create dust clouds, and dummies were placed in horse-lines. After the war, Salmond explained that this part of the deception plan was suggested by the air officers. 'We knew that if we left this area unpatrolled,' Salmond observed, 'the German airmen would report on it and apparently they did.'⁷¹ At least one enemy aircraft had conducted an aerial reconnaissance just four days before the battle was to begin. The aerial reconnaissance report was among documents captured when the enemy's general headquarters was taken. The captured documents revealed that von Sanders and his staff were convinced that Allenby would attack in the east, across the Jordan, and the aerial reconnaissance report did not provide evidence contrary to this view. It read: 'Some regrouping of cavalry units apparently in progress behind the enemy's left flank; otherwise nothing unusual to report.' By this stage, Allenby had concentrated more than 10,000 horsemen behind his left flank and von Sanders and his staff were completely ignorant of this development.⁷² While the conditions of air superiority assisted elements of the deception plan, there were a number of other important aspects.

After Allenby's cavalry force - less the Anzac Mounted Division - had covertly moved across to the west, wireless messages were transmitted from its former headquarters in Jericho as though it was still in this location. Elaborate steps were also taken to deceive enemy agents into thinking that Allenby's general headquarters was about to be shifted to the east from its location at Bir Salem on the plain into a hotel in Jerusalem. The hotel was cleared, telephone lines were laid and offices allocated and marked.⁷³

In the west - that is, on Allenby's left flank - steps were taken to conceal the concentration of forces. Movements were made by night. Forces were warned of approaching enemy aircraft so that concealment action could be taken. Lights were prohibited at night and no wood, only solidified alcohol, was to be used in cooking fires.⁷⁴

Special preparations were made to exploit aircraft in the coming battle. The nature of the land dictated that should the Turks be forced to withdraw from their prepared positions then they would be confined to certain withdrawal routes. There were five main lines of retreat that they might use:

- Tul Karm to Samaria
- Samaria to Jenin
- 'Anebta, on the Tul Karm road, to Jenin
- Nablus - Wadi el Far'a - Jisr ed Damieh
- Balata-Khurbet Ferweh-Beisa



Possible Turkish withdrawal routes

0 30
Miles

All of these routes were photographed from the air in the period before the battle. Defiles were noted. If bombing attacks could be made against retreating Turkish transport when they passed through these choke points then the withdrawal could be slowed allowing greater damage to be inflicted. After the battle began these routes were to be kept under constant surveillance by Bristol Fighters of No. 1 Squadron. These aircraft were equipped with long-range wireless sets so that headquarters staff would know 'the times and places best suited for a concentrated bombing offensive'.⁷⁵

As in all battles, the passage of information to commanders was considered to be a vital element, especially for the breakthrough forces on the left flank that were to use mobility and speed to encircle and cut-off the Turkish armies. No. 142 Squadron, which had been designated to cooperate with the cavalry on left flank, was to keep in touch with the leading cavalry divisions and to inform the cavalry headquarters and Allenby's general headquarters of their progress. The squadron was also to maintain liaison between these two headquarters. A liaison officer had been attached to the cavalry headquarters with equipment that enabled aircraft to pick up messages without landing. The infantry force, XXI Corps, also had its designated cooperation squadron, No. 113 Squadron, organised to assist in the passage of information. Signalling panels, klaxon horns, flares, disks and, where the fall of artillery was to be adjusted urgently, wireless were all to be used for communication between the ground forces, aircraft and headquarters.

Where aircraft were to play an important role in acquiring and disseminating information between the various formations and headquarters of Allenby's forces, it was also recognised that they could play a significant role in denying information to the enemy forces, especially the senior command elements

No. 113 Squadron was also ready to deny information to the Turkish forces by covering the advancing troops with smoke screens during the critical early phase of the initial attack. The smoke screens, which were about 400 metres long, were to be created by dropping sixty pyrotechnic devices from aircraft. The equipment for this operation had been invented by RAF personnel in the Middle East.

Where aircraft were to play an important role in acquiring and disseminating information between the various formations and headquarters of Allenby's forces, it was also recognised that they could play a significant role in denying information to the enemy forces, especially the senior command elements. If this could be done effectively, a type of paralysis could be imposed on the enemy, who, denied information, would be unable to know how to react, or, indeed, to know whether any reaction at all was required. In the official history, Jones observed that 'for the success of General Allenby's scheme it was desirable ... that, once the battle began, knowledge of the early forward movements of the British cavalry in the coastal plain should remain hidden from the enemy higher command'. Salmond made a similar comment: 'Once the battle was joined it was most important that the enemy should not realise the advance of the cavalry round their right flank.' Salmond also explained that, as result of discussions by air staff on denying information to the enemy, the decision was taken to destroy the enemy's communication centres.⁷⁷ This determined how some aircraft were employed from the outset and Jones noted that it 'reveals how carefully the staff had planned'.⁷⁸

THE BATTLE BEGINS

The battle began in the early hours of 19 September, three days after an Arab force under Colonel T.E. Lawrence had started operations to cut the Hejaz railway at Der'a and isolate the Turkish armies.⁷⁹ Aircraft delivered the first carefully considered blows. These were directed against the enemy's communications systems – the telegraph and telephone centres – and the headquarters of the enemy armies.⁸⁰ Their locations had been determined during the preparatory phase using intelligence sources and air photographs. Aerial reconnaissance of enemy headquarters and 'points where telephone and telegraph exchanges were suspected' had been undertaken by 5th Corps aircraft in the early weeks of September.⁸¹

Captain Ross Smith of No. 1 Squadron, AFC, set out at 1.15 a.m. in the Handley Page bomber carrying sixteen 112-lb bombs. His target was the telephone exchange of the Turkish army group at El 'Affule. Smith was followed at 6.30 a.m. by five DH9s from No. 144 Squadron of Richard Williams' Fortieth (Army) Wing. They attacked the same target with four 112-lb. bombs and thirty-two 20-lb bombs. The attack was repeated at 11.25 a.m. by eight pilots from the same squadron.⁸²

Commencing at 5.20 a.m., attacks were also made against the headquarters and the telephone exchanges of the Turkish Eighth Army at Tul Karm and the Seventh Army at Nablus. Aircraft from No. 144 Squadron and No. 142 Squadron of the Fifth (Corps) Wing carried out these raids. Three minor Turkish headquarters were also bombed by No. 14 Squadron.⁸³

The bombing raids were made without interference from enemy aircraft, largely as a result of the air superiority that had been gained by aggressive counter-air operations by technically superior aircraft over the summer months. This dominance was enforced on the day the battle began by maintaining constant patrols by Fortieth (Army) Wing SE5a's over the main enemy aerodrome at Jenin. Salmond explained another important reason for this particular action to General Sykes, the British Chief of Air Staff: 'the object being to prevent the cavalry turning movement from being observed in the critical stages'.⁸⁴ As a result of the constant air patrol over Jenin, no German aircraft left the ground that day and the enemy was denied vital information, ensuring that surprise was achieved.⁸⁵

Bomb damage assessments of the attacks against the communication centres and headquarters could not be made at the time, but the British official history contains the following statement by Liman von Sanders concerning the air operations on the first day of the battle:

'Shortly after daybreak British air squadrons appeared over the head-quarters of the Seventh and Eighth Armies, over the camps of the various corps head-quarters, and over the central telephone offices of the Army Group at 'Affule. From low height they attacked with bombs and destroyed part of the telephone line ... Telephonic and telegraphic communication between Tul Karm and Nazareth [von Liman's headquarters] ceased about 7 a.m. The wireless station of the head-quarters of the Eighth Army also failed to reply when called.'⁸⁶

While the air attacks were in progress, XXI Corps launched its attack against the Turkish position on Allenby's left flank at 4.45 a.m. Two smoke screens were laid by aircraft to cover the advancing troops from view. One was successful but there were problems coordinating the other screen with the surface force, so it was laid across the frontage of one of the enemy positions. Within a short time the infantry had overwhelmed the enemy and taken their positions.

Exploiting the breakthrough, the cavalry began their advance along the beach at 7.00 a.m. The very nature of such operations, where speed and manoeuvre were key features, meant that tactical decision making by junior officers and men was essential. Allenby's plan would fail if the operation depended on decisions by a senior commander located in the rear areas. At the outset, there was an early indication how information acquisition, a quick decision and speed of manoeuvre could bring decisive results. One of the aircraft from No. 113 Squadron, which had been designated to provide artillery observation for XXI Corps, noticed a house and an orchard a short way ahead of the leading elements of the cavalry. Flying low over the area the pilot and his observer discovered that the orchard was occupied Turkish troops and transport. A note was written and dropped to the approaching elements of the cavalry. They put in a quick attack, taking the Turks by surprise. Sixty prisoners were captured with two guns and twelve wagons at a cost of one life and two men wounded.⁸⁷

At midday, air reconnaissance revealed that the Turkish forces were retreating towards Nablus along one of the roads that had been previously photographed from the air. All available aircraft were dispatched to bomb the retreating column in a defile where it was impossible for transport to leave the road. Bristol Fighters, DH9's, and SE5a's from Richard Williams' Fortieth (Army) Wing and a squadron from the Fifth (Corps) Wing executed the sustained attack. These aircraft were relieved every half-hour. The damage was extensive. Liman von Sanders commented that the aircraft attack 'covered the roads with dead men and horses and shattered transport'.⁸⁸ Next day, Allenby saw the damage that his aircraft had inflicted. 'I was at Tulkeram [sic] today,' he wrote to his wife, 'and went along the Nablus road. It was strewn with broken lorries, wagons, dead Turks, horses and oxen, mostly smashed and killed by our bombing aeroplanes.' The air attacks were to continue. 'I think I ought to capture all the Turks' guns, and the bulk of his army,' Allenby concluded.⁸⁹ A young Australian observer with No. 1 Squadron, Lieutenant H.B. Fletcher DFC also commented on the impact of air attack on the enemy forces. 'Prisoners were unanimous in saying that the bombing was horrible and one of the main items in their defeat,' Fletcher wrote, 'The bombing of the Tul Keram [sic] – Nablus Road had demoralised the troops on it and as soon as the

the bombing so demoralised the troops that in almost every occasion transport, guns and prisoners were captured without firing a shot

5th Light Horse brigade put in an appearance they put up their hands and waved white flags and continued to do the latter whenever Aeroplanes flew overhead. ... Light Horse Officers are practically unanimous in saying that the bombing so demoralised the troops that in almost every occasion transport, guns and prisoners were captured without firing a shot, and they were delighted with the co-operation of the Air Service.⁹⁰

The first day of operations amounted to a catastrophe for the Eighth Turkish Army. Two Turkish divisions were destroyed as fighting forces. Seven thousand Turkish troops were taken prisoner along with one hundred guns. 'I think the Turkish Army is practically destroyed,' Allenby informed his wife. 'My losses are very slight.'⁹¹

In the meantime, the cavalry were still advancing. It appeared that they would reach El 'Affule before dawn on the second day, so the Handley Page bomber executed a night bombing attack against the Jenin station and aerodrome, destroying three enemy aircraft and damaging others.⁹²

Air reconnaissance early on the morning of 20 September revealed that most Turkish camps in the western sector had been burnt or abandoned. Jenin aerodrome was obviously in the process of being evacuated. There were still four aircraft on the aerodrome at El 'Affule, but air reconnaissance aircraft could see the cavalry forces approaching rapidly. Within hours the aerodrome at El 'Affule had been taken and from that afternoon it was used as an advanced landing ground for reconnaissance aircraft. Supplies of petrol, oil and spares were flown in to the advanced field from Ramleh and Sarna. As planned, a forward element of the cavalry force, the 13th Brigade, made a quick dash to Nazareth, arriving soon after dawn. The breakdown in enemy communications meant that von Sanders' headquarters was taken by surprise. The cavalry captured the Army-Group headquarters and documents, but only just missed taking Liman von Sanders, who made his escape in his staff car.⁹³

Thirty hours after the offensive commenced, aircraft were operating out of an aerodrome that had been sixty-five kilometres inside the Turkish lines when the offensive was launched. The Eighth Turkish Army had been routed, but air reconnaissance revealed that the Seventh Turkish Army around Nablus was largely intact and only slowly starting to show signs of stirring. But the problem for this force was that the rapid advance in the west and the encircling move to their north had already cut off their lines of retreat in that direction. There was only one way they could go and that was east across the Jordan River. And, remarkably, all was quiet in that direction. Such was the breakdown of communications, the Fourth Turkish Army at Es Salt showed no sign that it was aware that anything was happening west of the Jordan River.⁹⁴

While the rout of the Eighth Army had been taking place, Chetwode's XX Corps had been moving northward on the 19 and 20 September through difficult country attempting to engage the Seventh Turkish Army and, if possible, to cut its only withdrawal route along the Wadi el Far'a to the east. By 21 September, however, it became abundantly clear that elements of XX Corps did not need to cut this withdrawal route.⁹⁵

At first light on 21 September two Bristol Fighters from No. 1 Squadron found that the Seventh Turkish Army was retreating from Nablus through Balata and then on to Khurbet Ferweh and Ain Shibleh along the Wadi el Far'a road. On the left-hand side of the road there were steep hills and on the right-hand side of the road a sheer precipice. The Australian airmen counted about six-hundred horse-wagons and guns between Balata and Khurbet Ferweh. There were about another two-hundred horse-transport beyond Khurbet Ferweh approaching Ain Shibleh. Other long columns were moving along the Wadi el Far'a

The Wadi el Far'a soon became choked and the attacks turned into a sickening slaughter which deeply affected the airmen

towards Ain Shibleh from the other direction. The Bristol Fighters were equipped with wireless and arrangements were made to begin concentrated bombing and strafing attacks. In the meantime, the two Australian aircraft started their own attack on the column between Balata and Khurbet Ferweh. The attacks were organised so that two aircraft arrived over the route every three minutes and, additionally, a formation of six aircraft would attack the column of Turks every 30 minutes. In the Australian official history, Cutlack recorded that the raids continued all day. No. 1 Squadron, No. 144 Squadron, No. 111 Squadron and No. 145 Squadron – that is the squadrons of the Fortieth (Army) Wing – were the primary attacking force, but the three squadrons of the Fifth (Corps) Wing also made a contribution. Just over 9 tons of bombs were dropped and 56,000 rounds of machine-gun ammunition were fired into the troops below. The Wadi el Far'a soon became choked and the attacks turned into a sickening slaughter which deeply affected the airmen. Few Turks returned fire and only two aircraft were downed with the loss of their occupants. Cutlack observed that: 'In all the history of war there can be few more striking records of wholesale destruction.'⁹⁶

When surface forces came to the site next day they discovered that the bombs themselves had caused only part of the damage. Other damage was a result of the blind panic that took hold of the Turks. Motor lorries had crashed into other transports and retreating troops and horses had bolted. The equipment that choked the defile amounted to some 100 guns, 55 motor lorries, 4 motor cars, 837 four-wheeled wagons, 75 two-wheeled wagons, and 20 water carts and kitchens.⁹⁷

By the evening of 21 September, the Seventh Turkish Army and the Eighth Turkish Army were ineffective fighting forces. Although some members of the Seventh Army had managed to escape to the north and attempted to cross the Jordan River, the cavalry engaged them on 24 September and took some 5,000 prisoners.⁹⁸

Remarkably the Fourth Turkish Army around Es Salt showed no signs of stirring until the afternoon of 22 September, that is a full day after the other two Turkish armies had been effectively destroyed. Chaytor's Force had not had the strength to deal with the Fourth Army in an outright attack, but when the Turks learnt of the debacle to the west they began a withdrawal, giving Chaytor his chance to begin harassing them. The Arabs also cooperated by containing the Turkish army and by obstructing its retreat route to the north.

As the Fourth Army conducted its retreat it became a target for No. 1 Squadron aircraft. There were no defiles along their route but the Turkish force concentrated at Amman. Air attacks were conducted throughout the day on 23 September. There was a lull in the attacks on 24 September. On that day, Allenby wrote to his wife: 'Telegrams of congratulations are pouring upon me. I, myself, am almost aghast at the extent of the victory! I have taken Es Salt, E.[ast] of Jordan; and, by now, my Cavalry are probably at Amman on that flank. Haifa and Acre are in my hands, and patrols are moving to Lake Tiberias.'⁹⁹

Operations resumed in earnest next day. Chaytor's Force did not give chase to the fleeing Fourth Army but, at 2.00 p.m. that afternoon, Chaytor's Force captured Amman. This force occupied this position to intercept the Turkish Second Corps which was withdrawing from the south; it surrendered without fighting. Minor operations to clean up groups of retreating Turks continued for a few days. At the end of that time Chaytor's Force had taken 10,322 prisoners, 57 guns, 132 machine-guns, together with stores and railway rolling stock.¹⁰⁰

Allenby had taken Palestine by 26 September. Two Turkish armies – the Seventh and the Eighth – had been annihilated and the remnants of the Fourth Turkish Army were in retreat. Some 50,000 prisoners had been taken. It had been the most spectacular campaign of the war.

'You are a butcher – you call that fighting.' Somehow the military mind perceived killing the enemy from the air to be morally inferior to killing them with bullets, bayonets and shells

There is much to be learnt from Allenby's joint operations in Palestine in 1917-18. Not the least is the importance of competent leadership to inspire fighting forces and to give purpose and direction to the execution of operations. Allenby's impact on the Egyptian Expeditionary force echoes throughout accounts of the operations, whether official histories or personal memoirs. Allenby's confident leadership was the cornerstone of the operations.

To appreciate the operations themselves it is necessary to take a broad perspective. To focus in on one element, to take a narrow view, is to miss the important lessons. Yet it seems that many have turned their backs on the broad perspective. In his summing up of the campaign, Lawrence James noted that: 'At the time and for some years afterwards, Allenby's success was entirely attributed to his deployment of cavalry ...' James continued: 'Less notice was taken of the part played by the [air force], which between 19 and 25 September had wreaked havoc on exposed Turkish columns jammed along narrow passes. Not as glamorous as the cavalry charge but infinitely more deadly, the continual bombing and machine-gunning of retreating men assured Allenby's victory.' James pointed out that, 'revealingly', the air supremacy won by the air force 'was given only one paragraph in the official military history'.¹⁰¹ In that paragraph, Captain Cyril Falls commented simply that air supremacy 'greatly ... assisted' the achievement of the surprise concentration of the forces behind Allenby's left flank.¹⁰² Another facet of such prejudice is revealed in a letter that Major-General Salmond sent to Major-General Sykes, Chief of the Air Staff. Describing the carnage caused by air attack on the Turkish troops during the final battle, Salmond said that Lieutenant-General Bulfin had confronted him with the comment that: 'You are a butcher – you call that fighting.'¹⁰³ Somehow the military mind perceived killing the enemy from the air to be morally inferior to killing them with bullets, bayonets and shells. Yet we need to put prejudice aside if we are to learn from Allenby's campaign.

The mobility of cavalry forces when used in concert with the speed, reach, and perspective of aircraft had transformed the way in which battles could be fought, especially with the advanced types of aircraft that were available in the last year of the war. Other technological developments, such as radio, added to this capability. But we need to be clear about the nature of the relationship between the cavalry and aircraft. It would be wrong to claim that aircraft simply supported the surface force. Of course, in certain roles – close air support and artillery observation, for example – it would appear that this was the case, but in the case of the Palestine campaign there was more to consider.

Speedy information acquisition and dissemination were fundamental requirements for the type of operation that Allenby conducted. Aircraft played a central role in this process by undertaking reconnaissance, both tactical and strategic to use the terminology of the time.¹⁰⁴ Aircraft provided the detailed aerial photography necessary for gaining knowledge about the country that lay ahead of the advance. Aircraft were also capable fighting platforms. In the space of a few hours, they destroyed the communication network between von Sanders' general headquarters and the headquarters of the Eighth, Seventh and Fourth armies. This and the ability to keep German aircraft on the ground denied the enemy commanders vital information about the nature of the attack, especially the daring thrust by the cavalry up the left flank. Aircraft worked in cooperation with components of the attacking forces providing tactical reconnaissance, artillery observation, and close air support. Aircraft played a key role in the passage of information. Aircraft maintained air supremacy during the battle. Aircraft concentrated over the routed enemy armies and brought about their destruction. Aircraft did all this with the speed and reach that surface forces do not have. But this is not to say that the cavalry did not have a vital role to play. There can be no doubt that they did. The one big lesson from Allenby's Palestine campaign is the dynamic synergism achieved by aircraft and cavalry – that a dynamic, mobile form of warfare using information dominance and manoeuvre totally overwhelmed the entrenched enemy. Another import lesson is that no one seems to have learnt this at the time. The narrow focus – prejudice – produced distorted accounts of the campaign. As von Sanders had dug trenches in Palestine to hold his ground, after the war, other men dug trenches in their minds.

Notes:

- 1 L. James, *Imperial Warrior: The Life and Times of Field-Marshal Viscount Allenby 1861-1936*, Weidenfeld and Nicolson, London, 1993, p. 106.
- 2 *Ibid.*, p. 105.
- 3 Field-Marshal Viscount Wavell, *Allenby: Soldier and Statesman*, George G. Harrap & Co. Ltd., London, 1948, p. 155.
- 4 James, *Imperial Warrior*, pp. 111-2.
- 5 *Ibid.*, p. 117.
- 6 Wavell, *Allenby*, p. 157.
- 7 James, *Imperial Warrior*, p. 114; & F.M. Cutlack, 'The Australian Flying Corps', *The Official History of Australia in the War of 1914-1918*, Vol. VIII, University of Queensland Press in association with The Australian War Memorial, St Lucia, 1984, p. 63.
- 8 H.S. Gullett, 'Sinai and Palestine', *The Official History of Australia in the War of 1914-1918*, Vol. VII, Angus & Robertson, Sydney, pp. 356-7.
- 9 R. Williams, *These Are Facts: The Autobiography of Air Marshal Sir Richard Williams, KBE, CB, DSO*, The Australian War Memorial and the Australian Government Publishing Service, Canberra, 1977, p. 71.
- 10 Wavell, *Allenby*, p. 217 & p. 165.
- 11 *Ibid.*, p. 166.
- 12 James, *Imperial Warrior*, p. 115.
- 13 T.E. Lawrence, *Seven Pillars of Wisdom*, Penguin Books, Ringwood, 1962, p. 330.
- 14 James, *Imperial Warrior*, p. 117.
- 15 Gullett, 'Sinai and Palestine', p. 358.
- 16 James, *Imperial Warrior*, p. 118.
- 17 *Ibid.*, pp. 119-20.
- 18 Lecture on Aircraft in the Palestine Campaign by Squadron Leader H.I. Hanmer DFC, Air1/2397/264/1, Public Record Office, Kew.
- 19 Williams, *These Are Facts*, p. 79.
- 20 'Work of the R.A.F. in the Final Offensive in Palestine', Lecture by Sir Geoffrey Salmond, Air1/489/321/1, Public Record Office, Kew.
- 21 A.J. Hill, *Chauvel of the Light Horse: A Biography of General Sir Harry Chauvel, G.C.M.G., K.C.B.*, Melbourne University Press, 1978, p. 70.
- 22 Despatch dealing with the Work of The Palestine Brigade, Royal Air Force, during the period preparatory to and during the Operations which commenced on the 19th September 1918 – 'Review of 5th Wing R.F.C. Wireless Work for 1917 – Sinai and Palestine', Air 1/2415/303/28, Public Record Office, Kew.
- 23 Photographic Work of the R.F.C. in Sinai and Southern Palestine during 1917, Air1/2415/303/28, PRO.
- 24 *Ibid.*
- 25 James, *Imperial Warrior*, pp. 131; see also Extract from 16th Divisional Orders 29.10.33 for Turkish intelligence assessment of Allenby's use of artillery, Allenby 1/8/21, Allenby Papers, Liddell Hart Centre for Military Archives, Kings College, London.
- 26 James, *Imperial Warrior*, p. 122; & Wavell, *Allenby*, p. 168-9, p. 170, p. 173. Note: As experience was gained in Palestine the camels were dispensed with because, while they were well suited to operating in the desert, they were not able to move freely in the broken country of Palestine.
- 27 Wavell, *Allenby*, p. 173.
- 28 James, *Imperial Warrior*, p. 133-4.
- 29 Allenby to his wife, 1 November 1917, Allenby 1/8/17, Allenby Papers, Liddell Hart Centre for Military Archives, Kings College, London.
- 30 Despatch dealing with the Work of The Palestine Brigade, Royal Air Force, during the period preparatory to and during the Operations which commenced on the 19th September 1918, 'Review of 5th Wing R.F.C. Wireless Work for 1917 – Sinai and Palestine', Air1/2415/303/28, Public Record Office, Kew.
- 31 Allenby to his wife, 7 November 1917, Allenby 1/8/20, Allenby Papers, Liddell Hart Centre for Military Archives, Kings College, London.
- 32 Despatch dealing with the Work of The Palestine Brigade, Royal Air Force, during the period preparatory to and during the Operations which commenced on the 19th September 1918, 'Review of 5th Wing R.F.C. Wireless Work for 1917 – Sinai and Palestine', Air1/2415/303/28, Public Record Office, Kew.
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- 35 *Ibid.*, p. 138.
- 36 Allenby to his wife, 11 December 1917, Allenby 1/8/32, Allenby Papers, Liddell Hart Centre for Military Archives, Kings College, London.
- 37 James, *Imperial Warrior*, pp. 139-41.
- 38 H.A. Jones, 'The War in the Air', *Official History of the War*, Vol. VI, Oxford University Press, Oxford, 1937, p. 175.
- 39 Wavell, pp. 197-8.
- 40 Jones, 'The War in the Air', pp. 176-8.
- 41 *Ibid.*, p. 179.
- 42 Wavell, *Allenby*, p. 205.
- 43 Jones, 'The War in the Air', pp. 177-81.
- 44 Jones, 'The War in the Air', p. 183; & Wavell, *Allenby*, p. 208.
- 45 Wavell, *Allenby*, pp. 208-9.
- 46 Jones, 'The War in the Air', pp. 185-90; & Wavell, *Allenby*, p. 209.
- 47 Jones, 'The War in the Air', p. 192.
- 48 Jones, 'The War in the Air', pp. 194-5; & Wavell, *Allenby*, pp. 211-4.
- 49 Wavell, *Allenby*, pp. 214-5.

- 50 Jones, 'The War in the Air', p. 181.
- 51 Wavell, Allenby, p. 215.
- 52 Williams, These Are Facts, p. 80.
- 53 Jones, 'The War in the Air', p. 207.
- 54 Work of the R.A.F. in the Final Offensive in Palestine, Lecture by Sir Geoffrey Salmond, Air1/489/321/1/ Public Record Office, Kew.
- 55 Williams, These Are Facts, p. 91.
- 56 Jones, 'The War in the Air', p. 202 & p. 176.
- 57 James, Imperial Warrior, p. 166.
- 58 Wavell, Allenby, p. 225-6.
- 59 Ibid., p. 205.
- 60 Ibid., p. 224.
- 61 Wavell, Allenby, p. 229.
- 62 Ibid., pp. 224-5.
- 63 Ibid., p. 227.
- 64 Jones, 'The War in the Air', p. 205.
- 65 Ibid., pp. 208-9.
- 66 Williams, These Are Facts, pp. 85-7.
- 67 Ibid., p. 92.
- 68 Jones, 'The War in the Air', p. 210.
- 69 Ibid., p. 210.
- 70 'Work of the R.A.F. in the Final Offensive in Palestine', Lecture by Sir Geoffrey Salmond, Air1/489/321/1, Public Record Office, Kew.
- 71 Ibid.
- 72 James, Imperial Warrior, p. 162.
- 73 Wavell, Allenby, pp. 227-8.
- 74 Jones, 'The War in the Air', pp. 212-3.
- 75 Ibid., p. 216.
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- 77 'Work of the R.A.F. in the Final Offensive in Palestine', Lecture by Sir Geoffrey Salmond, Air1/489/321/1, Public Record Office, Kew.
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- 84 Salmond to Sykes, 'Allenby's Victory over Turks', Air1/725/115/1, Public Record Office, Kew.
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- 86 Ibid., p. 215.
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- 89 Allenby to his wife, 20 September 1918, Allenby 1/9/2, Allenby Papers, Liddell Hart Centre for Military Archives, Kings College, London.
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- 91 Allenby to his wife, 21 September 1918, Allenby 1/9/3, Allenby Papers, Liddell Hart Centre for Military Archives, Kings College, London.
- 92 Jones, 'The War in the Air', p. 219.
- 93 Ibid., p. 222; & James, Imperial Warrior, p. 165; see also, Allenby to his wife, 21 September 1918, Allenby 1/9/3, Allenby Papers, Liddell Hart Centre for Military Archives, Kings College, London.
- 94 Jones, 'The War in the Air' p. 222-3.
- 95 Ibid., pp. 223-4.
- 96 Ibid., pp. 224-5; & Cutlack, 'The Australian Flying Corps', pp. 160-1.
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- 104 Cutlack, 'The Australian Flying Corps', t/n 4, p. 70.

Winged Defence:

Answering the critics of Airpower

By Col Philip S Meilinger (USAF Rtd)

Bohlen synthetic oil plant under attack

The use of airpower, and specifically strategic bombing, has frequently generated controversy. Even before the 'aeroplane' ever flew, debates have raged over its utility, effectiveness, efficiency, legality and even its morality. These debates continue despite (or perhaps because of) the hundreds of books that have been written on the subject and the scores of examples we have been able to witness. As the old saying goes, certain topics tend to produce more heat than they do light. In some cases, the questions regarding airpower, strategic bombing and their roles in war are unanswerable, or at least un-agreeable. Soldiers, sailors and airmen tend to approach war from different viewpoints and with differing service-cultural perspectives. Others who write and speak about war are similarly influenced by these varied perspectives. This is natural and perhaps advantageous—fresh ideas are always useful. Unfortunately, much of the debate regarding airpower and strategic bombing has been coloured by accusations, misconceptions, inaccuracies, myths and simple untruths.

The concept for this essay occurred to me as a result of innumerable questions asked or statements made to me over the past decade by students at the US Naval War College and Air University. I have also lectured at several other Staff Colleges and War Colleges in the US and abroad and had similar experiences. Many scholars have similarly raised such issues, so I decided to explore them in more depth.

This paper does not purport to be a historical overview of strategic bombing or strategic thought. Rather, it is a series of points and counterpoints regarding airpower. It is an attempt to clear away some of the detritus obscuring the subject to allow more informed debate on the real issues concerning airpower and strategic bombing. This in turn, hopefully, will give our political and military leaders a better basis on which to form decisions in future conflicts.

Charge: The US Army Air Corps and Royal Air Force entered World War II with a 'Douhetian' concept of airwar that emphasised area bombing and the waging of war on women and children.

Response: Giulio Douhet was an Italian air theorist whose major work, *Command of the Air*, appeared in 1921 and predicted future wars that saw the use of gas bombs and high explosives against urban centres.¹ However, no one in the US Army Air Corps hierarchy during the 1930s advocated such an air strategy. On the contrary, for various military, legal and humanitarian reasons, such an air strategy was expressly rejected. Instead, the Air Corps Tactical School (ACTS) formulated a doctrine of high altitude, daylight,



Bombs falling on the Bremen oil refinery

It called for the destruction of Germany's industrial structure through a sustained bombing campaign...

precision, formation bombing of industrial targets. Specific military targets such as transportation networks, oil, electricity, chemicals, and munitions factories were the key systems singled out for attack.² The prewar theories of ACTS were translated into a war plan in August 1941, AWPDP-1. Its thrust was strikingly similar to those theories—no surprise since four former ACTS instructors wrote the plan. It called for the destruction of Germany's industrial structure through a sustained bombing campaign.

The doctrine manual the AAF took into the war, Field Manual 1-5, 'Employment of Aviation of the Army,' listed several potential target systems that could be struck after the first priority (enemy forces) had been sufficiently tackled: raw materials, rail, water and motor communications, power plants, transmission lines and other utilities, factories and processing plants, steel mills, oil refineries, 'and other similar establishments.'³ There is no mention in the manual of targeting population centres or popular will. The situation in Britain was similar. The official doctrine of the Royal Air Force was articulated in official doctrine manuals, CD-22 'Operations' (1922) and AP 1300 'War Manual.' This latter document was first published in 1928 and defined the 'vital centres' of an enemy nation as consisting of organised systems of production, supply, communications and transportation. It did not refer to bombing of the population. A revised version of AP 1300 appeared in February 1940 and repeated these targeting priorities; in fact, it went to some lengths to stress that the civilian populace was not a legitimate military target. This was not just for public consumption. During the Battle of France in June 1940 the Chief of Air Staff sent a message to all of his commanders emphasising that the intentional bombing of the civilian population was illegal. The types of targets to be struck were limited to enemy forces, fortifications, supply depots, shipyards, power stations, oil refineries, munitions factories and rail lines.⁴

On the other hand, the bleak realities of war, coupled with the technological limitations of contemporary aircraft and bombsights, the miserable weather over both Germany and Japan, and extremely stiff enemy defenses, rendered prewar doctrine insufficient. But few sailors or soldiers accurately predicted what the war would look like either, as the Battle of France and the Atlantic, Pearl Harbor, and Kasserine Pass painfully illustrated. It took all of the services time to adjust to the war's realities.

Charge: Airmen thought they could win the war alone.

Response: Airmen did not believe they could win the war 'alone'; rather, they thought that airpower could play a dominant or perhaps decisive role in both Western Europe and the Pacific—just as soldiers and sailors believed they could play such roles. Airmen fully realized the importance of the massive attritional toll that the Eastern Front was taking on the German war machine, as well as the serious effects the blockade and the US Navy's unrestricted submarine warfare campaign were having on Japan. What some airmen did maintain was that given a higher priority, strategic bombing—in conjunction with these land and sea campaigns—could bring about German and Japanese surrender prior to an Allied invasion of the Continent or of the Japanese home islands. That is in fact what happened in Japan, and it was believed that it could have happened in Europe. When one recalls that much of the Allied bombing effort was diverted to support the North African invasion, the Battle of the Atlantic, the invasions of Sicily and Italy, the attacks on the German V-1 and V-2 launching sites and the submarine pens, the Normandy invasion, the Okinawa campaign, and B-29 mine-laying operations in Japanese home waters, one can better understand the airmen's argument. Indeed, 72 percent of all Allied bombs fell on Germany after 1 July 1944.⁵ In the Pacific, 96 percent of all bombs fell on Japan after March 9, 1945.⁶ Airmen have often wondered what the results would have been had this 'crescendo of bombing' occurred a year or more earlier.

Airmen did not believe they could win the war alone...

Speer reported that in 1944 Germany had produced 35 percent fewer tanks, 31 percent fewer aircraft, and 42 percent fewer trucks than planned...



Albert Speer, German Minister of Armaments and Munitions 1942-1945

...fighter production apparently did increase, but did so at the expense of bomber and cargo aircraft production...

Charge: German production continued to increase throughout 1944, especially aircraft production. Therefore, the Combined Bomber Offensive (CBO) was ineffective, and the resources going into it would have been better spent elsewhere.

Response: Production did increase in Germany up through the first half of 1944; it then began falling precipitously in virtually all categories starting in the autumn of 1944. Most of the production increase was the result of slack in the German economy—it had not been fully mobilised for war at the outset of hostilities—and tremendous inefficiency within that economy caused by the lack of centralised control over raw materials and production assets. (Studies after the war, for example, revealed that the automobile industry, the largest sector of the German economy in the 1930s, was utilised at barely 50 percent of its capacity during the war.)⁷ Many of these maladies were remedied by the appointment of Albert Speer as Armaments Minister in early 1942. The real issue concerns what German leaders expected to produce in 1944, versus what they actually did produce. The difference between those figures is largely attributable to the effectiveness of the CBO. In January 1945, Speer reported that in 1944 Germany had produced 35 percent fewer tanks, 31 percent fewer aircraft, and 42 percent fewer trucks than planned.⁸ German industry was able to surge in 1943 and early 1944 partly because it had not yet been seriously attacked; when it was, the results were dramatic. In January 1945 Speer wrote Hitler:

The war was over in the area of heavy industry and armaments . . . From now on the material preponderance of the enemy can no longer be compensated for by the bravery of our soldiers.⁹

As for aircraft production, fighter production apparently did increase, but did so at the expense of bomber and cargo aircraft production — 65 percent of all aircraft accepted by the Luftwaffe in 1944 were single-engine fighters.¹⁰ In 1942 over half of aircraft production had been bombers, but by 1944 that number was down to 18 percent. The CBO forced Germany to stop building offensive weapons and concentrate instead on defensive ones in an unsuccessful effort to stop the Allied bombing campaign.

Even so, the supposed increase in fighter production is suspect. There were large discrepancies in the number of fighters allegedly produced, and the number actually employed by the Luftwaffe. In reality, despite all these production and acceptance statistics, the weakness of the Luftwaffe can be best understood when it is realised that by April 1944 there were only 300 German fighters in the west to oppose the 12,000 aircraft of the Allies, and there were another 500 in the east to oppose the 13,000 aircraft of the Soviets.¹¹ As a consequence, on D-Day the Luftwaffe flew only about 200 sorties — most of which failed to reach the beachhead and none of which inflicted significant damage — compared to the Allies who flew nearly 9,000.¹² Only six days after the landings, Prime Minister Winston Churchill and the Combined Chiefs of Staff thought the air situation safe enough that they actually visited the Normandy beachhead. The Luftwaffe had essentially been eliminated as a threat to the Allied invasion, despite what the production figures allegedly illustrated.

...on D-Day the Luftwaffe flew only about 200 sorties — most of which failed to reach the beachhead and none of which inflicted significant damage

Moreover, even if we sweep all those arguments aside, we look at the basic charge: that because production increased, the CBO was a failure. A different perspective would be to note that in 1939 the German Army consisted of 120 divisions. Yet, despite four years of war and the combined efforts of the Soviet, American, British and French armies, it had grown to 318 divisions by 1944.¹³ Using the logic of the production argument above, that must mean the actions of the Allied armies were a dismal failure — no matter how hard they fought, the German Army continued to grow. Therefore, such (fatuous) logic would force us to conclude that the Allies would have been better off spending their money on something else besides ground forces.

Charge: Bombing was ineffective because it actually stiffened enemy morale rather than lowered it.

Response: Although this comment is heard frequently, there seems little basis for its accuracy. In truth, the USSBS reported the following regarding morale in Germany:

Bombing appreciably affected the German will to resist. Its main psychological effects were defeatism, fear, hopelessness, fatalism, and apathy. It did little to stiffen resistance through the arousing of aggressive emotions of hate and anger. War weariness, willingness to surrender, loss of hope in German victory, distrust of leaders, feelings of disunity, and demoralising fear were all more common among bombed than among un-bombed people.¹⁴

Regarding the Japanese population, the USSBS reported: 'Civilian morale was predominantly, but not completely, destroyed. Just before the end of the war there was still roughly one-fourth of the civilian population with some confidence in victory and willingness to go on.'¹⁵ Although it is possible that initially there may have been a spike in morale among the enemy population — applying pressure to an object generally tends to consolidate that object before fracturing it — there is no evidence to support the claim of increasing morale under air attack.

As for the actual performance of German and Japanese workers, an important criterion is absenteeism. Whether a factory worker admits to bad morale or not, if he is not showing up for work because of the bombing campaign, then bombing is achieving one of its goals. In mid-1945, when the bombing campaign against Japan was at its height, absenteeism in Japanese factories was approaching 50 percent. Nearly 8.5 million people had fled the cities to escape the bombing campaign, nationwide, and of those 8.5 million, nearly $\frac{1}{3}$ were factory workers.¹⁶ That is not an indication of increasing morale. In Germany, absenteeism averaged 20 to 25 percent in many key factories.¹⁷ Performance was thus suffering greatly in both Germany and Japan, as was morale. Three-quarters of the German people thought the war was lost by the beginning of 1944, and when asked by Gallup pollsters after the war what was the hardest thing

The CBO forced Germany to stop building offensive weapons and concentrate instead on defensive ones in an unsuccessful effort to stop the Allied bombing campaign...



Luftwaffe had essentially been eliminated as a threat to the Allied invasion, despite what the production figures allegedly illustrated...

they had to endure, 91 percent of Germans responded that it was the Allied bombing.¹⁸ A classic study of morale under bombing that was conducted after the war confirmed the USSBS findings while also concluding that if the populace did become angry, it was usually directed at their leaders for failing to protect them, not against the enemy.¹⁹

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Charge: The atomic bombs were unnecessary. The Japanese were about to surrender anyway, and even if not, an invasion or continued blockade would have been more humane.

Response: There is no indication that anyone in authority within the Japanese government was seriously contemplating surrender in late July or early August 1945. President Truman's Potsdam Declaration, calling on Japan to surrender, or else, but also suggesting that survival of the emperor was acceptable, was rejected on 26 July. Top secret 'Ultra' message intercepts from the June and July timeframe revealed that the Japanese were expecting and indeed hoping for an invasion — they assumed it would be such a blood bath (based on casualty figures at Iwo Jima and Okinawa) that the Allies would be dissuaded from carrying through with an invasion, and they could therefore get better peace terms.²⁰

Using the previous Pacific campaigns of World War II as examples, Japanese military losses due to US invasions would have been around 3 million dead...

As for an invasion, according to Allied intelligence at the time, the Japanese defenders had increased to over 600,000 on the island of Kyushu — where our first landings, involving approximately 767,000 personnel, were scheduled to occur in November 1945. In reality, postwar findings revealed there were closer to 900,000 Japanese defenders.²¹ An invasion of the main island of Honshu, consisting of over 1 million soldiers, sailors, airmen and marines, was already scheduled for March 1946. There were over 2 million Japanese regulars defending the main island.

The following statistics give an idea what an invasion would have meant:

Japanese soldiers tended to fight to the death rather than surrender — 95 percent on average throughout the war, with 97 percent at Saipan and 99 percent at Iwo Jima. Using the previous Pacific campaigns of World War II as examples, Japanese military losses due to US invasions would have been around 3 million dead.²²

Based on the previous Pacific campaigns, US casualties tended to run about 1/5 of the number of troops engaged.²³ Thus, of the 1.75 million men scheduled to assault the Japanese home islands, we should have expected in excess of 500,000 casualties. During World War II about 30 percent of the US Army's combat casualties were deaths; based on that same ratio, the invasions would have cost around 150,000 US dead.²⁴

Japanese civilians tended to get caught in the way when Allied and Japanese forces fought during World War II. As many as 150,000 Japanese civilians died during the Okinawa campaign, as well as 10,000 Koreans who had been brought in to perform heavy labour.²⁵ Hundreds of thousands of Japanese civilians would no doubt have been 'caught in the way' and killed in the massive ground assaults scheduled for late 1945 and early 1946.

As for cancelling the invasion and simply maintaining the blockade: this would have been an extremely long-term strategy, and it would have had two seriously deleterious effects. First, it would have slowly starved the Japanese population to death, as we did the Germans in World War I when it is estimated that well over 750,000 civilians died as a direct result of the Allied starvation blockade.²⁶ Deliberate starvation is not more humane than bombing. Second, while we held back and waited for the blockade to take effect, we would have been condemning the millions of Asians then under an oppressive Japanese occupation to death and privation. How many more Koreans, Vietnamese, Indonesians, Malays, Chinese, etc. would have died had we simply waited? As it was, as many as 6 million Asians died under Japanese rule.²⁷ An Allied policy of waiting would no doubt have been branded later as a deliberately racist strategy. In addition, more than 558,000 Allied prisoners of war and internees were still in captivity in August 1945. Japanese prison camps were notoriously deadly to their unfortunate inhabitants: nearly 40 percent died in captivity. Waiting the Japanese out almost certainly would have condemned these men and women to death.²⁸

As for the contentious issue of what role the bombing, and specifically the atomic bombs, played in the Japanese decision to surrender, here are some statements made by key Japanese leaders at the time:

'Fundamentally, the thing that brought about the determination to make peace was the prolonged bombing of the B-29s.' — Prince Fumimaro Konoye, President of Great East Asia League and former Premier²⁹

'Merely on the basis of the B-29s alone I was convinced that Japan should sue for peace.' — Baron Kantaro Suzuki, Premier³⁰

'If I were to give you one factor as the one leading to your victory, I would give you the Air Force.' — Admiral Osami Nagano, Supreme Naval Advisor to the Emperor³¹

'The chance had come to end the war. It was not necessary to blame the military side, the manufacturing people, or anyone else—just the atomic bomb. It was a good excuse.' — Chief Cabinet Secretary Hisatsune Sakomizu.³²

'The enemy has begun to employ a new and most cruel bomb, the power of which to do damage is, indeed, incalculable, taking the toll of many innocent lives. Should we continue to fight, it would not only result in an ultimate collapse and obliteration of the Japanese nation, but also would lead to the total extinction of human civilisation.' — Emperor Hirohito, radio address announcing surrender, 14 August 1945.³³

Charge: Strategic bombing was, in balance, a wasted effort, and its overall effect was minor.

Response: The subject of strategic bombing's overall effectiveness in World War II and how decisive it was in victory could easily be the subject of several papers, indeed books. Unquestionably, it was the combined efforts of all the services and all the allies that brought victory. Even so, at the risk of oversimplifying the issue, here are some more statistics derived from USSBS and Overy:

By December 1944:

- German rail traffic was down 50%³⁴
- Aviation fuel production was down 90%³⁵
- Ruhr steel production was down 80%³⁶
- German coal supplies were down 50%³⁷

By mid-1943 Italian industrial production was down 60% (they soon surrendered, although Germany then occupied the country and continued to fight for another two years)³⁸

75% of all German 88s (their best artillery piece and also best tank killer) were being used as antiaircraft guns³⁹



The enemy has begun to employ anew and most cruel bomb, the power of which to do damage is, indeed, incalculable, taking the toll of many innocent lives...

Antiaircraft artillery (AAA) absorbed 20% of all ammunition produced by Germany, as well 1/3 of all optics and more than 1/2 of all radar and signals equipment. The aluminium used to make AAA shells would have built an additional 40,000 airplanes.⁴⁰

2 million people were engaged in the repair of damaged factories; 1/2 million more were engaged in trying to move German factories underground; 1 million were used to reproduce civilian goods destroyed by air attack; and 1 million were engaged in the production and manning of air defence equipment. (There were over 55,000 AAA batteries in 1943.) That's a total of 4.5 million people, or 20% of the German work force. What if those 4.5 million had been building tanks, or bombers, or submarines, or, worst of all, put in uniform and stationed in France to defend against an Allied invasion?⁴¹

I would also note that these production losses were not the result of key German industrial areas being overrun by Allied troops. Silesia was not captured by the Soviets until late January 1945; the Rhine was not crossed at Remagen until March 7, 1945; and the Ruhr, Germany's industrial heartland, was not overrun until April 1945. In the words of Colonel-General Alfred Jodl (Wehrmacht Operations Chief): 'So I would say that the decisive factor was not so much the very unpleasant effect of your air attacks at the front, as the destruction of the homeland, almost without resistance.'⁴² Note also the following statistics from USSBS and Overy regarding Japan:

By July 1945 aluminum production was down to 9% of the wartime peak⁴³

Steel and oil production were down to 15% of the wartime peak⁴⁴

Production in cities not bombed in Japan was at 94% of the wartime peak, but 27% in cities that had been bombed⁴⁵

Overall, Japanese production dropped 53% between November 1944 and July 1945, prompting the USSBS to state:

By July 1945 Japan's economic system had been shattered. Production of civilian goods was below the level of subsistence. Munitions output had been curtailed to less than half the wartime peak, a level that could not support sustained military operations against our opposing forces. The economic basis of Japan had been destroyed.⁴⁶

Once again, this is not to say that airpower alone caused this catastrophic collapse. The US Navy's unrestricted submarine warfare campaign, as well as the amphibious assaults of hundreds of thousands of Allied troops were all crucial to ultimate victory.

Regarding the cost of airpower during the war: the US spent approximately \$183 billion on armaments during World War II, of which the AAF's aircraft share was \$45 billion (24.5%). Of that amount, the AAF spent \$9.2 billion on bombers (20.4% of the AAF total, 5% of the US total). The AAF bought 230,175 aircraft, of which 34,625 were heavy bombers (15%); as a percentage of aircraft weight, heavy bombers were 35% of the total.⁴⁷ In Britain, 50 percent of the defence budget during World War II went to the Army; 33 percent to the Navy, and 17 percent to the RAF—Bomber Command's share of the war effort was 7 percent.⁴⁸ Was the 5 percent spent on bombers by the AAF and the 7 percent by the RAF excessive?

The Vietnam War is another subject that has engendered more emotion, more loose talk, and more misunderstanding than any conflict since World War II...

The Vietnam War is another subject that has engendered more emotion, more loose talk, and more misunderstanding than any conflict since World War II. Certainly, the great successes of airpower in the Persian Gulf War and the years since have muted much, but not all, of such talk. Indeed, it appears that in some quarters, precisely because of airpower's success since Desert Storm, many critics have looked backwards, hoping that by discrediting airpower in Vietnam, they will cast a shadow on the present. As a consequence, attacks on airpower's performance in Vietnam continue.

Charge: Airpower was a failure in Vietnam. It lost the war and let the Army down. Why do we even have an independent Air Force if it can't beat a fourth-rate power like North Vietnam?

Response. 8.7 million Americans served in uniform during the Vietnam War. Of those, 4.4 million were in the Army; 1.8 million in the Navy; 1.7 million in the USAF, and nearly 800,000 in the Marines. In addition, at any one time, there were nearly one million South Vietnamese ground troops on duty.⁴⁹ Thus, at the height of the war, there were well over one million Allied ground troops continuously operating in South Vietnam—a country the size of Wisconsin. Yet, all those ground troops were unable to control the countryside. If the Air Force, with its 1.7 million personnel failed in Vietnam, than the 9 million or so military personnel of the other services and the South Vietnamese failed even more completely.⁵⁰

Moreover, it is important to note who was in charge of US political and military strategy during this war. There were seven positions of key leadership during the Vietnamese era, and these positions were occupied by 21 men from 1963 to 1973:

NAME	YEARS	BACKGROUND
Presidents:		
John F. Kennedy	1961-63	Naval officer in WWII
Lyndon B. Johnson	1963-69	Naval officer in WWII
Richard M. Nixon	1969-73	Naval officer in WWII
National Security Advisors		
McGeorge Bundy	1961-66	Army officer in WWII
Walt W. Rostow	1966-69	Army officer in WWII
Henry M. Kissinger	1969-73	Army NCO in WWII
Secretaries of Defence		
Robert S. McNamara	1961-68	AAF officer in WWII
Clark M. Clifford	1968-69	Naval officer in WWII
Melvin C. Laird	1969-73	Naval officer in WWII
Chairmen, JCS		
Maxwell D. Taylor	1962-64	Army officer
Earle G. Wheeler	1964-70	Army officer
Thomas H. Moorer	1970-74	Naval officer
Theatre Commanders (CINCPAC)		
Harry D. Felt	1958-64	Naval officer
U.S. Grant Sharp	1964-68	Naval officer
John S. McCain, Jr.	1968-72	Naval officer

Sub-Theatre Commanders (COMUSMACV)		
Paul D. Harkins	1960-64	Army officer
William C. Westmoreland	1964-68	Army officer
Creighton W. Abrams	1968-72	Army officer
Ambassadors to South Vietnam		
Henry Cabot Lodge	1960-64	Army officer in WWII
Maxwell D. Taylor	1964-65	Army officer
Ellsworth Bunker	1965-73	No Military Experience

Thus, of these 21 leaders, only one, Robert S. McNamara, had served in the Air Force (as a staff officer in the AAF). Ten others were or had been Army officers; nine others, including all three presidents, were or had been Naval officers; and one, Ambassador Ellsworth Bunker, had no military experience.⁵¹ Moreover, during the 'Rolling Thunder' air campaign against North Vietnam from 1965 to 1968, the strategy, targets and even sometimes the tactics, were determined in Tuesday lunch meetings in the White House. No airman was ever invited to attend those meetings. General Earle G. Wheeler, an infantryman, attended instead and purportedly gave 'the air point of view.'⁵²

Certainly, there is much blame to go around regarding how the Vietnam War was planned and fought, and airmen must share responsibility for defeat. But given that airpower was only one part of a fatally flawed strategy, and given further that airmen were permitted to play virtually no direct role in formulating that flawed strategy, one cannot place the main onus for defeat on airpower. It is also noteworthy that the most vocal military critic of our Vietnam War policy at the time was Air Force Chief of Staff General Curtis LeMay. For his pains he was forced into early retirement.⁵³

Charge: Strategic bombing failed in Vietnam because 'Rolling Thunder' did not break the will of Ho Chi Minh and his cohorts to continue the war in the South.

Response: 'Rolling Thunder' was the air campaign against North Vietnam that lasted from 1965 to 1968.

If the Air Force, with its 1.7 million personnel failed in Vietnam, then the 9 million or so military personnel of the other services and the South Vietnamese failed even more completely...



Gradual escalation robs airpower of both its physical and its psychological impact...

It was not strategic bombing—it was an interdiction campaign, and a half-hearted one at that. Approximately 90 percent of all targets struck during 'Rolling Thunder' were transportation targets, and most of those were located south of the 20th parallel—well below the key industrial and transportation centres of Hanoi and Haiphong. The latter, North Vietnam's major port through which it received 85 percent of all supplies, was not closed by mining until 1972. Supplies could not, therefore, be halted near their source. Indeed, both cities were usually off limits to bombing during 'Rolling Thunder' and prohibited zones were placed around them—up to thirty miles for Hanoi and ten miles for Haiphong. There were also sixteen bombing halts between 1965 and 1968. Finally, a prime principle of airwar concerns the necessity of achieving air superiority as a first priority. Without it, air operations become far more difficult. Yet, the Administration would not allow the North Vietnamese airfields to be struck until April 1967—more than two years after the start of the 'Rolling Thunder' campaign.⁵⁴ In addition, surface to air missile sites were often off limits to American air strikes—unless and until they took hostile action against our aircraft.

In 1964 the JCS proposed various plans that included air strikes against 94 key targets in North Vietnam that would be conducted over a period of sixteen days; the strike aircraft would include B-52s. In addition, the JCS—and note these were joint plans, not USAF plans—also proposed the blockade of North Vietnam and the mining of Haiphong harbour, as well as the introduction of US ground troops into South Vietnam to combat the insurgency. These plans were rejected by the administration.⁵⁵ Eventually, most of the 94 targets were hit, but over a period of three years, not the sixteen days called for by the JCS. It is a tenet of airpower doctrine that force should be used quickly and overwhelmingly to have the desired effect. Gradual escalation robs airpower of both its physical and its psychological impact. This tenet, however, was ignored. This does not mean that the JCS plans would have been successful if they had been approved and implemented. It is simply to say that the plans submitted by the country's top military experts were rejected. Certainly, President Johnson had cogent political reasons for rejecting the advice of his top military advisors—his fear of Chinese intervention, for example. The result, nonetheless, was to make it extremely difficult to devise options that could navigate political shoals while also providing military success. The options that were implemented were failures.

The only time strategic bombing was attempted against North Vietnam was during the eleven-day 'Linebacker II' offensive of December 1972, when B-52s struck targets in and around Hanoi and Haiphong on a series of massive raids. 'Linebacker II' did not 'win the war' for the US and South Vietnam, but it did force the North Vietnamese government to return to the negotiating table and sign an agreement that had been agreed to 'in principle' but not signed two months before. At the same time, 'Linebacker II' reassured the South Vietnamese government—erroneously as it turned out—that we remained committed to its continued survival.

It has long been debated whether or not 'Linebacker II' actually coerced Vietnamese leaders into signing an agreement. Although the December settlement was similar to the one negotiated two months earlier, Hanoi's leaders did not sign that accord. It is impossible to know if they would have done so without the Christmas bombing. It is interesting to note the words of two expert observers who expressed their opinions on the significance of those attacks:

'One look at any Vietnamese officer's face told the whole story. It telegraphed hopelessness, accommodation, remorse, fear. The shock was there; our enemy's will was broken.' — Vice Admiral James B. Stockdale, POW and Medal of Honour winner ⁵⁶

'I am convinced that Linebacker II served as a catalyst for the negotiations which resulted in the cease fire. Air power, given its day in court after almost a decade of frustration, confirmed its effectiveness as an instrument of national power—in just nine and a half flying days.' — Admiral Thomas H. Moorer, Chairman, Joint Chiefs of Staff, 1973⁵⁷

Charge: Airpower was an indiscriminate weapon that killed excessive numbers of Vietnamese civilians.

Response: Guenter Lewy has provided the most authoritative statistics on casualties in the Vietnam War—although he himself admits these numbers should be considered estimates. He cites a figure of nearly 250,000 South Vietnamese civilians killed in the fighting, with another 39,000 assassinated by the Viet Cong. Trying to break down the casualties by cause is difficult, but based on those civilians who were admitted to hospitals between 1967 and 1970, Lewy estimates that 67 percent of all injuries resulted from mines, mortars, guns and grenades. The other 33 percent were injured by shelling or bombing. If these percentages are used for the entire war, and if we assume that the number of those injured by shelling or bombing are equal (Lewy doesn't break this category down), and if we assume that those killed met their fates in the same percentages as did those who were wounded—and all of those are big if's—then of the 587,000 Vietnamese civilians, both north and south, that Lewy states were killed during the war, then around 145,000 (25 percent) died from air attacks. The other 75 percent, over 440,000 people, were killed by ground or naval action.⁵⁸

Also note that the Army declared certain areas in South Vietnam as 'free fire zones' where there was unrestricted use of artillery and mortar fire. While Air Force, Navy, Marine and South Vietnamese aircraft dropped five million tons of ordnance on South Vietnam, the Army and Marine Corps shot eight million tons of artillery rounds there.⁵⁹ A great deal of fire and steel was rained down on South Vietnam, but the majority of it was not dropped by aircraft.

...when B-52s struck targets in and around Hanoi and Haiphong on a series of massive raids. 'Linebacker II' did not 'win the war' for the US and South Vietnam, but it did force the North Vietnamese government to return to the negotiating table...



...of the 587,000 Vietnamese civilians, both north and south, that Lewy states were killed during the war, then around 145,000 (25 percent) died from air attacks. The other 75 percent, over 440,000 people, were killed by ground or naval action...

Charge: The USAF was insufficiently responsive to Army needs in South Vietnam.

Response: In truth, the USAF flew 3.9 million combat sorties in South Vietnam in support of the Army; of those, 633,180 were 'attack' sorties, including 67,477 B-52 strikes, each delivering up to thirty tons of bombs.⁶⁰ The Army commander in Saigon, General William Westmoreland from 1964-1968, determined the targets in South Vietnam for USAF aircraft—including the tens of thousands of B-52 'Arc Light' strikes, usually directed against 'suspected enemy locations.' The targets for strikes into North Vietnam came from Pacific Command headquarters in Hawaii (after they were approved in Washington). The USAF had no control over Navy, Army, Marine, or South Vietnamese aircraft and helicopters operating in South Vietnam.⁶¹

Despite successes in Desert Storm and thereafter, some unjustified criticisms of airpower continue.

Charge: Airpower was too focused on strategic attack during the Persian Gulf War, and support of ground forces was inadequate.

Response: Strategic attack made up only a small part of the Coalition air campaign. In fact, the Air Tasking Order that codes all air missions by type does not even have a 'strategic attack' category. Thus, missions that struck chemical weapons bunkers in northern Iraq or an electrical power plant in Baghdad were coded as 'air interdiction.'⁶² Such a classification system seems incongruous if airmen really wished to emphasise strategic attack as their primary mission.

Even so, some targets were considered as being of a strategic nature: leadership (especially telecommunications), key production facilities (electricity and oil), transportation infrastructure (railroads and bridges), and NBC—Nuclear, Biological and Chemical research, production and storage facilities. Using these categories, of the 41,039 strike sorties flown by Coalition aircraft, only 5,692 (13.7 percent) would be classified as 'strategic.'⁶³ Moreover, because heavy bombers like the B-52 dropped a disproportionate share of the bomb tonnage during the war (32 percent), and most of those strikes were flown against the Iraqi Army, it is apparent that the vast amount of all bombs delivered fell on enemy ground forces and their equipment.⁶⁴

...it is apparent that the vast amount of all bombs delivered fell on enemy ground forces and their equipment...

Consider also the weight of ordnance actually falling on Baghdad—the epitome of a strategic centre of gravity. In forty-three days a mere 330 weapons (244 laser-guided bombs and 86 Tomahawk cruise missiles) were delivered against Baghdad targets. Those 330 weapons represent 3 percent of all the precision weapons used during the war, which in turn amounted to less than 9 percent of all the air weapons expended. As a consequence, the total tonnage falling on Baghdad during the war was a scant 287 tons—a minute fraction of the total tonnage of 84,200 tons dropped by the Air Force.⁶⁵

Damaged and abandoned Iraqi ground equipment, 1991



When it is realized that a military unit is considered 'combat ineffective' when it has lost 40 percent of its strength, it is small wonder that over 80,000 Iraqi soldiers deserted during the aerial pounding and another 86,000 surrendered virtually without a fight...

The effect of this massive air campaign against the Iraqi ground forces was enormous. US Central Command estimated that prior to the start of Coalition ground operations on 24 February 1991, all front-line Iraqi divisions had lost more than 50 percent of their strength; rear divisions had been reduced by 25 percent. More detailed examinations by US intelligence agencies after the war confirmed these percentages. When it is realised that a military unit is considered 'combat ineffective' when it has lost 40 percent of its strength, it is small wonder that over 80,000 Iraqi soldiers deserted during the aerial pounding and another 86,000 surrendered virtually without a fight.⁶⁶

Charge: Air attack is nothing more than 'recreational bombing.' Pilots remain at such an altitude that they can't possibly hit their targets accurately.

Response: In operations such as Allied Force, the war over Serbia to free Kosovo in 1999, political leaders deemed it fundamental that NATO casualties be kept to an absolute minimum. The alliance was shaky from the start, but it would undoubtedly split apart if heavy casualties were sustained. Hence, early on President Clinton and NATO leaders declared that a ground invasion was out of the question. Instead, airpower would be used as the weapon of first resort. Yet, the need to limit casualties, on both sides, remained a primary consideration for NATO leaders.

As a consequence, allied aircraft were directed to remain at medium altitude, usually above 15,000 feet, so as to remain above the range of most enemy ground fire. Some have argued that this policy induced inaccurate bombing, thus increasing collateral damage and civilian casualties.

In the vast majority of cases this was not true. A precision guided munition (PGM) is most accurate when it is dropped in the mid-altitude range—from 15,000 to 23,000 feet—allowing enough time for the weapon to



From the pilot's perspective, medium altitude is also advisable because it allows time to identify the target at sufficient distance, 'designate it' (if laser guided), and launch the weapon...

correct itself in flight. If dropped from a lower altitude, the weapon will have less kinetic energy, and its steering fins will have less opportunity to correct the aim; the weapon will usually land short of the target. From the pilot's perspective, medium altitude is also advisable because it allows time to identify the target at sufficient distance, 'designate it' (if laser guided), and launch the weapon. In short, for PGMs against a fixed target whose position is already established—which was the case in most of the targets struck in Serbia—the optimum altitude to ensure accuracy is at or above 15,000 feet.

To ensure accuracy, the optimum drop altitude for non-guided munitions is lower than for a PGM. Even so, acquisition remains a limiting factor: coming in too low at 500 knots makes it nearly impossible to acquire the target, line up, and place the bomb accurately. As a result, the compromise altitude for the delivery of unguided bombs is around 5,000 feet. However, this places the delivery aircraft right in the thick of fire from ground defenses. Allied Force commanders resolved this dilemma by keeping aircraft at medium altitudes, but restricting the use of non-PGMs to areas where there was little or no chance there would be civilian casualties or collateral damage.

A difficulty arises in identifying and attacking mobile targets. On April 14, 1999, near Korisa, Kosovo, NATO pilots attacked what intelligence sources had identified — and which indeed appeared to be—a military column. It is now known the column also contained refugees: several dozen civilians were killed in the air strikes. This is the only instance in the 78-day air campaign when NATO intelligence sources and aircraft at medium altitude combined to misidentify a target, thereby causing civilian casualties. Could this accident have been avoided if the aircraft had flown at a lower altitude? Probably. Indeed, NATO changed the rules after this, allowing aircraft in certain circumstances to fly lower to ensure target identification. There is, however, a tradeoff in such instances: if flying lower increases the risk to aircrews due to enemy ground fire, at what point does the risk of misidentifying a target override the risk of losing a plane and its crew? If friendly losses meant the shattering of the Alliance, were they preferable to allowing Milosevic to continue his atrocities unchecked?

Charge: Despite all the talk by airmen, airpower remains an indiscriminate use of military force that deliberately targets civilians.⁶⁷

Response: Various books and articles continue to perpetuate this myth. Although one must recall the caution of Mark Twain regarding lies, damned lies, and statistics, the following statistics are fairly unambiguous.

Gil Elliot in *The Twentieth Century Book of the Dead* estimates that 110 million people is 'a reasonably conservative estimate' of the number who have died in wars during the first seven decades of the 20th century.⁶⁸ More than half of those died due to genocide and forced starvation. Of the 46 million who died due to 'technology,' Elliot lists the causes of death as small arms = 24 million; 'big guns' = 18 million; 'mixed' = 3 million; and aerial bombing = 1 million.⁶⁹ He notes that the figure of 1 million dead due to air attack may be higher, but certainly less than 2 million.⁷⁰ Thus, even if we add the numbers of those who have died since Elliot wrote in 1972, the number of those dying due to air attacks during the entire 20th century would not exceed 2 million.

Other researchers have listed a figure of 170 million dead in both internal and external wars during the 20th century.⁷¹ Those who advance higher casualty figures usually attribute the additional deaths to even more vicious dictators than those assumed by Elliot. Bear in mind that more than 15 million Russian civilians died during World War II—and there was virtually no bombing taking place on the Eastern Front. Similarly, over 1 million civilians died in the siege of Leningrad where air attack played a negligible role.⁷² One of the pervasive myths from World War II regards the death toll at Dresden resulting from Allied air attacks in February 1945. In truth, perhaps 30,000 died at Dresden, not 135,000 as initially claimed by David Irving—he later revised his figure down to 25,000 but everyone continues to cite his first number.⁷³ Even so, terrible as even that smaller death toll is, more than five times as many civilians were killed in the ground fighting on Okinawa a few months later.

If we are to accept these staggering figures, it means that of the 170 million people who died in wars during the 20th century, the overwhelming majority died as a result of military operations by armies, navies and paramilitary 'police' forces. Two million people, or 1.1 percent of the total, were the victims of air attack. Below are some more statistics relative to warfare since World War II:

According to Green Peace, 3,000 civilians died in the six-week Desert Storm air campaign; later studies lower that figure to 1,000.⁷⁴

UNICEF reported in 1999 that the infant mortality rate in Iraq more than doubled in the decade following the imposition of UN sanctions. Worse, the mortality rate for babies (children under five) jumped from 56 deaths per 1,000 live births to 131. This means that between 1990 and 1998, over 225,000 Iraqi children have died as a direct result of 'bloodless' sanctions imposed by the United Nations.⁷⁵

Slobodan Milosevic told US ambassador Richard Holbrooke that perhaps 25 Serbs died in the 1995 air campaign over Bosnia; NATO lost one aircraft, and the two crewmembers were captured and later released.⁷⁶

Human Rights Watch states that around 500 civilians died in the 78-day NATO air campaign over Serbia/Kosovo; there were no allied casualties.⁷⁷

18 US Army Rangers died in Mogadishu with another 80 or so wounded, but at least 500 Somali civilians were killed and another 500 wounded during the 24-hour firefight of October 1993.⁷⁸

The American Red Cross states that 200 people worldwide are killed each week by landmines, with another 100 or so wounded. The US is not a signatory of the Landmine Ban Treaty.⁷⁹

Certainly, it is most regrettable that any civilians are killed or injured by air attack, but we must be realistic. Innocent people always die in war—tens of millions of them over the past century. Given that less than 2 percent of them were victims of air attack, it is peculiar to charge that airpower is an indiscriminate or inhumane weapon. Unfortunately, there are those who still do. Yet, the arithmetic and facts are clear.

Innocent people always die in war—tens of millions of them over the past century...

The biggest killers of the 20th century were small arms fire, blockades, sanctions, sieges, artillery fire, landmines, and, worst of all, despotic leaders who inflicted genocide and starvation on friend and foe alike. War is indeed hell and always has been, but there are ways to mitigate its effects on the innocent. Airpower advocates and theorists have maintained since the advent of flight that this invention offered a form of war that was less deadly, to both sides, than traditional means of war on land and sea. History has proven these prophets were correct. Moreover, the ability of aircraft to project force in a discriminate manner so as to minimise civilian casualties and collateral damage has continued to increase over the past two decades. It is not the answer to all problems and can still inflict most grievous harm. Yet, recent conflicts have made it clear that the centuries-old desire to wage war with humanity and discrimination is finally becoming possible.

Philip S. Meilinger is a retired Air Force colonel and command pilot with a PhD in military history. He is the author of 4 books and over 60 articles on military theory and operations. Currently, he is the deputy director of the AEROSPACENTER at Science Applications International Corporation. These are his views and not those of SAIC.

Notes:

- 1 A revised version of *Command of the Air* was published in 1927. This version was translated into English by Dino Ferrari and published in 1942; it was reprinted by the Air Force History Office in 1983.
- 2 Thomas H. Greer, "The Development of Air Doctrine in the Army Air Arm, 1917-1941," USAF Historical Study, no. 89, 1955 (reprinted by the Air Force History Office, 1985), 57-60.
- 3 US Army, Field Manual 1-5, "Employment of Aviation of the Army," April 15, 1940, 36.
- 4 RAF "War Manual," AP 1300, July 1928 and February 1940, both chapter VIII; message from CAS to all AOCs, June 4, 1940, Public Records Office. For a more detailed discussion of this issue, see Phillip S. Meilinger, "Trenchard and 'Morale Bombing': The Evolution of Royal Air Force Doctrine before World War II," *Journal of Military History* 60(April 1996): 243-70.
- 5 United States Strategic Bombing Survey (USSBS), "Over-all Report (European War)," Sep 30, 1945, 10. The Strategic Bombing Survey was chartered by President Roosevelt in 1944 to examine the effects of strategic bombing on Germany and Japan. The Survey was headed by Franklin D'Olier, head of the Prudential Insurance Company who had no previous experience with aviation. D'Olier divided the roughly 1,500 members of the Survey into groups corresponding to target sets: oil, chemicals, transportation, etc. Each of these divisions was headed by a distinguished civilian businessman, economist, engineer or lawyer, including such later luminaries as Paul Nitze, George Ball, and John Kenneth Galbraith. Even included was Dr Rensis Likert, a specialist in public opinion sampling. After examining mountains of documents, interviewing thousands of German and Japanese leaders, and visiting scores of bombed sites, the Survey produced 212 volumes on the strategic air campaign against Germany and a further 108 reports on Japan. Although the Survey has had some detractors over the years, especially regarding internal squabbles between some of its members, no one has attempted to refute the findings of the Survey itself—its research and documentation are simply too thorough and massive to contest.
- 6 USSBS, "Statistical Appendix to Over-All Report (European War)," Feb 1947, 13; USSBS, "Summary Report (Pacific War)," 1945 (Reprinted along with "Summary Report (European War)" by Air University Press, 1987), 84.
- 7 Richard J. Overy, *Why the Allies Won* (London: Jonathan Cape, 1995), 203. Overy is recognized as one of the world's top military historians, but he is also an economic historian, which makes him especially authoritative when discussing air or sea power as forms of economic war.
- 8 Ibid., 131.
- 9 Albert Speer, *Inside the Third Reich* (NY: Macmillan, 1970), 424.
- 10 USSBS, "Over-all Report (European War)," 18; Overy, 129.
- 11 Overy, 124.
- 12 Bernard C. Nalty (ed.) *Winged Shield, Winged Sword: A History of the United States Air Force*. 2 vols. (Washington: Air Force History and Museums Program, 1997), I, 308. Correspondence from Alfred Price, 7 June 2002.
- 13 David T. Zabecki (ed.) *World War II in Europe: An Encyclopedia*. 2 vols. (NY: Garland, 1999), I, 625.
- 14 USSBS, "Over-all Report (European War)," 95-96.
- 15 USSBS, "The Effects of Strategic Bombing on Japanese Morale," June 1947, 32.
- 16 Ibid., 13; USSBS, "The Effects of Strategic Bombing on Japan's Urban Economy," March 1947, 25.

- 17 Overy, 133. Of interest, approximately 2.7 million British civilians left the major industrial cities during the war to escape the German bombing—which was on a far lower scale than was the Allied bombing of Germany. Richard M. Titmuss, *History of the Second World War: Problems of Social Policy* (London: His Majesty's Stationery Office, 1950), 345.
- 18 USSBS, "Over-all Report (European War)," 96; Overy, 132.
- 19 Irving L. Janis, *Air War and Emotional Stress* (Santa Monica: RAND, 1951), see especially chapter 7, "Aggression and Wartime. In other words, people living in the countryside did not believe that bombing affected their morale; those in the cities being bombed felt quite differently.
- 20 Bruce Lee, *Marching Orders: The Untold Story of World War II* (NY: Crown, 1995), see chapters 18-20 for a thorough examination of the various ULTRA/MAGIC messages that discussed the issue of Japanese surrender. The best overall treatment of this contentious issue, which focuses on Japanese sources, is Sadao Asada, "The Shock of the Atomic Bomb and Japan's Decision to Surrender—A Reconsideration," *Pacific Historical Review* 67(November 1998): 477-512.
- 21 Edward J. Drea, *MacArthur's Ultra: Codebreaking and the War against Japan, 1942-1945* (Lawrence: University Press of Kansas, 1992), 222. For a detailed and sobering examination of the actual US invasion plans, see Thomas B. Allen and Norman Polmar, *Code-Name Downfall: The Secret Plan to Invade Japan and Why Truman Dropped the Bomb* (NY: Simon & Schuster, 1995).
- 22 Lee, 491; Overy, 301.
- 23 Drea, 210.
- 24 "Almanac," *Defense*, September/October 1989, 47. These numbers are probably conservative. For the best discussion of this issue see D.M. Giangreco, "Casualty Projections for the U.S. Invasions of Japan, 1945-1946: Planning and Policy Implications," *Journal of Military History* 61(July 1997): 521-82.
- 25 George Feifer, *Tennozan: The Battle of Okinawa and the Atomic Bomb* (NY: Ticknor & Fields, 1992), 533.
- 26 The British official history states that 762,736 German civilians starved to death during the war and another 245,021 died of tuberculosis caused by the lack of fat, oils and milk in their diets—the absence of which were due to the blockade. A.C. Bell, *A History of the Blockade of Germany, 1914-1918* (London: His Majesty's Stationery Office, 1937), 672. The Germans maintained the number of dead was far higher, but in any event, the total does not include the civilians killed in Austria-Hungary and Turkey, where the effects of the starvation blockade were far more severe.
- 27 R.J. Rummel, *Death by Government: Genocide and Mass Murder in the Twentieth Century* (New Brunswick: Transaction, 1996), table 8.1, 148.
- 28 Van Waterford, *Prisoners of the Japanese in World War II* (Jefferson, NC: McFarland, 1994), 146.
- 29 USSBS, "Mission Accomplished: Interrogations of Japanese Industrial, Military, and Civil Leaders of World War II," 1946, 40. It should also be noted that the 8AF had transitioned into B-29s and recently deployed to airbases on Okinawa. Because of the shorter distances involved from these bases, versus the distance of 20AF aircraft based in the Marianas, the conventional bomb tonnage dropped on Japan was scheduled to triple beginning in September 1945.
- 30 Ibid., 39.
- 31 Ibid.
- 32 USSBS, "Japanese Morale," 99.
- 33 "The Emperor's Rescript," *Current History*, September 1945, 191-92.
- 34 Overy, 125.
- 35 USSBS, "Over-all Report (European War)," 37.
- 36 Ibid.
- 37 Overy, 125.
- 38 Ibid., 129.
- 39 Ibid..
- 40 Overy, 131; Speer, 278-79; and Sebastian Cox (ed.) *The Strategic Air War Against Germany, 1939-1945* (London: Frank Cass, 1998), xxxiv.
- 41 Overy, 129-31; USSBS, "Over-all Report (European War)," 37. Of the one million personnel manning air defense batteries, approximately _ were regular Luftwaffe troops; the remainder were factory workers, what were termed "pre-military age" youths from 16-18, and Russian prisoners performing menial tasks.
- 42 Richard Overy, *Interrogations: The Nazi Elite in Allied Hands, 1945* (NY: Viking, 2001), 281.
- 43 USSBS, "Overall Report (Pacific)," 88.
- 44 Ibid.
- 45 USSBS, "Effects on Urban Economy," 11.
- 46 USSBS, "The Effects of Strategic Bombing on Japan's War Economy," December 1946, 2.
- 47 Craven and Cate, VI, 360; Holley, 550.
- 48 Cox, xxv.
- 49 "Almanac," *Defense*, September/October 1989, 47; Guenter Lewy, *America in Vietnam* (NY: Oxford University Press, 1978), 455.
- 50 Scape-goating was a common exercise in the decade after Saigon fell. For a discussion of a particularly prevalent view that it was weak-kneed politicians who actually lost the war, see Jeffrey P. Kimball, "The Stab-in-the-Back Legend and the Vietnam War," *Armed Forces & Society* 14(Spring 1998): 433-58.
- 51 Walt Rostow was an unusual case. As a major in the Office of Strategic Services (OSS), he was assigned to the Economic Objectives Unit in London because of his background in economics. There, he studied the German economy to determine the appropriate targets for Allied strategic bombers. In addition, Admirals Moorer and Felt were aviators.
- 52 Wayne Thompson, *To Hanoi and Back: The United States Air Force and North Vietnam, 1966-1973* (Washington: Air Force History and Museums Program, 2000), 23-24.
- 53 Ibid., 21.

54Ibid., 63.

55 John P. Glennon (ed.) *Foreign Relations of the United States, 1964-1968. Vol. 1: Vietnam, 1964* (Washington: Government Printing Office, 1992), 112-18, 713-17, 847-57; Thompson, vii.

56 Jim and Sybil Stockdale, *In Love and War* (NY: Harper & Row, 1984), 432.

57 Thomas H. Moorer, "The Decisiveness of Airpower in Vietnam," *Air Force Policy Letter for Commanders*, Supp. No. 11 (November 1973), 9, quoted in John T. Smith, *The Linebacker Raids: The Bombing of North Vietnam, 1972* (London: Arms and Armour, 1998), 174.

58 Lewy, 442-51. This total includes the 39,000 South Vietnamese that were assassinated by the Viet Cong, as well as the 65,000 Lewy states were killed by US air attacks in North Vietnam.

59 Thompson, 6.

60 "USAF Combat Sorties in Southeast Asia, January 1962 Thru December 1973," HQ AF/XOOCOAB Study, 5 April 1974.

61 Thompson, 14-19. Momyer was opposed to the Army's targeting of the B-52s, arguing that such missions were wasteful and indiscriminate. His arguments were waved aside: "Westmoreland's zeal for Arc Light strikes remained undiminished despite Air Force objections and a paucity of measurable results." John Schlight, *A War Too Long: The History of the USAF in Southeast Asia* (Washington: Air Force History and Museums Program, 1996), 31.

62 Eliot Cohen (ed.) *Gulf War Air Power Survey (GWAPS)*, 5 vols. and Summary volume (Washington: Government Printing Office, 1993), V, 227.

63 Ibid., 418.

64 Ibid., Summary, 15.

65 William M. Arkin, "Baghdad: The Urban Sanctuary in Desert Storm?" *Airpower Journal* (Spring 1997): 5-6; GWAPS, Summary, 226.

66 Ibid., 105-06.

67 Michael A. Carlino, "The Moral Limits of Strategic Attack," *Parameters* 32(Spring 2002): 15-29; Conrad C. Crane, "Sky High: Illusions of Airpower," *National Interest* 65(Fall 2001): 116-22.

68 Gil Elliot, *Twentieth Century Book of the Dead* (NY: Ballantine, 1973), 249.

69 Ibid., 154.

70 Ibid., 161.

71 Rummel, table 1.2, p 4. See also William Eckhardt, "War-Related Deaths Since 3000 B.C.," *Bulletin of Peace Proposals* 22(Fall 1991): 437-44.

72 Harrison E. Salisbury, *The 900 Days: The Siege of Leningrad* (NY: Harper & Row, 1969), 514-16. Salisbury states that over one million died due to starvation, with a total of between 1.3 and 1.5 million dying from all causes.

73 David Irving, letter to the *London Times*, 7 July 1966. Irving also notes that Nazi propaganda statements at the time cited figures of over 300,000 dead. Although this number has no basis in fact, it has been repeated by sloppy historians on several occasions since. Michael Sherry, for example, gives a truly astonishing figure of 600,000 killed at Dresden—thus doubling the figure of Joseph Goebbels himself! *The Rise of American Air Power* (New Haven: Yale, 1987), 260.

74 John G. Heidenrich, "The Gulf War: How Many Iraqis Died?" *Foreign Policy* 90(Spring 1993): 108-25.

75 UNICEF, "Child and Maternal Mortality Survey, 1999, Preliminary Report," July 1999, 10; Fourth Freedom, "Morbidity and Mortality Among Iraqi Children," March 1999, 1.

76 Colonel Robert C. Owen, *Deliberate Force: A Case Study in Effective Air Campaigning* (Maxwell AFB: Air University Press, 2000), 161.

77 Civilian Deaths in the NATO Air Campaign (NY: Human Rights Watch, 7 February 2000), 5.

78 Mark Bowden, *Black Hawk Down: A Story of Modern War* (NY: Atlantic Monthly, 1999), 333. Bowden notes that many of the frightened US soldiers stated they simply shot at anything that moved, spraying bullets at every window, every door, every street, every person: "especially people. They were all going down. It was a free-for-all now. All semblance of an ordered retreat was gone. Everybody was just scrambling." Bowden, 287.

79 Landmines: A Deadly Legacy (NY: Human Rights Watch, 1993), 3-4. The US State Department maintains that landmines killed or maimed 26,000 people per year in the 1990s. "Bush Administration Faces Decisions on Land Mine Programs, Treaty," *Inside the Army*, 5 February 2001, 1.

A full-page background image showing a fighter jet, likely an F-18, taking off from a ship's deck. The jet is angled upwards, and its landing gear is still extended. In the foreground, two crew members are visible from behind, looking out at the aircraft. One is wearing a green flight suit, and the other is wearing a bright yellow flight suit. The sky is a clear, pale blue.

Network Centric Warfare:

Evolution or Revolution?

By Lt Cdr G J Wise RN

We are living in a time of enormous technological advancement in which the development rate of computational devices has exceeded all expectations. The personal computer has, with the more recent Internet and communications revolution, presented the individual with new opportunities to gain knowledge, and there is true power' in the ability of the Internet to make information available. The developed world is moving toward an 'information age' and is beginning to see the impact of this new era. Motivated by profit, business has been quick to exploit the timely exchange of information to better integrate and streamline processes. The military are also keen to exploit opportunities offered by the information age and many technologists and academics have worked to see how the information revolution can be exploited militarily, with the objective of seizing combat advantage in the same way that some companies have seized competitive advantage.

...will NCW ultimately be evolutionary or revolutionary?

The military exploitation of these new technologies may be contributing to a contemporary 'Revolution in Military Affairs' (RMA), which according to many occurs when the nature and conduct of warfare are radically altered. Whether this will be the case remains to be seen, but there is little doubt that recent conflict, with its emphasis on the use of stealth, precision guided munitions (PGM) and information,² indicates that new technology has brought about unprecedented levels of tactical military effect. In studying the nature and effect of new technologies, military leaders have sought coherence, and recent military operational concepts³ are underpinned by the wider information revolution.

The US Navy has embraced this thinking and is in the vanguard. Their concept is called Network Centric Warfare (NCW), which is the subject of this paper. NCW has been described as 'an operational concept which marks a fundamental shift from platform-centric operations toward network-centric operations, deriving its power from the effective linking of dispersed knowledgeable entities'.⁴ Working on the principle that information is power, NCW places 'information superiority' at its core and the US Joint Chiefs of Staff have noted that 'information superiority [is] a key enabler of the transformation of the operational capabilities of the joint force'.⁵

This is not a lightweight ambition and NCW will undoubtedly face many challenges on its journey from concept to reality. NCW is an immature discipline and its concepts are still being developed. As a result there are differing views on what it is, what benefits it can deliver and how it should be implemented. Yet NCW is already beginning to pervade UK thinking, raising the question of what NCW means for us. It is therefore timely to take a step back from the hype and present an analysis of NCW's claims and prospects.

This paper will therefore examine how the concept of NCW came about and its relationship with the wider contemporary RMA. It will then examine where NCW seems to be going to determine its military applicability and implications, unpicking the underlying concepts of 'shared awareness', 'speed of command' and 'self-synchronisation' to identify the prospects and challenges facing it. Finally, the paper will attempt to determine whether the journey will be successful in terms of revolutionising US Navy war fighting capability – will NCW ultimately be evolutionary or revolutionary?

This paper will not examine weapon technology, specifically the PGM whose tactical and strategic utility has been well proven in recent conflict. Nor will this paper plumb the depths of computer or sensor technology, as it is more important to explore the effect that the technology can create rather than the technology itself. Frequent reference will however be made to 'information', of which many different definitions exist. Throughout this paper we will take data to be unstructured observations or facts, and information to be data which are selected, summarised and presented to the recipient such that it is useful.

The paper concludes that the concepts of NCW are not far removed from current manoeuvre warfare doctrine, and the evidence thus far points more to an evolution of current capabilities than a revolution in the nature of war fighting. Underpinning NCW is 'information superiority', and while the promise of NCW advocates that the fog and friction of war can be lifted is a valuable idea, the reality is that the application of new technology is not the whole answer. Nevertheless, NCW will have a place in future war fighting, but it will need to be flexible (anathema to most military procurement) and the doctrinal, organizational and systemic implications will need to be fully explored if revolutionary change to the character of war fighting is a genuinely desirable outcome. These changes require the adoption of a culture which encourages experimentation and innovation. The reality is that resistance to change is likely to be fierce, and the most likely but benign outcome is a continuation of current war fighting methods, but made possible by 'better' information architectures.

THE REVOLUTION IN MILITARY AFFAIRS

To determine whether NCW might measure up to being revolutionary, it is necessary to consider what a 'revolution' in military affairs might constitute, assuming that such revolutions occur. Turning to contemporary thinking, one of the current RMA apostles is Admiral Bill Owens (Vice Chairman of the US Joint Chiefs of Staff from 1994-6), who believes that it 'promises to transform the application of military force far more than the stirrup, the machine gun, or even the nuclear weapon ever did'.⁶ But what is this RMA of which Owens evangelises, and where has it come from?

The historian Krepenevich contends that warfare has been recurrently revolutionised through the ages, often by changes in technology,⁷ and that when revolution occurs, it fundamentally alters the way in which wars are fought and won. However, the introduction of new technology on its own is not enough to revolutionise warfare, and Krepenevich argues that organisational adaptation and innovative operational concepts are also part of the transformation recipe⁸. Other schools of thought abound,⁹ for example Van Creveld divides military history into four eras separated by revolution:¹⁰ the age of tools; the age of the machine; the age of systems; and the age of automation. The Tofflers take a wider societal view, asserting that war is waged in the same manner in which wealth is created, believing us to be entering the 'information age'.¹¹ Others believe history demonstrates warfare is subject to periodic accelerations of a continual evolution during which revolutionary changes emerge. But whatever the particular thesis, there is little argument that military capability has been periodically revolutionised and broad consensus that we are on the cusp of the next one.

An oft-quoted example of military revolution is Blitzkrieg, used to such startling effect by Germany in the period 1939-41

An oft-quoted example of military revolution is Blitzkrieg, used to such startling effect by Germany in the period 1939-41. While the technologies of armour, aircraft and radio had been used toward the end of the first world war, for instance at Cambrai in 1917, it took new operational concepts and doctrine to effect a radical change in war fighting capability. In the late 1980's, Andrew Marshall (the first Director of Net Assessment, US DoD) recognised that the period between the two world wars, which saw considerable technical and operational innovation, provided the best model to study and used it in developing a definition of an RMA, which has become broadly



accepted as 'a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and operational and organizational concepts, fundamentally alters the character and conduct of military operations'.¹²

Having identified what we mean by an RMA, it is worth briefly examining how the contemporary RMA might develop. Krepenyevich sees it as an increased ability to detect and engage, with a higher degree of precision and lethality, far more targets, over a far greater area, in a shorter period of time.¹³ Owens echoes this view, with a belief that it is characterised by 3 broader functional concepts¹⁴ – battlespace awareness, C4I, and precision force use. McKittrick et al suggest the emergence of new systemic 'warfare areas'¹⁵ – long-range precision strike, information warfare, dominating manoeuvre and space warfare. On the other hand, O'Hanlon is more cautious, arguing that from a technology perspective it is too early to say whether rates of scientific advance will support a revolution.¹⁶ The detail of these predictions contain four salient themes: firstly that any RMA will probably involve the integration of systems with systems; secondly that achieving an RMA will take time; thirdly, we do not know what the outcome will look like; and lastly, that increasingly available new technology will have a key role to play.

The rate of development of sensors and networks by the US has been unprecedented and is to date virtually unrivalled

Taking all this into account, it is not difficult to spot the pedigree of Joint Vision 2020 which synthesises and builds on these themes. The US Joint Chiefs of Staff proposes to achieve 'full spectrum dominance' through 'dominant manoeuvre', 'precision engagement', 'focussed logistics' and 'full dimension protection',¹⁷ made possible by information superiority. Seen alternatively as 'grandiose'¹⁸ and 'less than radical',¹⁹ there is little agreement regarding the prospects of this vision being achieved. Turning the promise of an RMA into reality is likely to be a severe challenge and it will not happen by chance.

Underlying the promise of a contemporary RMA are the advances made in the ability to gather, process and disseminate information. The assumption is that value can be derived from information and that this value increases as it moves toward 100 percent relevance, 100 percent accuracy and zero time delay. Any RMA is thus likely to involve exploitation of the wider information revolution.²⁰ On the face of it, the



...the superior information position, or 'information superiority' is about knowing more of the enemy and his intentions than he knows of you

assumption appears to be a fair one. The US has poured enormous resources into information gathering and dissemination assets; from satellites to unmanned air vehicles, spanning the entire electromagnetic spectrum (especially visible, and increasingly real-time); and equally, the network infrastructure (or 'infostructure') across which information is transported. The rate of development of sensors and networks by the US has been unprecedented and is to date virtually unrivalled.

The RMA proponent's belief is that US forces should be able to place themselves in a superior information position relative to opponents, and that this has intrinsic war fighting value. The thinking behind this proposition needs little rehearsal, for intelligence has long been considered the key to winning war with Sun Tzu providing the mantra to 'know the enemy and know yourself [and] in a hundred battles you will never be in peril'.²¹ Thus, the superior information position, or 'information superiority'²² is about knowing more of the enemy and his intentions than he knows of you.

Modern war, with its foreshortened engagement timelines and increasingly difficult target identification make the proposition of information superiority an extremely attractive one, and there is little dissent among RMA advocates that it is a 'good thing'. The US military has come to often confer upon itself the comfortable notion that in any battle situation, they will be able to gain information superiority over their foe.²³ However, looking in from the outside are a number of other nations eager to learn from any new capability, and they regard the US with envious eyes. For example, a peculiarly Indian perspective that 'an ounce of silicon and effective information exploitation may be worth more than a ton of uranium'²⁴ neatly indicates a covetousness in what they are observing. It is fallacious to believe the US will be without competition, and the US should not rely on the cost of technological advancement acting as an entry barrier to assure any form of dominance. Indeed, by conferring 'critical success factor' status on information superiority, the US has defined new vulnerabilities and targets for both attack and defence.²⁵

THE STRATEGIC CONTEXT FOR NETWORK CENTRIC WARFARE

Having examined the RMA context of NCW, what of its strategic context? Here it is necessary to briefly examine the likely circumstances under which US forces may be engaged and the nature of future competitors, because whatever NCW turns out to be, it must provide military value in this projected environment. To peer thus into a foggy future is open to contention, but to proceed without such an assessment is to ignore the relationship between NCW and why the US thinks it needs it.

Conflict is often thought of as military engagement between nation states, normally fought for territory, resource, religion, ideology or in self-defence. While this type of conflict certainly exists, the current 'war' against terrorism and missions of humanitarian assistance are clear examples of lower intensities of military mission. The immediacy and number of these conflicts is likely to increase and they will become more complex.²⁶ It will become more difficult to identify the 'front line'; a premium will be placed on speed and precision; the need to act with international consensus will set legal constraints on action; and surprise and deception will play key roles. Underlying these themes is change to the international order, which is apparent in greater regional instability, set in an increasingly globalised yet simultaneously fragmenting world. Events are recorded in real time by a pervasive media, a public expectation for rapid, discriminate results with minimum casualties exists, and a US desire to be a 'force for good' prevails; all eminently exploitable by potential competitors. Add to this the danger of asymmetric engagement, asymmetric ideals, weapons proliferation and weapons of mass destruction, attacks against infrastructure²⁷ or military infostructure, and a complex picture emerges. Yet NCW must be credible in this diverse and complex environment against a range of potential competitors.

While it is true that the US does not have a current peer competitor, to presume that one will not emerge over the next two decades would be to ignore history



Attack on Pearl Harbor December 1941

One useful framework for thinking about competitors distinguishes 3 types:²⁸ firstly, the peer competitor who is capable of competing across the full spectrum of military activity at a global level; secondly, those developing states who will be able to compete regionally using comparatively limited capability; and thirdly, competitors who emerge from militarily ineffectual nations scarred by complex security problems but armed with niche capabilities. While it is true that the US does not have a current peer competitor, to presume that one will not emerge over the next two decades would be to ignore history.²⁹ It is plausible that improved access to high technology will pave the way for a nation such as India to achieve peer status, in much the same way as Japan did in the 1930's. In the same manner, regional competitors such as Iran are unlikely to stand by while the US establishes unassailable military capability. These competitors, realising the risks attached to engaging the US in head-to-head battle, may use new technologies coupled with new techniques to engage in new ways. A nation such as China may be the first to develop revolutionary ways of competing, given its alternative strategic culture and doctrine descended from Mao rather than Clausewitz.³⁰ The concept of achieving high leverage against US forces³¹ through niche capability can be extended to non-state actors; the sort of terrorist organisation typified by Hamas or al-Q'aida who co-ordinate a network of dispersed units using commercial communications. The point here

is that the information revolution also underlies any change in the nature of conflict³² and the interrelationship between threat and opportunity will undoubtedly create unforeseen dynamics that NCW must be adaptable enough to cope with.

Another increasing trend has been for nations to act in coalition, as all-arms groups and away from home. This emphasis on joint, combined, expeditionary warfare has set new challenges for force providers and procurers, ushering in a period of great change in force structures but against a backdrop of shrinking defence budgets. In addition, we have seen in the field of operations other than war, an increasing requirement to be able to integrate with other government departments and non-governmental organisations, typically relief agencies. This trend seems set to continue, so there is a real need to ensure that NCW can integrate with partners and permit coherent interoperability.

...NCW is not a thing and cannot be considered as such; it is an immature operational concept in whose prospects the US Navy is placing much faith

WHAT IS NETWORK CENTRIC WARFARE?

So, given the background strategic context and the promise of an RMA, what is Network Centric Warfare? In short, NCW is the US Navy's concept for an RMA, made possible by the information revolution. Although the words 'network centric' are much used, there are a variety of views on what they actually mean and the aim here is to provide an interpretation based on the literature. However, before commencing there are three notes of caution. Firstly, it is fair to say that NCW is not a thing and cannot be considered as such; it is an immature operational concept in whose prospects the US Navy is placing much faith. Secondly, there is a tendency towards a literal interpretation of the term 'network'. While NCW does rely on computer and communications networks, it also has a broader outlook. Thirdly, it is also fair to say that a network-centric force does not currently exist.³³ Given these three cautions, we must recognise that an absolute characterisation of NCW is still emerging, and it is possible to develop only an interpretation of the concept, which follows.

NCW has grown out of the empirical observation that networked computing has fundamentally changed the underlying economics of business and can have dramatic effects on competitive performance. It has been observed that networking information can improve corporate understanding, thus empowering decisions at lower levels, enabling speedier reactions to occur and making businesses more agile. Equally important is the recognition that agile businesses are able not only to share information better, but gather it better, generally having an 'information grid' (improving information reach) and a 'sensing grid' built on a series of networks (improving information richness; timeliness, accuracy, content and relevance).³⁴ It is claimed this coupling of information reach and richness increases agility and leads to improved competitiveness. A belief has thus developed that the same thinking can be applied to conflict;³⁵ after all, the thinking goes, the cut-and-thrust of business can closely resemble conflict. NCW has therefore been conceived as military operations that deliver increased combat power through the networking of a force.³⁶ NCW is focussed at the operational and tactical levels of warfare, taking as underlying tenets that information is the key enabler and that NCW is about more than technology; it is also about human and organisational behaviour.³⁷

It is claimed that NCW will enable a shift to occur from warfare based on attrition to warfare characterised by new concepts of shared awareness, speed of command and self-synchronisation, which will not aim to

destroy the enemy per se, but to neutralise the effect the enemy can create. By networking the forces' sensing capabilities and fusing the information gathered into a common picture, the force will be able to achieve a shared awareness. Using this shared awareness, the force will be able to generate a superior speed of command, and this will allow the force to create high rates of change in the environment, in essence by making decisions faster than the enemy. By focussing these changes on the enemy's vulnerabilities, it will be possible to 'lock out' their courses of action as they will, by the time the enemy has developed them, already be neutralised. Taking this idea one step further, if all units share an awareness not just of the battlespace,³⁸ but of the commander's intent and the objective, they should be able to organise their activities from the bottom upwards. Bottom-up organisations are perceived as dynamic and better able to rapidly exploit opportunities in a complex environment. Thus, in ideal conditions, the force will be able to self-synchronise its activities, effectively out-thinking and out-maneuvring the enemy, and bringing about earlier foreclosure of hostilities.

NCW brings with it powerful claims for a number of prospective advantages. The movement of information is clearly less costly than the movement of things, and increasing availability of satellite communications removes the requirement to group platforms closely together, giving units the freedom to focus on their operational functions, rather than the creation and maintenance of communication links. It can raise awareness of what other participants can see, which may help to reduce Clausewitz's 'fog and friction' of war. In addition, the potential exists to move complexity away from platforms and into the infrastructure, because not all platforms will require similar sensing capabilities. Sensors and weapons can be increasingly decoupled, giving greater versatility to the force as a whole, and that force can be more geographically dispersed, taking advantage of longer range weapons. Speed of command potentially improves operational tempo while force protection can be improved because units can be kept out of harm's way until they are required to cause an effect. Finally, the combination of these actions allows effects to be massed without having to mass platforms.

NETWORK CENTRIC WARFARE – ON THE ROAD TO VALHALLA?

If NCW's claims seem like the road to Valhalla, it must be remembered that the benefits discussed thus far are prospective benefits, which require NCW and the wider RMA to overcome many challenges, even if some precursor systems are increasingly in place. The question is whether NCW has the power to yield revolutionary results. A number of influencing factors have already been identified: NCW must be more than technology; the technical edge may be short-lived; it must cope with the full spectrum of conflict against all competitors; it must be adaptable; and it must be interoperable. This is a remarkable set of challenges, yet there are a number of additional implications arising from NCW's concepts of shared awareness, speed of command and self-synchronisation that must be considered. It is these implications that this paper will now examine in examining whether NCW has the potential to yield the promised RMA.

INFORMATION SUPERIORITY AND SHARED AWARENESS

NCW's dependence on information superiority sets it as a pre-condition of network-centric operations. Admiral Owens, reviewing current technology, argues without reservation that the RMA has the potential to lift Clausewitz's 'fog of war', pointing to the ability of Allied forces during the Gulf war to thwart Iraq's every move through superior surveillance. Owens suggests that to be able to sense all objects in an area 200 by 200 miles square across the entire electromagnetic spectrum is a realistic objective,³⁹ and points to a plethora of systems which are building capability in this direction. Other NCW apostles point to a strong

...employing tactical data Link 16 to share information between F-15C fighters improved situational awareness significantly over non-Link 16 fitted aircraft, increasing the number of 'enemy' fighters killed by a factor of 2.5



correlation between information sharing, improved situational awareness, and improved combat power. Garstka argues that the potential of NCW has begun to emerge, citing a US Air Force experiment which found that employing tactical data Link 16 to share information between F-15C fighters improved situational awareness significantly over non-Link 16 fitted aircraft, increasing the number of 'enemy' fighters killed by a factor of 2.5.⁴⁰ It is difficult not to be impressed by the technology on offer and the way in which sensor and information networks are being progressively integrated. Yet despite this technical prowess, the underlying belief among NCW's evangelists that technology can lift the fog of war has met with much challenge.

Recent experience in Somalia and Kosovo has highlighted that well-equipped, modern forces using high technology have been unable to achieve information dominance against a resourceful, indigenous, entrenched opposition that can meet its needs with simple or easily available means. The presence of real-time airborne surveillance did not deny Somali warlords the ability to co-ordinate their actions using mobile phone, or by signalling using burning car tyres. The same assets did not overcome the fog of war on the ground during the disastrous US raid into Mogadishu of 3 October 1993.⁴¹ In Kosovo, information superiority did not prevent NATO from mistakenly striking trains, convoys and the Chinese Embassy in Belgrade. In addition, the Serbs used deception, disinformation, camouflage and CNN to limit the effectiveness of NATO's sensors.⁴² NATO had almost perfect intelligence about the intentions of President Milosevic, yet did not foresee his ethnic cleansing campaign in time to stop him.⁴³ This all points to systemic issues with information superiority and some commentators have even described it as an 'Alician rabbit-hole'⁴⁴ or a 'chimera'.⁴⁵ So what is the problem, and why does information superiority not appear to be the whole solution?

More data does not necessarily equal better information. Indeed, there are plenty of examples where the underlying data has been plain wrong,⁴⁶ and shared mis-information is probably more damaging than no information. Cebrowski counters with the observation that information superiority does not equal more

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volume of data, but more accuracy, relevance and timeliness. He argues that 'once the chaff has been winnowed the question of information overload subsides'.⁴⁷ However, he fails to examine the process by which this transformation from data to useful information occurs; the interpretation of that data. The most essential component is the human who brings together disparate data and creates from it a coherent assessment, a not inconsiderable task. As some have commented, the human element seems to be missing from current NCW theory.⁴⁸



Witness the USS Vincennes incident in which an Iranian airliner was mistaken for an F-14 fighter and shot down. All of the data required to support an identification of neutral airliner was present and in the fog of the moment, the Vincennes command team made the wrong decision

Even when the requisite data is available, interpreting it remains a fine art and the more problematic relationship between information and military decision-making is not fully understood.⁴⁹ Even if the interpretation process is not overwhelmed by the increasing amounts of data available, knowing which data create useful information is one thing, but knowing which information allows a commander to make good decisions is another entirely. Witness the USS Vincennes incident in which an Iranian airliner was mistaken for an F-14 fighter and shot down. All of the data required to support an identification of neutral airliner was present and in the fog of the moment, the Vincennes command team made the wrong decision. One of the deepest challenges for NCW lies in tackling this conundrum of the relationship between better information and the nature of command.

More information does not necessarily equal better shared awareness. Shared battlespace awareness is in the mind,⁵⁰ not in the network's various databases. In order to outsmart the enemy, one has to know not only where he is, but also what his intentions are. There will be plenty of occasions when assessment of the enemy's intentions will be at best an informed guess. This guess, based on the commander's intuition, remains largely in the human purview and the prospects for automation are bleak. There has yet to be a computer that can differentiate between a feint and a main effort.⁵¹ Although there is some limited application for simple machine-based reasoning, more complex forms of machine assistance are currently beyond the art of the possible as rule-sets have to be constrained by design. Thus it will be a long time before machines will be able to account for or predict the unexpected, and it is exactly this harm that the enemy is attempting to inflict on us. The perennial question will continue to be whether the information gathered is truly 'superior' – an enemy with inferior battlespace sensors but superior intuition may prove to have the superior battlespace awareness.

Neither information superiority nor shared awareness will remove friction from war, whether it arises from rational or irrational act. Clausewitz recognised friction as a fundamental factor in the conduct of war, arising from danger, exertion, imperfect information, chance, resistance within one's own forces, physical and political limitations on the use of force, unpredictability caused by interaction with the enemy and disconnects between ends and means in war.⁵² It is the interplay of these factors that leads us to the maxim that 'no plan survives contact with the enemy' and imperfect information is only one aspect of general friction. Indeed, there is compelling evidence that all of the frictional factors mentioned above were present in the Gulf war,⁵³ despite the fact that advocates often cite this war as evidence of the incipient RMA.

...technology can only detect what is observable; it cannot detect what cannot be observed

The only certainty is that uncertainty will remain an important factor in warfare. The bottom line is that technology can only detect what is observable; it cannot detect what cannot be observed. War will always be a struggle between opposing wills and the enemy will use ingenuity and guile to increase uncertainty. Attaining certainty requires access to all relevant information, but it is time-consuming to gather and process and although certainty increases with time, information can quickly become obsolete as interaction with the enemy continues. Also, there are practical limits on the amount of information that can be gathered, processed and assimilated in time to be of use and so a balance must therefore be found between the requirement for information and quick action. Thus the technology may be able to quickly transmit, store and present large amounts of information, but it is worthless without proper analysis.

It seems that even if technology will be better able to sense and inform, information superiority is not the whole answer – it is what is done with the information that is the key to success, not the information as an end to itself. A better interpretation of the requirement might be one from which superior decisions can be made. Thus a more appropriate concept may be 'decision superiority'. Joint Vision 2020 illustrates that the US has begun to acknowledge the criticisms levelled at information superiority, and has introduced a concept of decision superiority that allows for the human element of training and experience. Turning shared awareness into decision superiority requires a common framework and solid understanding of the way that friendly forces will operate. This implies a doctrine that is well rehearsed by all participants. NCW-enabled operations will therefore require regular training which, to achieve the required level of complexity and sophistication, is likely to be expensive and difficult to routinely mount outside of a synthetic environment.

SPEED OF COMMAND

Command has always required information to decide a course of action. The essential element of competitive decision-making and therefore successful command is to take action before the factors on which the decision was made are invalidated, and the challenge is to balance the risk of incomplete information with the need for speedy decisions. Speed of command is therefore about converting information into actions via decisions faster than the enemy can manage, often described as the OODA loop.⁵⁴

Whether increasing the availability of information will affect decision making in a network-centric force remains to be seen. Some claim that it will reinforce a 'zero defect' culture, slowing command by feeling a need to wait for that last vital clue, thus stifling initiative and the ability think 'out of the box'.⁵⁵ Others claim that NCW's emphasis on speed will lead to hasty decisions.⁵⁶ But these are perennial issues that are not unique to a network-centric force. The question NCW must tackle is 'how fast?' The key is being fast enough when needed, remembering that advantage is relative not absolute. It has been noted that 'we need to understand better how we can leverage speed of command in military situations and dispel the myth that speed is either a panacea or an unmitigated good'.⁵⁷ The emphasis here should be to exploit any extra time made available by provision of better information in the 'OO' portion of the OODA loop to improve the decision or to mass additional effect. Of course, the underlying assumption remains that a superior information position exists.

...forgetting that speed is not necessarily of the essence is tantamount to acting in anger

NCW should concentrate on what to do when inside the enemy decision cycle, not pursue speed for its own sake.⁵⁸ As one commentator has noted, forgetting that speed is not necessarily of the essence is tantamount to acting in anger.⁵⁹ Another way of looking at speed of command may be that improved shared awareness allows shorter duration plans to be made in the first place. These plans, potentially of lesser consequence, could possibly be better targeted, and thus achieve disproportionate effect. However, the danger exists that network-centric forces will be capable of acting so rapidly inside the enemy's ability to act or communicate that they end up responding to their own signals, effectively spinning on their own axis. The question then becomes one of exactly whose options have been locked out.

It is important to continue considering the human element of decision making. Human decision-making capacity changes under stress and time pressure⁶⁰ and among the observable changes is a tendency to focus more on the decision and less on situational awareness. Hence we rely on a smaller, more comfortable, portion of the available information and tend to become wedded to the existing plan. Over-emphasis on speed is thus potentially damaging to our cognitive capabilities and above all, NCW must ensure that the commander is protected as far as possible from these effects.

The concept of speed of command is a good one, but is open to criticism because it tends to focus attention on the means and not the end. The end is an improved rate at which effect can be brought to the enemy. Advocates of NCW believe that speed of command is a new concept. However, using initiative to precisely mass effects against enemy vulnerabilities is a key tenet of the manoeuvrist approach.⁶¹ It would probably be more accurate to describe speed of command as operational tempo and acknowledge that this is reinforcing current doctrine. Therefore speed of command is synonymous with increasing tempo in manoeuvrist warfare, hardly a revolutionary development.

SELF-SYNCHRONISATION

Synchronisation is an essential aspect of complex military operations, and achieving it arises largely as a result of training and initiative. Self-synchronisation thus describes the ability of an informed and trained force to synchronise activity from the bottom upwards. Advocates of this concept believe that such bottom up organisations are better able to cope with the fast-paced, dynamic and complex environment of military operations.⁶² The organising principles are unity of effort, clearly articulated commander's intent and carefully crafted rules of engagement.⁶³ Traditional military operations use top-down command to achieve synchronisation of effect. However, because each element of the force has its own preferred operating rhythm, combat is managed at the operational level as a sequence of discrete steps, each separated by a distinct pause in which battlespace awareness is regained.⁶⁴ Each pause offers an opening to the enemy. Thus the aim of self-synchronisation is to deny the enemy the ability to exploit this opening by removing the pause between steps, which also has the effect of maintaining a rate of change in the environment that the enemy commander cannot cope with;⁶⁵ in essence increasing the friction felt by the foe. This is conceptually very sound, however in practical terms, self-synchronisation must have bounds of control. It must have conditions, or doctrine, associated with its use.

Writing about the theory of manoeuvre warfare, Antal notes⁶⁶ that developing a faster decision cycle than your opponent means you must delegate decisions and allow trained, subordinate leaders maximum freedom of action guided by the commander's intent, train cohesive units capable of independent action, develop a streamlined information gathering and processing system, and instil the understanding that decisions will be made without the availability of perfect information. From the discussion this far, it would be difficult to differentiate between the conceptual objectives of NCW and current manoeuvrist doctrine. However, when considering the possibilities arising from the synergy between speed of command and self-synchronisation, a distinct and powerful difference begins to emerge.

On initial inspection, self-synchronisation seems very similar to the current doctrine of mission command, but conceptually it can be more radical than this. Mission command means that a commander assigns a task, resources and guidelines to a subordinate and then gives them as much freedom as possible in the execution.⁶⁷ In a self-synchronised force, the task is inferred from the commander's intent and resources are co-ordinated from the bottom up. With each force element acting towards the commander's intent, but not in an explicitly synchronised way, each element can operate at its own optimum speed, without being held back by the need for higher-level synchronisation. This means that while the effects that can individually be delivered may be smaller, they will occur in an asynchronous fashion that is difficult for the enemy to comprehend.⁶⁸ This is where the concept of 'lock out' arises, with multiple events changing the environment in rapid succession. The synergy of speed of command and self-synchronisation provides opportunity for a 'swarm' of events which are unified to the commander's intent but which push the enemy into a state of chaos. Some commentators have written about operations at the 'edge of chaos', taking from chaos theory and seeking application in NCW,⁶⁹ and if NCW offers anything truly radical, it is probably here.

...we may find that the US will be forced to hold back their abilities in order to operate in coalition

Self-synchronisation may not meet with universal approval, nor will it necessarily suit all circumstances. If the ability to self-synchronise is taken to its limits, then there will be inevitable implications for doctrine in terms of the command and control process, and also for training. It may be that the US can move to a self-synchronisation capability in time, but the question is whether their likely allies would wish to do so; we may find that the US will be forced to hold back their abilities in order to operate in coalition.

SOME IMPLICATIONS OF FOLLOWING AN NCW STRATEGY

Assuming that the issues tackled earlier can be successfully resolved, and something more radical than a 'refined' manoeuvre war doctrine emerges out of the benefits of self-synchronisation and speed of command, what might the implications be for US forces, their potential competitors and allies? These are the broader issues which the US must deal with which are fundamental to the efficacy of following an NCW strategy. This paper does not offer solutions, but highlights important areas of consideration for both US and other nations considering the pursuit of similar strategies.

HIERARCHY AND ORGANISATION

Improved access to information at all levels and the ability to self-synchronise and operate at higher tempos has implications for the military chain of command. Networks tend to imply flatter organisational structures, and in order for self-synchronisation to occur, these structures must be allowed to form; yet this is in conflict with current hierarchical military command culture. For organisations such as militaries that feel they must uphold hierarchies, the challenge will be to discover how to combine the strengths of both hierarchy and network. For organisations that are used to a culture of 'information being power', the greater pervasiveness of information will result in better-informed subordinates. This will effectively democratise lower levels, thus leading to 'consultation and co-ordination', building blocks of the network design,⁷⁰ rather than 'command and control'. This is a side effect of NCW that requires fundamental culture change to bring about.



The potential pitfalls of increasing tactical visibility to higher levels of command are exemplified by the ability of Predator unmanned air vehicles to feed live pictures from Afghanistan to the White House (Predator TV)

Some argue that advances in information technology make it possible for the superior commander to exercise better centralised command. Whilst this is a possibility, it is not necessarily a virtue. The subordinate in the field will always have a better understanding of the situation, especially of the human aspects of war. The potential pitfalls of increasing tactical visibility to higher levels of command are exemplified by the ability of Predator unmanned air vehicles to feed live pictures from Afghanistan to the White House (Predator TV).⁷¹ Couple this ability with the fact that Predator can now be armed with Hellfire missiles, and a new definition of the 'long screwdriver' emerges, thus forever removing the distinction between the tactical and strategic. Without doubt this is a potentially revolutionary change with strong organisational implications that requires much thought.

So, if the US needs to redesign their organisation to fit NCW, what might it look like? One organisational form which shows some promise is the 'virtual organisation' in which the relevant actors come together in an ad hoc manner for a specific, time-limited, purpose.⁷² The composition of such teams would be based on 'best man for the job' rather than any sense of traditional military hierarchy, with the intention of providing an optimal skills mix. However, the virtual organisation is not without difficulty, mainly arising from the limited ability of geographically dispersed individuals to gain shared comprehension, clear understanding of command intent and mutual trust, irrespective of the underpinning technical networks. Other types of organisational form are being researched which mix the characteristics of both hierarchy and network,⁷³ the 'command network'; however the implications and efficacy of such structures will depend heavily on experimentation and the jury will remain out for years to come.

It is quite probable that a shift to a network centric strategy will further encourage competitors to find new ways of competing, including attack on the infostructure, in essence 'hacking' into the network to deny service or deceive; information warfare

COMPETITORS AND ALLIES

Should the US create an NCW-enabled RMA, they are likely to create an asymmetric opponent of everyone. The form of strategic asymmetric attack that could be mounted needs little rehearsal following the events of 11 September 2001 and few would dare to engage the US in head-to-head battle or to allow a rerun of the Gulf war. It is quite probable that a shift to a network centric strategy will further encourage competitors to find new ways of competing, including attack on the infostructure, in essence 'hacking' into the network to deny service or deceive; information warfare. This exploitation of the US dependence on information superiority may yet prove to be NCW's undoing and the US will have to concentrate much effort on mitigating this threat. The ability of a network-centric force to induce chaos among the enemy at will may prove to have credence as a deterrent, but only if NCW is secured against information warfare.

The flip side of this point is interoperability. Allies need to be able to communicate with the US if they are to operate with them symmetrically, thus there must be openings into the system which are potential points of exploitation that have to be guarded. Coalitions of the willing, who are perhaps unused to operating with the US, will provide particular challenges because of security concerns. In addition, coalitions will need to share common doctrine and training, and have organisations that are able to 'recognise' each other structurally. If the political imperative of coalition operations remains, the US will have to ensure that allies do not become 'locked out' of NCW because of fundamental incompatibilities, especially if they are not

equipped with the same 'sense and share' capacity or are not privy to the same 'national' information as the US. This tends to suggest that standing coalitions such as NATO will have greater value to the US in international conflict resolution than informal coalitions. Tiered participation is also a possibility where more capable and closer allies are allowed into the 'inner sanctum' while others are sidelined and expected to do what they are told. One cannot see such a situation encouraging good international relations.

CONFLICT INTENSITY

A further set of implications arises from considering the diverse intensity of military operations that the US is likely to contribute to. A common criticism is that NCW focuses on high-end war fighting and does not lend itself to operations other than war.⁷⁴ The question here is whether the ambition of speedily 'locking out' enemy courses of action is appropriate in low intensity conflict. However, it is not necessary to use the full spectrum of capability in all circumstances, and as long as the US has operational versatility, this issue is of lesser importance.

Of more importance is what the 'network' and its information may be able to add. Here, there is scope for a network-centric force to act as the information provider, maintaining channels of communication to all interested parties, including non-governmental organisations and relief agencies. The challenge will be turning information superiority to benign use. In such operations, the value of self-synchronisation is questionable and in any case is probably not universally desirable at all levels of conflict; while the benefits to another Gulf War are fairly obvious, the benefits to humanitarian relief operations are less easily stated.

CULTURE AND CHANGE MANAGEMENT

While Cebrowski, Alberts et al are quick to point out that commerce has been able to revolutionise its processes using information technology,⁷⁵ they have not been so quick to point out that these successes have occurred in companies which already have deeply embedded cultures of innovation and change.⁷⁶ The status quo is anathema to companies who have successfully made the transition to information-enabled operations and there are more examples of change management failures in commerce than there are success stories, a point acknowledged by Alberts et al⁷⁷. However, industry is quick to learn from mistakes and has procurement and reorganization cycles that make the military look laborious by comparison. Defence reform is not dynamic enough to keep up with changes in the environment, and large-scale modernisation will always be a complex and expensive undertaking. Thus the military will always lag the art of the feasible.

...there is nothing more difficult to take in hand, more perilous or more uncertain in its success, than to take the lead in the introduction of a new order of things

One could argue that this works to the military's advantage because it allows previously adopted change to be fully absorbed into the organisation and become inculcated; the military being a large and hierarchical organisation with a strong sense of propriety within which culture change is rarely achieved without overcoming much stiction. However, this is more likely to hold back any revolution, leading to an evolutionary approach in which opportunity is lost. As we have observed, in order to achieve whole scale revolution, we have to introduce more than new technology. The dilatory rate of change of organisational structures and culture act as a brake on the uptake of new concepts and is the greatest cause of friction⁷⁸.

Success will be measured by the willingness of the military to adapt to, and fully adopt, new methods of working, even if they threaten established hierarchies and structures. Meanwhile, the US Navy wants NCW, but questions whether it is prepared to take the risks necessary to achieve it, for as Machiavelli noted, 'there is nothing more difficult to take in hand, more perilous or more uncertain in its success, than to take the lead in the introduction of a new order of things'.

There is a danger of being sucked in by the hype surrounding NCW. To say that NCW will definitely revolutionise warfare, before much more experimentation has been conducted, would be brave in the extreme. While this outcome cannot be discounted, the concerns and evidence presented here point toward not only evolutionary implementation, but also evolutionary results. For a start, the conceptual distance between NCW and traditional maritime operations is not as large as supposed⁷⁹, and the three key concepts of shared awareness, speed of command and self-synchronisation, as we have seen, correspond closely to the principles of manoeuvre war.

It is therefore incongruous to develop future war fighting concepts on the notion that the US will, through information superiority, gain the total advantage

Shared awareness has long been an aspiration and is likely to see incremental improvements in capability as networking technologies come on line. The progress that has been made is undeniable. However, no amount of technology is going to remove Clausewitz's fog and friction and his warning that war 'has to operate in the dark, or at best in the twilight'⁸⁰ remains salutary. While technology has the power to push at the fog's edges, war will continue to be frustrated by friction, if for no other reason than because the enemy gets a vote. It is axiomatic that both sides will engage in information denial at the same time as information gathering, more still that both protagonists will take action on different information thresholds. It is therefore incongruous to develop future war fighting concepts on the notion that the US will, through information superiority gain the total advantage. The concept of decision superiority, is no better placed, as it will be affected by the same limitations in generating shared awareness. As every car driver knows, shining a bright light at fog serves to create dazzle, not penetrate the fog.

Equally, we have seen that speed of command is in essence improved operational tempo, while self-synchronisation could closely approximate the current doctrinal tenet of mission command. Self-synchronisation could become more radical than this, but whether it is desirable is questionable. Meanwhile, achieving synergy between forces, delegation of authority to appropriate levels, local co-ordination and individual initiative are not new aspirations which are waiting for an NCW revolution; they are with us in well trained and equipped forces today. Command in war remains a universally human activity and NCW advocates would do well to remember this during future development work. Now, more than ever, NCW's evangelists need to consider carefully whether it really does offer anything fundamentally new before embarking on a programme of wholesale revolution.

All the indications are that the philosophy of NCW will become deeply embedded in US thinking. What remains to be seen is the extent to which the US Navy can, or even needs to, re-invent itself to make sufficient space for NCW to mature and deliver its potential revolution. For example, NCW may well allow changes in force structures, with a move to lighter armed, more mobile formations and platforms. If the US can induce shock and chaos using NCW, then high-end war fighting capability is preserved, while simultaneously offering greater potential versatility at lower intensities of conflict, where it is predicted that

the greatest frequency of operation will occur. However, NCW will not provide a single answer or solve all problems. The goal should be to identify those combinations of new thinking and new technologies that offer better answers to the war fighter's needs over as great a portion of the spectrum of conflict as possible.

NCW is unlikely to come about overnight or without significant investment in time and money. To achieve the vision set out in JV2020 of a force capable of 'dominant manoeuvre', made possible by implementation of NCW concepts, will require continued experimentation. Experimentation by definition requires a culture of innovation in which an acceptance exists that fundamental changes to existing concepts of organisation and structure may be required. Should this willingness exist in a US Navy that is prepared to accept the risks associated with radicalism, then there is a prospect that NCW may ultimately be revolutionary. Should the willingness not exist then the probability is that NCW will realise evolutionary improvement to current doctrine. It will, without doubt, generate improvements in the conduct of 20th century warfare, but may not become the blueprint for 21st century war. The US Navy only have a short period to begin to effect any required culture change, otherwise however large the head of steam, NCW will fail to make the climb. As Cebrowski notes, 'the keys to success are bold leadership, continual experimentation and learning and organizational adaptation'⁶¹.

For NCW to be evolutionary may be both the best and the worst outcome. It may be the best outcome because it does not fundamentally alter the balance of capability between the US and their allies and potential competitors. It is the case that to fundamentally revolutionise the way of war is to create an asymmetric opponent of everyone, at least in the short term. These opponents will be increasingly required to compete on unequal terms, driving conflict in new directions for which NCW and the wider military is potentially not well prepared. To believe that the concepts of NCW are equally applicable across the entire spectrum of conflict is, at this stage, a premature conclusion. It may be the worst outcome because the US Navy may in the end not prove to be the vanguard. Other potential competitor nations, with access to similar industrial and technological capabilities, may develop the battle-winning advantage by another route.

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Notes:

- 1 Metcalfe's Law states that the 'power' of any network is proportional to the square of the number of nodes in that network.
- 2 More holistically, Command, Control, Communications, Computers, Information, Surveillance and Reconnaissance (C4ISR).
- 3 The US Joint Vision 2020 is an example; see www.dtic.mil/jv2020.
- 4 Alberts et al (1999), p.2.
- 5 www.dtic.mil/jv2020, Joint Vision 2020.
- 6 Owens (2000), p.17.
- 7 Krepenovich (1994), p.30. Although open to debate, Krepenovich identifies ten military revolutions: Infantry; Artillery; Sail & Shot; Fortress; Napoleonic; Land Warfare; Naval; Mechanization & Aviation; Information; and Nuclear.
- 8 Krepenovich (1994), p.31.
- 9 For a summary of RMA perspectives, see O'Hanlon (2000), pp.11-18, or Cooper, J (1994) pp.116-123.
- 10 van Creveld (1989).
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- 22 'The capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same'. Defined in US Doctrine publication JP1-02, and reflected in UK Doctrine publication JWP-010.
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KOSOVO

and the Continuing SEAD Challenge

By Dr Benjamin S Lambeth

Just as the attacks of 11 September 2001 refocused national attention on terrorism, so did the shootdown of an F-117 stealth aircraft over Kosovo in 1999 serve as a wake-up call for the Air Force to improve tactics, techniques, and procedures relating to the suppression of enemy air defences

Almost everyone acknowledged that the allied forces' use of airpower in the North Atlantic Treaty Organisation's (NATO) air war for Kosovo in 1999 was a resounding success.¹ Yet, some troubling questions arose well before the war's favourable outcome over a number of unexpected problems along the way. Perhaps the most disturbing of these involved assessed deficiencies in the suppression of enemy air defenses (SEAD) in support of allied strike operations against the enemy's fixed and mobile targets.

Much of the surprise experienced by allied aircrews during their early, unsuccessful forays against Serbia's integrated air defence system (IADS) in Operation Allied Force may have stemmed from an overconfidence in the Air Force's SEAD capability, which had taken root in the aftermath of the highly effective SEAD campaign during the opening days of Operation Desert Storm eight years before. At that time, Baghdad was protected by the heaviest concentration of air defenses of any city in the world after Moscow. Likewise, highly internetted, radar-guided surface-to-air missiles (SAM) and antiaircraft artillery (AAA) proliferated throughout the rest of Iraq. Accordingly, the coalition's initial SEAD attacks focused on neutralising Iraq's radar-directed medium- and high-altitude SAMs with AGM-88 high-speed anti-radiation missiles (HARM) so as to open up a sanctuary for coalition aircraft above 10,000 feet.² The underlying

concept of operations entailed using a combination of tactical surprise and deception, from the very first moments of the campaign, to force the largest possible number of Iraqi SAM batteries to disclose their positions to the coalition's HARM shooters by activating their radars.³

In marked contrast to the highly satisfying SEAD experience of Desert Storm, the initial effort to suppress Serbian air defences in Allied Force did not go nearly as well as expected

During the first four hours of the war, coalition sensors logged nearly 100 radar emissions from Iraqi air defenses, resulting in the firing of more than 500 HARMs to useful effect during the first 24 hours. Consequently, Iraq's IADS operators quickly learned that activating their radars meant inviting a deadly attack. By the sixth day of the war, Iraqi SAM, AAA, and early warning radar emissions had dropped by 95 percent. Now that Iraq's air defenders were fully intimidated and loath to activate their SAM acquisition-and-tracking radars, coalition SEAD operations moved from suppression to the physical destruction of enemy defenses, using general-purpose bombs, AGM-65 Maverick missiles, and CBU-87 cluster bombs.⁴ Instead of rolling back the enemy's defenses sequentially, coalition planners attacked those assets simultaneously, neutralising them in such a way that Iraq never recovered. For good reason, the US Air Force's Gulf War Air Power Survey later characterised the SEAD campaign as 'one of the clear success stories' of the war.⁵

In marked contrast to the highly satisfying SEAD experience of Desert Storm, the initial effort to suppress Serbian air defenses in Allied Force did not go nearly as well as expected. The avowed objective called for neutralising as many of Serbia's SAMs and AAA sites as possible, particularly its estimated 16 SA-3 Low Blow and 25 SA-6 Straight Flush fire-control radars. Another early goal involved taking out or suppressing long-range surveillance radars that could provide timely threat warnings to enemy troops carrying shoulder-fired, infrared SAMs such as the SA-7. Unlike the Iraqis, however, the Serbs kept their SAMs defensively dispersed and operating in an emission-control mode, prompting concern that they meant to draw NATO aircraft down to lower altitudes for easier engagement. Before the initial strikes, there were reports of a large-scale dispersal of SA-3 and SA-6 batteries from nearly all of the known garrisons. The understandable reluctance of enemy SAM operators to emit and thus render themselves cooperative targets made them much harder to find and attack, forcing allied aircrews to remain constantly alert to the radar-guided SAM threat throughout the war.⁶ This situation also had the effect of denying some high-risk targets for a time, increasing force-package size, and increasing overall requirements for SEAD sorties.

Moreover, unlike the more permissive operating environment in Desert Storm, limitations to airspace availability typically made for high predictability on the part of attacking NATO aircraft, and prohibitions against collateral damage frequently prevented the use of the most tactically advantageous attack headings. Adm Leighton Smith, USN, retired, commander of NATO forces in Bosnia from 1994 to 1996, said that the resulting efforts to neutralise the Serb IADS were 'like digging out potatoes one at a time.'⁷ Gen John Jumper, commander of United States Air Forces in Europe (USAFE) at the time, later added that the combined air operations centre (CAOC) could never get political clearance from NATO to attack the most troublesome early warning radars in Montenegro, which meant that the Serbs knew when attacks were coming most of the time.⁸ In other cases, the cumbersome command and control (C2) arrangements and the need for prior CAOC approval before attacking the fleeting IADS pop-up targets resulted in many lost opportunities and few hard kills of enemy SAM sites.



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THE ALLIED FORCE GAME PLAN

Allied Force drew principally on 48 Air Force Block 50 F-16CJs and 30 Navy and Marine Corps EA-6B Prowlers to conduct the suppression portion of allied counter-SAM operations. Land-based Marine EA-6Bs, tied directly to attacking strike packages, typically provided electronic countermeasures (ECM) support for missions conducted by US aircraft. Navy Prowlers aboard the USS Theodore Roosevelt supported carrier-launched F-14 and F/A-18 raids and strike operations by allied fighters. Each of the carrier-based Prowlers carried two HARMs. In contrast, those operating out of Aviano Air Base, Italy, almost never carried even a single HARM, preferring to load an extra fuel tank because of their longer route to target. To compensate, EA-6Bs often teamed with HARM-shooting F-16CJs or with HARM-equipped German and Italian Tornado electronic-combat-role variants.⁹



The Air Force used EC-130 Compass Call electronic warfare (EW) aircraft to intercept and jam enemy voice communications, thus allowing the EA-6Bs to concentrate exclusively on jamming the enemy's early warning radars

The Air Force used EC-130 Compass Call electronic warfare (EW) aircraft to intercept and jam enemy voice communications, thus allowing the EA-6Bs to concentrate exclusively on jamming the enemy's early warning radars. RC-135 Rivet Joint electronic intelligence (ELINT) aircraft, which orbited at a safe distance from the combat area, validated the success of the latter efforts. The biggest problem with the EA-6B was its relatively slow flying speed, which prevented it from keeping up with ingressing strike aircraft and diminished its jamming effectiveness. On occasion, the jamming of early warning radars forced Serb SAM operators to activate their fire-control radars, which, in turn, rendered them susceptible to attack by a HARM. Accordingly, the enemy limited activation of his SAM fire-control radars to increase their survivability.¹⁰

SEAD operations conducted by F-16CJs almost invariably entailed four-ship formations, the spacing of which ensured that the first two aircraft in the flight always looked at a threat area from one side while the other two monitored it from the opposite side. That enabled the aircraft's HARM Targeting System, which provided only a 180-degree field of view in the forward sector, to maintain 100 percent sensor coverage of a target area whenever allied strike aircraft attempted to bomb specific aiming points within it. According to one squadron commander, the F-16CJs would arrive in the target area ahead of the strikers and build up the threat picture before those aircraft got close, so that the strikers could adjust their ingress routes accordingly. In so doing, the F-16CJs provided both the electronic order of battle and the air-to-air threat

picture as necessary. The squadron commander added that enemy SAM operators got better at exploiting their systems at about the same rate the F-16CJ pilots did, resulting in a continuous cat-and-mouse game that made classic SAM kills 'hard to come by.'¹¹

Evidently, the Serbs launched only a few SAMs against attacking NATO aircraft the first night. The second night, the enemy fired fewer than 10 SA-6s, none of them scoring a hit. Later during Allied Force, the Serbs frequently fired SAMs in large numbers, with dozens launched in salvo fashion on some nights but

only a few launched on others. Although these ballistic launches constituted more a harassment factor than any serious challenge to NATO operations, in numerous instances allied pilots had to jettison their fuel tanks, dispense chaff, and manoeuvre violently to evade enemy SAMs that were guiding.¹²

Indeed, the SAM threat to NATO's aircrews proved far more pronounced and harrowing than media coverage typically depicted, and aggressive jinking and countermanoeuvring against airborne SAMs frequently became necessary whenever the Serbs sought to engage NATO aircraft. Ten or more pilots operating in a target area might report a SAM shot as ballistic while the one pilot on whose helmet the missile was figuratively guiding would be actively reacting to it. Shortly thereafter, 10 pilots would recover to widely dispersed home bases and report nonthreatening ballistic launches, while only one would return with the evidence of a guided shot. Such episodes drove an initial impression among Allied Force leaders that 'most' of the observed SAM shots were ballistic. Fusion of all the pertinent information and elimination of duplicate reporting, however, indicated that a substantial number of SAM launches, perhaps as many as a third, were guided.¹³

Indeed, Gen Wesley Clark, US Army, supreme allied commander, Europe (SACEUR), later reported numerous instances of near-misses involving enemy SAM launches against NATO aircraft. General

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Jumper added that a simple look at cockpit-display videotapes would show that 'those duels were not trivial.'¹⁴ From the very start of NATO's air attacks, Serb air defenders also sought to sucker NATO aircrews down to lower altitude to bring them within the lethal envelopes of widely proliferated man-portable air defence systems (MANPADS) and AAA emplacements. A common Serb tactic involved firing on the last aircraft in a departing strike formation, perhaps on the presumption that those aircraft would be unprotected by other fighters; flown by less experienced pilots; and low on fuel, which would limit their freedom to countermanoeuvre.

THE F-117 SHOOTDOWN



It did not take long for the problems connected with the air war's SEAD effort to register their first toll. On the fourth night of air operations, an apparent barrage of SA-3s downed an F-117 at approximately 2045 over hilly terrain near Budanovci, about 28 miles northwest of Belgrade – marking the first combat loss ever of a stealth aircraft. Fortunately, the pilot ejected safely and, against formidable odds, was recovered before dawn the next day by a combat search and rescue team using MH-53 Pave Low and MH-60 Pave Hawk helicopters led by a flight of A-10s.

Afterward, this unexpected event occasioned a flurry of speculation regarding how it might have taken place. Experts at Lockheed Martin Corporation, the aircraft's manufacturer, reported that – unlike earlier instances of F-117 combat operations – the

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Remains of downed F-117

missions flown over Yugoslavia required the aircraft to operate in ways that may have compromised its stealthy characteristics. By way of example, they noted that even a standard turning manoeuvre could increase the aircraft's radar cross section by a factor of 100 or more. Such turns were unavoidable in the constricted airspace within which the F-117s had to fly.¹⁵ Another unconfirmed report suggested that the RC-135 Rivet Joint aircraft monitoring enemy SAM activity may have failed to locate the SA-3 battery thought to have downed the F-117 and may not have relayed timely indications of enemy SAM activity to the appropriate C2 authorities. Lending credence to that interpretation, Gen Richard Hawley, commander of Air Combat Command at the time, commented that 'when you have a lot of unlocated threats, you are at risk even in a stealth airplane.'¹⁶

Although the Air Force has remained understandably silent about the confluence of events it believes occasioned the F-117's downing according to press reports, Air Force assessors concluded, after conducting a formal postmortem, that a lucky combination of low-technology tactics, rapid learning, and astute improvisation had converged in one fleeting instant to enable an SA-3 not operating in its normal, radar-guided mode to down the aircraft. Undoubtedly, enemy spotters in Italy reported the aircraft's take off from Aviano, and IADS operators in Serbia, as well as those in Bosnia and along the Montenegrin coast, could have assembled enough glimpses of its position enroute to its target from scattered radars to cue a SAM battery near Belgrade to fire at the appropriate moment. The aircraft had already dropped one laser-guided bomb (LGB) near Belgrade, offering the now-alerted air defenders yet another clue. (The Air Force is said to have ruled out theories hinging on a stuck weapons-bay door, a descent to below 15,000 feet, or a hit by AAA.)¹⁷

Allegedly, at least three procedural errors contributed to the downing.¹⁸ First, ELINT collectors reportedly could not track the changing location of the three or four offending SAM batteries. Three low-frequency Serb radars that could have detected the F-117's presence, at least theoretically, were not neutralised because US strike aircraft had earlier bombed the wrong aiming points within the radar complexes. Also, F-16CJs carrying HARMs and operating in adjacent airspace could have deterred the SA-3 battery from emitting, but those aircraft had been recalled before the F-117 shootdown.

The second alleged procedural error entailed an EA-6B support jammer that was operating too far away from the F-117 (80 to 100 miles) to offer much protection. Furthermore, it was out of proper alignment with the offending threat radars, resulting in inefficient jamming.

I'm surprised we didn't bomb it, because the standing procedure has always been that when you lose something of real or perceived value – in this case real technology, stealth – you destroy it

Last, F-117s operating out of Aviano had previously flown along more or less the same transit routes for four nights in a row (because of SACEUR's ban on overflight of Bosnia) to avoid jeopardising the Dayton Accords. That would have made their approach pattern into Yugoslav airspace predictable. Knowing the direction the F-117s would take, Serb air defenders could have employed low-frequency radars for the best chance of getting a snap look at the aircraft. Former F-117 pilots and several industry experts acknowledged that the aircraft is

detectable by such radars when viewed from the side or directly below. US officials also suggested that the Serbs may have gotten brief, nightly radar hits while the aircraft's weapons bay doors opened fleetingly.

In the immediate aftermath of the shootdown, heated arguments arose in Washington and elsewhere over whether US European Command had erred in not acting aggressively to destroy the wreckage of the downed F-117 in order to keep its valuable technology out of unfriendly hands and eliminate its propaganda value, which the Serbs made every effort to exploit.¹⁹ Said Gen John M. Loh, USAF, retired, former commander of Tactical Air Command, 'I'm surprised we didn't bomb it, because the standing procedure has always been that when you lose something of real or perceived value – in this case real technology, stealth – you destroy it.'²⁰ Paul Kaminski, the Pentagon's former acquisition chief and the Air Force's first F-117 program manager during the 1970s, bolstered the case for at least trying to deny the enemy the wreckage. He noted that, although the F-117 had been operational for 15 years, 'there are

things in that airplane, while they may not be leading technologies today in the United States, [that] are certainly ahead of what some potential adversaries have.' Kaminski added that the main concern was not that any exploitation of the F-117's low-observable technology would enable an enemy to put the F-117 at greater risk but that it could help him eventually develop his own stealth technology in due course.²¹ Reports indicated that military officials had at first considered attempting to destroy the wreckage but opted in the end not to follow through because they could not have located it before civilians and the media surrounded it.²² Those issues aside, whatever the precise explanation for the downing, it meant not only the loss of a key US combat aircraft, but also the dimming of the F-117's former aura of invincibility, which for years had carried incalculable psychological value.

OTHER FRUSTRATIONS

The persistence of a credible SAM threat throughout the Kosovo air war meant that NATO had to dedicate a larger-than-usual number of strike sorties to the SEAD mission to ensure reasonable freedom to operate in enemy airspace. Thus, fewer sorties were available for NATO mission planners to allocate against enemy military and infrastructure targets although the limited number of approved targets at any one time tended to minimise the practical effects of that consequence. Moreover, the Block 50 F-16CJ, which lacked the ability to carry the LANTIRN targeting pod, was never used for precision bombing at night because it could not self-designate targets.²³

...the U-2 and Rivet Joint typically performed well and did not suffer the same problems that sometimes plagued the E-8



One of the biggest problems that confronted attacking NATO aircrews on defence-suppression missions was target location. Because of Kosovo's mountainous terrain, the moving-target indicator and synthetic aperture radar aboard the E-8 joint surveillance, target attack radar system (JSTARS) aircraft could not detect targets masked from view at oblique look angles, although sensors carried by the U-2 and the EC-135 Rivet Joint often compensated for this shortfall. The cover provided to enemy air defence assets by the interspersed mountains and valleys became a severe, complicating factor. Mitigating that constraint somewhat, the limited surveillance range of JSTARS caused by interposed ridgelines restricted E-8 operations primarily with regard to Kosovo, which harboured only a limited SAM threat (only one of the five SA-6 regiments and no SA-2s or SA-3s). Most of the enemy IADS targets lay outside Kosovo. Moreover, the U-2 and Rivet Joint typically performed well and did not suffer the same problems that sometimes plagued the E-8.²⁴

By the same token, the Yugoslav IADS's extensive network of underground command sites, buried land-lines, and mobile communications centres hampered the allied effort to attack that system's internetted communications links. This internetting used fused radar input, which allowed the acquisition and tracking of NATO aircraft from the north, and subsequently fed the resulting surveillance data to air defence radars in the south. This enabled the southern sector operations centre to cue defensive weapons (including shoulder-fired man-portable SAMs and AAA positions) at other locations in the country that had no active radar nearby. That may have accounted, at least in part, for why the F-16CJ and EA-6B often proved ineffective as SAM killers since both employed the HARM to home in on enemy radars that normally operated in proximity to SAM batteries.²⁵ In all, well over half of the HARM shots taken by allied SEAD aircrews were preemptive targeting or so-called PET shots, with a substantial number of these occurring in the immediate area of Belgrade.²⁶ Many HARM shots, however, were reactive rather than preplanned, made in response to transitory radar emissions as detected.²⁷

Yugoslavia's poorly developed road network outside urban areas also may have worked to the benefit of NATO attackers on more than a few occasions because the enemy's SAM operators depended on road transportation for mobility, and towed AAA tended to bog down when it left prepared surfaces and moved into open terrain. NATO pilots, therefore, studiously avoided flying down roads and crossed them when necessary at 90-degree angles to minimise their exposure time. By remaining at least five kilometres from the nearest road, they often negated the AAA threat, albeit at the cost of making it harder to spot moving military vehicles.

Whenever available intelligence permitted, the preferred offensive tactic entailed destruction of enemy air defenses (DEAD) attacks aimed at achieving hard kills against enemy SAM sites using Block 40 F-16CGs and F-15Es carrying LGBs, cluster bombs, and the powered AGM-130, rather than merely suppressing SAM radar activity with F-16CJs and HARMs.²⁸ For attempted DEAD attacks, F-16CGs and F-15Es would loiter on call near tankers orbiting over the Adriatic, rolling in on any pop-up SAM threats that might suddenly materialise.²⁹ Also, the unpowered AGM-154 Joint Standoff Weapon (JSOW), a near-precision glide weapon featuring inertial and Global Positioning System satellite guidance and employed by Navy F/A-18s, used its combined-effects submunitions to good effect on at least a few occasions against enemy acquisition-and-tracking radars.³⁰

...whenever attacking fighters found themselves engaged by a SAM, they were pretty much on their own in defeating it...

One problem with such DEAD attempts was that the data cycle time had to be short enough for attackers to catch the emitting radars before they moved on to new locations. One informed report observed that supporting F-16CJs were relatively ineffective in the reactive SEAD mode because the time required for them to detect an impending launch and get off a timely HARM shot to protect

a striker invariably exceeded the flyout time of the SAM aimed at the targeted aircraft. As a result, whenever attacking fighters found themselves engaged by a SAM, they were pretty much on their own in defeating it. That suggested to at least some participating aircrews the value of having a few HARMs uploaded on selected aircraft in every strike package so that strikers could protect themselves as necessary without having to depend in every case on support from F-16CJs or EA-6Bs.³¹

The commander of the Marine EA-6B detachment at Aviano commented that allied SEAD assets had no single-solution tactic to employ against enemy systems: 'If we try to jam an emitter in the south, there may

be a northern one that can relay the information through a communications link and land line. They are fighting on their own turf and know where to hide.'³² He added that Serb SAM operators would periodically emit with their radars for 20 seconds and then shut down the radars to avoid swallowing a HARM.

In all, more than 800 SAMs reportedly fired at NATO aircraft, both manned and unmanned, over the course of the 78-day air war, including 477 SA-6s and 124 confirmed man-portable infrared missiles.³³ A majority of the fixed SAMs were fired without any radar guidance. Despite that expenditure of assets, enemy fire downed only two NATO aircraft – the F-117 mentioned above and, later, an F-16 – although another F-117 sustained light damage from a nearby SA-3 detonation and two A-10s were hit by enemy AAA fire but not downed.³⁴ Also, in two reported cases short-range, infrared-guided missiles hit A-10s, one of the missiles apparently striking the bottom of the aircraft, defusing itself, and bouncing off harmlessly.³⁵ US and NATO aircraft fired at least 743 HARMs against radars supporting these enemy SAMs.³⁶ Yet, enough of the Serb IADS remained intact – mainly the persistent AAA and MANPADS threat – to require NATO fighters to operate above a 15,000-foot floor throughout most of the air effort. Although allied pilots could effectively counter the older SA-7 with flares if they saw it in time, the SA-9/13, SA-14, SA-16, and SA-18 presented a more formidable threat.

THE BALANCE SHEET FOR KOSOVO

In the end, as noted above, enemy SAM fire brought down only two aircraft (both American), thanks to allied reliance on electronic jamming, towed decoys, and countermeasures to negate enemy surface-to-air defenses.³⁷ However, NATO never fully succeeded in neutralising the Serb IADS, and NATO aircraft

...it began to dawn on us that they were going to try to survive as opposed to being willing to die to shoot down an airplane

operating over Serbia and Kosovo were always within the engagement envelopes of enemy SA-3 and SA-6 missiles—envelopes that extended as high as 50,000 feet. Because of that persistent threat, mission planners had to place such high-value surveillance-and-reconnaissance platforms as the U-2 and JSTARS in less-than-ideal orbits to keep them outside the lethal reach of enemy SAMs. Even during the operations final week, NATO spokesmen conceded that they could confirm the destruction of only three of Serbia's approximately 25 known mobile SA-6 batteries.³⁸

In all events, by remaining dispersed and mobile, and by activating their radars only selectively, the Serb IADS operators yielded the short-term tactical initiative in order to present a longer-term operational and strategic challenge to allied combat sorties. The downside of that inactivity for NATO was that opportunities to employ the classic Wild Weasel tactic of attacking enemy SAM radars with HARMs while SAMs guided on airborne targets were 'few and far between.'³⁹ Lt Gen Michael Short, the Allied Force air commander, later indicated that his aircrews were ready for a wall-to-wall SAM threat like the one encountered over Iraq during Desert Storm but that 'it just never materialised. And then it began to dawn on us that . . . they were going to try to survive as opposed to being willing to die to shoot down an airplane.'⁴⁰

One may also explain the dearth of enemy radar-guided SAM activity, at least in part, by reports that the Air Force's Air Combat Command had conducted information operations by inserting viruses and deceptive communications into the enemy's computer system and microwave net.⁴¹ Although US information operators probably could not insert malicious code into enemy SAM radars themselves, General Jumper

later confirmed that Allied Force had seen the first use of offensive computer warfare as a precision weapon in connection with broader US information operations against enemy defences. As he put it, 'We did more information warfare in this conflict than we have ever done before, and we proved the potential of it.'⁴²

During Desert Storm, by means of computer penetration, high-speed decrypting algorithms, and taps on landlines passing through friendly countries, the United States reportedly intercepted and monitored Iraqi E-mail and digitised messages but engaged in no manipulation of enemy computers. During Allied Force, however, information operators allegedly succeeded in putting false targets into the enemy's air defence computers to match what enemy controllers were predisposed to believe. Such activities also supposedly occasioned the classic operator-versus-intelligence conundrum from time to time, in which intelligence collectors sought to preserve enemy threat systems that provided them with streams of information while operators sought to attack and negate them in order to protect allied aircrews.⁴³

All of this raised basic questions about the adequacy of US SEAD tactics, suggesting a need for better real-time intelligence on mobile enemy SAMs. We not only needed to get that information to pilots quickly enough for them to act on it, but also needed to give them greater standoff-attack capability. The downings of the F-117 and F-16 were both attributed to breakdowns in procedures aimed at detecting enemy IADS threats in a timely manner and ensuring that pilots did not fly into lethal SAM envelopes unaware of them. Other factors cited in the two downings included poor mission planning and improper use of available technology. Although far fewer aircraft were lost during Allied Force than expected, these instances pointed up some systemic problems in need of fixing.

THE WAGES OF PAST NEGLECT

The unsettling SEAD experience of Allied Force sent a much-needed wake-up call to the Air Force's EW community. The survival tactics used to such maddening effect against NATO's aircrews by Serb IADS operators were first developed and tested in the no-fly zones of Iraq. Operations Northern and Southern Watch had steadily policed these zones ever since the coalition first showed the full extent of its capability against active SAM radars during the Gulf War. For that reason, they should have come as no surprise to the Air Force's mission planners. It is reasonable to expect more of the same as potential future opponents continue to monitor US SEAD capabilities and operating procedures, adapting their counter tactics accordingly.

Thanks to Allied Force and to the heightened appreciation of possible IADS threats yet to come, Air Force leadership has acknowledged that it needs to make SEAD a renewed priority. As one general observed candidly regarding the frustrations of that experience, 'There had to be about ten things that didn't go right. But the central issue is an overall lack of preparedness for electronic warfare.'⁴⁴ Indeed, one of the first signs of that insidious trend manifested itself as far back as August 1990, when half of the Air Force's ECM pods being readied for deployment to the Arabian peninsula for Desert Storm were found to be in need of calibration or repair. Numerous later sins of neglect with respect to EW included Air Force decisions to make operational readiness inspections and Green Flag EW training exercises less demanding – decisions that naturally resulted in an atrophying of the readiness inspection and reporting of EW units, along with a steady erosion of EW experience at the squadron level. 'Now', said the above-cited general, 'they only practise reprogramming [of radar warning receivers] at the national level. Intelligence goes to the scientists and says the signal has changed. Then the scientists figure out the change for the [ECM] pod and that's it. Nobody ever burns a new bite down at the wing.'⁴⁵

Once the United States fields these new multirole combat aircraft in sufficient strength toward the end of this decade, their much-reduced radar cross sections will enhance their survivability by shrinking the effective engagement envelopes of enemy radar-directed SAMs by 95 percent or more



Joint Strike Fighter

Moreover, during the years since Desert Storm, the response time for engaging high-end SAM threats has grown longer rather than shorter, thanks to an absence of adequate planning and to the disappearance of a talent pool of Air Force leaders skilled in EW. One senior Air Force veteran of the Gulf War complained that 'we used to have an XOE [operational EW] branch in the Air Staff. That doesn't exist any more. We used to reprogram [ECM] pods within the wings. They don't really do that any more.'⁴⁶ During a subsequent colloquium on the Kosovo air war and its implications, former Air Force Chief of Staff Gen Michael Dugan attributed these problems to the Air Force's having dropped the ball badly in 1990, when it failed to 'replace a couple of senior officers in the acquisition and operations community who [oversaw] the contribution of electronic combat to warfighting output. The natural consequence was for this resource to go away.'⁴⁷ The challenge now confronting the Air Force leadership in this respect is to anticipate and, to the extent possible, preempt the emerging SAM threats of the early twenty-first century.

NEW SOLUTIONS

One palliative now on the horizon that portends a major boost in overall SEAD mission effectiveness is substantially reduced observability to enemy radars an inherent design feature of the next-generation F-22 and F-35 (the latter previously known as the Joint Strike Fighter).⁴⁸ Once the United States fields these new multirole combat aircraft in sufficient strength toward the end of this decade, their much-reduced radar cross sections will enhance their survivability by shrinking the effective engagement envelopes of enemy radar-directed SAMs by 95 percent or more. Provided that proper tactics and some important operating limitations are respected, that will enable the F-22 and F-35 to fly in hostile airspace and reach effective weapons-release parameters undetected.⁴⁹

Granted, as we have already seen in the arresting case of the F-117 shootdown over Serbia in 1999, such low observability to enemy radars will not render the F-22 and F-35 fully invisible along the lines of the fanciful Romulan cloaking device of Star Trek fame. It will be impossible to operate these successor-generation stealth aircraft with complete abandon in a high-threat SAM environment. On the contrary, pilots will have to fly even the F-22 and F-35 in specific attitudes to threat radars to preclude their detection and susceptibility to risk. As a senior Air Force officer cautioned two years before the F-117 downing, stealthiness 'significantly reduces your vulnerable area, but it does not give you the freedom

to ignore the threats.⁵⁰ At some aspect angles, even the stealthiest aircraft may be at least fleetingly detectable by surface radars. Moreover, they will continue to emit infrared signatures that an enemy can exploit.

Nevertheless, such advanced low observability by radar promises to reduce substantially the range at which an enemy's acquisition radars can detect ingressing friendly aircraft from various look angles, as well as complicate the tracking of any F-22 or F-35 momentarily detected by enemy sensors. This will have the net effect of narrowing significantly any defenders window of opportunity for successfully engaging and downing such aircraft. Thus, the F-22 and F-35 can operate in high-threat areas with less intense concern for surface-to-air defenses and can fly on headings and at altitude aimed at maximising opportunities for early target acquisition.



SA-12b 'Giant' SAM launcher with missiles elevated into vertical position and engagement radar at front of vehicle still lowered in travelling position

increase the leverage of nonstealthy aircraft by negating enemy radar-guided SAM threats and thus provide those latter aircraft a safer envelope within which to operate over hostile terrain.

The SA-10 and SA-12 are lethal out to a slant range of 80 nautical miles, five times the killing reach of the earlier-generation SA-3

Indeed, when coupled with astute tactics based on accurate and timely threat intelligence, even the shaping and skin treatments of currently deployed stealth aircraft have rendered today's early warning and engagement radars, as well as the SAMs that depend on them, all but useless. The resultant ability provided to joint force commanders (JFC) – the ability to conduct precision attacks with near impunity – has imparted a new edge to US airpower. The F-117 and B-2, with their first- and second-generation stealth features, now allow JFCs to conduct vital operations in the most heavily defended enemy airspace that no number of less capable aircraft can perform at acceptable risk. The F-22 and F-35 will extend that capability to an ever-larger number of deployed US aircraft. Not only will such aircraft be able to produce strategic effects early in a war, but also they will

That said, however, JFCs in future contingencies will almost surely have to contend with threats of double-digit SAMs, namely the Russian S-300PM (NATO code name SA-10) and the comparably lethal SA-12 through SA-20, well before the F-22 and F-35 begin coming on-line in operationally significant numbers. The SA-10 and SA-12 are lethal out to a slant range of 80 nautical miles, five times the killing reach of the earlier-generation SA-3.⁵¹ One SA-10/12 site in Belgrade and one in Pristina could have provided defensive coverage over all of Serbia and Kosovo. They also could have threatened Rivet Joint, Compass Call, and other key allied aircraft such as the airborne command and control centre and the Navy's E-2C operating well outside enemy airspace.

Fortunately for NATO, the Serb IADS did not include the latest-generation SAM equipment currently available on the international arms market. Early, unsubstantiated reports, repeatedly denied by the Russian Ministry of Foreign Affairs, claimed that several weeks before the start of the bombing effort, Russia had provided Serbia with elements of between six and 10 long-range SA-10 systems, delivered without their 36D6 Clam Shell target designation and tracking radars.⁵² Had those reports been valid, even the suspected presence of such SAMs in the enemy's IADS inventory would have made life far more challenging for attacking NATO aircrews.⁵³ As Lieutenant General Short later commented darkly, 'It would have profoundly changed the balance of the threat and our ability to maintain air superiority.'⁵⁴ The inescapable message here is that the Air Force cannot afford to wait for the F-22 and F-35 deployments to help solve its SEAD conundrum. It must begin coming to effective grips now with this increasingly clear and present danger.

Beyond the stealthiness portended by the F-22 and F-35, another promising avenue for dealing with emergent SAM threats may lie in the realm of nonkinetic alternatives. To offer but a glimpse into the more intriguing possibilities in this respect, General Jumper remarked after Allied Force that although information operations remained a highly classified subject about which little could be said, the Kosovo experience suggested that 'instead of sitting and talking about great big pods that bash electrons, we should be talking about microchips that manipulate electrons and get into the heart and soul of systems like the SA-10 or the SA-12 and tell it that it is a refrigerator and not a radar.'⁵⁵ Some of the more cutting-edge variants of first-generation offensive cyber warfare, reportedly tested successfully in Allied Force, suggested the feasibility of taking down enemy SAM and other defence systems in ways that would not require putting a strike package or a HARM on critical nodes to neutralise them. Toward that end, Gen Hal Hornburg, current commander of Air Combat Command, recently reiterated the importance of looking beyond familiar solutions to this looming threat in certain portions of President George W. Bush's 'axis of evil,' where the United States might find itself engaged militarily: 'We don't just need jammers and we don't just need Block 50s. . . . We need an array of capabilities. . . . I am looking for kinetic and non-kinetic solutions. I am looking, for example, for space to be able to get down to an SA-10 and convince it to launch all missiles right now or to deny it from launching their missiles right now.'⁵⁶

Finally, an emergent concern prompted by the less-than-reassuring SEAD experience in Allied Force was the need for better capabilities for accommodating noncooperative enemy air defenses and, more specifically, countering the novel tactic whereby enemy SAM operators resorted to passive electro-optical rather than active radar tracking. That tactic prompted Maj Gen Dennis Haines, who at the time served as Air Combat Command's director of combat weapons systems, to spotlight the need for capabilities other

...we should be talking about microchips that manipulate electrons and get into the heart and soul of systems like the SA-10 or the SA-12 and tell it that it is a refrigerator and not a radar

than relying on radar emissions to detect SAM batteries, as well as the need to locate and identify enemy SAM sites more rapidly when they emitted only briefly.⁵⁷ As one looks farther down the road, the ultimate answer to this and related challenges may entail not only continuing to get better at traditional SEAD mission applications, but also moving increasingly toward developing more sophisticated concepts of operations and fielding associated new technologies. The latter include unmanned aerial reconnaissance platforms such as Global Hawk; armed, uninhabited combat air vehicles; and possibly space systems, with a view toward rendering SEAD and DEAD either missions of last resort or unnecessary altogether.

Notes

1. This article is based upon the author's book *NATO's Air War for Kosovo: A Strategic and Operational Assessment*, MR-1365-AF (Santa Monica, Calif.: RAND, 2001).
2. John D. Morrocco, 'Allies Attack Iraqi Targets; Scuds Strike Israeli Cities,' *Aviation Week and Space Technology*, 21 January 1991, 20–22.
3. The F-4G did most of the actual HARM shooting, with jamming support provided by EF-111s, EC-130s, and EA-6Bs. The allies also utilised Marine F/A-18s heavily on opening night to back up the SEAD campaign with preemptive HARM attacks.
4. Capt Dan Hampton, 'Combat Defence Suppression: The F-4G/F-16C Wild Weasel at War,' *USAF Fighter Weapons Review*, Summer 1991, 4–6.
5. Thomas A. Keaney and Eliot A. Cohen, *Revolution in Warfare? Air Power in the Persian Gulf* (Annapolis: Naval Institute Press, 1995), 119.
6. Dana Priest, 'NATO Unlikely to Alter Strategy,' *Washington Post*, 26 March 1999.
7. Quoted in Dana Priest, 'NATO Pilot Set to Confront Potent Foe,' *Washington Post*, 24 March 1999.
8. Gen John Jumper, 'Oral Histories Accomplished in Conjunction with Operation Allied Force/Noble Anvil' (Washington, D.C.: Air Force Studies and Analysis Agency, n.d.).
9. Robert Wall, 'Sustained Carrier Raids Demonstrate New Strike Tactics,' *Aviation Week and Space Technology*, 10 May 1999, 37.
10. Robert Wall, 'Airspace Control Challenges Allies,' *Aviation Week and Space Technology*, 26 April 1999, 30.
11. Tim Ripley, 'Viper Weasels,' *World Air Power Journal*, Winter 1999/2000, 102. The standard F-16CJ weapons loadout consisted of two AGM-88 HARMs and four AIM-120 advanced medium-range air-to-air missiles (AMRAAM).
12. Richard J. Newman, 'In the Skies over Serbia,' *U.S. News and World Report*, 24 May 1999, 24.
13. Comments on an earlier draft by Headquarters USAF/IN, 18 May 2001.
14. Cited in 'Ground Troops Lauded,' *European Stars and Stripes*, 6 August 1999; and 'Jumper on Air Power,' *Air Force Magazine*, July 2000, 41.
15. James Peltz and Jeff Leeds, 'Stealth Fighter's Crash Reveals a Design's Limits,' *Los Angeles Times*, 30 March 1999.
16. 'Washington Outlook,' *Aviation Week and Space Technology*, 3 May 1999, 21. Asked whether the aircraft's loss was caused by a failure to observe proper lessons from earlier experience, Hawley added, 'That's an operational issue that is very warm.'
17. Eric Schmitt, 'Shrewd Serb Tactics Downed Stealth Jet, U.S. Inquiry Shows,' *New York Times*, 11 April 1999. In subsequent testimony before the Senate Armed Services Committee, F. Whitten Peters, then the secretary of the Air Force, did confirm that enemy SAMs had downed the aircraft. See Vince Crawley, 'Air Force Secretary Advocates C-130, Predators,' *Defence Week*, 26 July 1999, 2.
18. See David A. Fulghum and William B. Scott, 'Pentagon Gets Lock on F-117 Shootdown,' *Aviation Week and Space Technology*, 19 April 1999, 28–30; and Paul Beaver, 'Mystery Still Shrouds Downing of F-117A Fighter,' *Jane's Defence Weekly*, 1 September 1999.
19. To bolster their case, some people noted that when an F-117 had crashed earlier at an air show near Baltimore in 1998, the Air Force had thoroughly sanitised the area and hauled off the wreckage to prevent its most sensitive features from being compromised.
20. Quoted in Vago Muradian, 'Stealth Compromised by Not Destroying F-117 Wreckage,' *Defence Daily*, 2 April 1999.
21. Ibid.
22. On 2 April, the Yugoslav government announced its intention to hand over pieces of the downed F-117 to Russian authorities. Robert Hewson, 'Operation Allied Force: The First 30 Days,' *World Air Power Journal*, Fall 1999, 18. For the record, the Air Force immediately put F-15Es on alert to destroy the wreckage with AGM-130s after confirmation of the F-117 downing, but by the time the service could positively determine the wreckage location, Cable News Network was on the scene, and collateral-damage issues precluded the attack. Comments on an earlier draft by Headquarters USAF/XOXS, 9 July 2001.
23. LANTIRN stands for low-altitude navigation and targeting infrared for night.
24. Comments on an earlier draft by Headquarters USAF/IN, 18 May 2001.
25. Wall, 'Airspace Control Challenges Allies,' 30.
26. Brig Gen Randy Gelwix, 'Oral Histories Accomplished in Conjunction with Operation Allied Force/Noble Anvil' (Washington, D.C.: Air Force Studies and Analysis Agency, n.d.).
27. Wall, 'Airspace Control Challenges Allies,' 30.

28. The AGM-130 could be fired from a standoff range of up to 30 nautical miles. It featured Global Positioning System satellite guidance, enhanced by terminal homing via man in the loop through live video feed data-linked to the attacking aircraft from the guiding weapon.
29. The Block 50/52 F-16CJs used for defence suppression were equipped to carry the AGM-65 Maverick missile, but they did not employ that munition in Allied Force because the pilots, given their predominant focus on making the most of the AGM-88 HARM, had not sufficiently trained for its use.
30. Gelwix, 'Oral Histories.' JSOW was employed only infrequently during Allied Force. Many of the targets assigned to the Navy were inappropriate for attack by the AGM-154's cluster-bomb variant because of collateral-damage concerns, lengthy timelines associated with attacks against mobile targets, and the munitions lack of a precise-impact timeline. William M. Arkin, 'Fleet Praises JSOW, Lists Potential Improvements,' *Defence Daily*, 26 April 2000.
31. Lt Col Philip C. Tissue, '21 Minutes to Belgrade,' *US Naval Institute Proceedings*, September 1999, 40.
32. Michael R. Gordon, 'NATO to Hit Serbs from 2 More Sides,' *New York Times*, 11 May 1999.
33. 'AWOS Fact Sheet,' Headquarters USAF/SA, 17 December 1999. See also William M. Arkin, 'Top Air Force Leaders to Get Briefed on Serbia Air War Report,' *Defence Daily*, 13 June 2000, 1.
34. David A. Fulghum, 'Kosovo Report to Boost New JSF Jamming Role,' *Aviation Week and Space Technology*, 30 August 1999, 22.
35. 'Washington Outlook,' *Aviation Week and Space Technology*, 20 September 1999, 25.
36. 'AWOS Fact Sheet.'
37. In all, US aircraft expended 1,479 ALE-50 towed decoys during Allied Force.
38. Comments on an earlier draft by Headquarters USAF/IN, 18 May 2001.
39. Tim Ripley, 'Serbs Running Out of SAMs,' *Says USA*, *Jane's Defence Weekly*, 2 June 1999.
40. Interview with Lt Gen Michael Short, USAF, PBS Frontline, 'War in Europe,' 22 February 2000. Serb IADS operators may have been able to trade short-term effectiveness for longer-term survivability because allied aircraft typically could not find and successfully attack fielded Serbian forces and other mobile ground targets. Had they been able to do so and kill enemy troops in large numbers, the Serb army's leadership would have insisted on a more aggressive air defence effort. That would have enabled NATO to kill more SAMs but at the probable cost of losing additional friendly aircraft.
41. David A. Fulghum, 'Serb Threat Subsides, but U.S. Still Worries,' *Aviation Week and Space Technology*, 12 April 1999, 24.
42. 'Jumper on Air Power,' 43.
43. David A. Fulghum, 'Yugoslavia Successfully Attacked by Computers,' *Aviation Week and Space Technology*, 23 August 1999, 31–34.
44. Quoted in David A. Fulghum, 'NATO Unprepared for Electronic Combat,' *Aviation Week and Space Technology*, 10 May 1999, 35.
45. Ibid.
46. Ibid.
47. Quoted in 'Washington Outlook,' *Aviation Week and Space Technology*, 23 August 1999, 27.
48. On potential F-35 SEAD applications in particular, see Edward H. Phillips, 'LockMart Eyes F-35 for AEA/SEAD Use,' *Aviation Week and Space Technology*, 18 March 2002, 32–33.
49. As the principal designer of the B-2 wrote several years ago with respect to these limitations, stealth in practice is a combination of low observability and tactics, the latter entailing close attention to mission doctrine, maneuver, sensor operation, and weapon application in addition to relying on the aircraft's inherent low-observability properties. 'When appropriate tactics are employed,' he added, 'survivability will be assured with or without supporting ECM.' By implication, when appropriate tactics are not employed, the survivability of a nominally stealthy aircraft is anything but assured. John Cashen, 'Stealth (and Related Issues)' (paper prepared for a conference on 'Control of the Air: The Future of Air Dominance and Offensive Strike,' sponsored by the Australian Defence Studies Centre, Canberra, Australia, 15–16 November 1999), 4.
50. Quoted in David A. Fulghum, 'Expanding Roles May Shield F-22,' *Aviation Week and Space Technology*, 6 January 1997, 43.
51. David A. Fulghum, 'Report Tallies Damage, Lists U.S. Weaknesses,' *Aviation Week and Space Technology*, 14 February 2000, 34.52. Zoran Kusovac, 'Russian S-300 SAMs in Serbia,' *Jane's Defence Weekly*, 4 August 1999.
53. Serbian president Slobodan Milosevic reportedly pressed the Russians hard for such equipment repeatedly, without success. Deputy Secretary of State Strobe Talbott later stated that the Clinton administration put the Yeltsin government on the firmest notice that any provision of such cutting-edge defensive equipment to Yugoslavia would have a 'devastating' effect on Russian-American relations. Michael Ignatieff, *Virtual War: Kosovo and Beyond* (New York: Henry Holt and Company, Inc., 2000), 109.
54. Quoted in Christopher J. Bowie, *Destroying Mobile Ground Targets in an Anti-Access Environment*, Analysis Centre Papers Series (Washington, D.C.: Northrop Grumman Corporation, December 2001), 4.
55. 'Jumper on Air Power,' 43.
56. Gen Hal M. Hornburg, USAF, presentation to the Air Force Association National Symposium, Orlando, Fla., 14 February 2002.

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AIR POWER

and the Changing Nature of Terrorism

By Flt Lt Craig White RAF

The horrific events of 11 September 2001 brought international terrorism back in to the spotlight and reinvigorated the debate about how terrorism can be combated. Since the attack on the United States (US), governments in many parts of the world have utilised a broad range of instruments in the fight against terrorism. This paper will concentrate upon evaluating the utility of one such instrument – air power – when employed for this purpose.

To begin with, it is necessary to define the terminology of modern international terrorism, and to appraise the changing nature of this phenomenon since the late 1960s. This approach highlights the emergence of a 'new wave' of terrorist groups that have become more prominent during the last 20 years. The subsequent analysis attempts to set out the major differences between more 'traditional' terrorist groups and their 'new wave' counterparts, concentrating on five main areas: motivation, organisational structure, state support, targeting policy and lethality.

Thereafter, in assessing the ability of air power to combat these 'new wave' organisations and their state sponsors, it will be suggested that there are four potential areas in which air power may be able to contribute to the fight against international terrorism: highlighting to public/media that action is being taken, inflicting costs, providing key Command, Control, Communications, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance (C4ISTAR) assets and assisting in the prevention of terrorism. The intention is to focus on the precise attributes of air power that lend themselves to counter-terrorist action, on recent experience, and on the difficulties posed by the defining characteristics of 'new wave' terrorist groups. The conclusion considers how these factors may influence the role of air power in the fight against international terrorism.

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DEFINITIONS

The concept of terrorism has historically proven difficult to define. There is no single accepted definition of terrorism: different governments, and indeed departments within a single administration, have their own distinct definition that reflects their own priorities. In the US, for example, the Federal Bureau of Investigation (FBI), Central Intelligence Agency (CIA), and Department of Defense (DOD) all have their own separate definitions.

This difficulty has been partly caused by an expansion of the type of groups that have been considered as terrorists, especially since the end of the Cold War. The concept covers a broad range of organisations that have a variety of political, religious and social motivations, from single-issue groups (for example anti-abortionists) to terrorist entities that have a wide range of political and religious objectives, such as Al – Qaeda. Additionally, terrorism is a 'value-laden' term that has negative connotations for those groups labelled as such. Being labelled as a terrorist can lead to governments evoking specialist anti-terrorist legislation that grants more wide-ranging powers to the civil authorities than when confronting 'ordinary criminals'. Moreover, the use of the term, especially within the political arena, can be subjective: it is an old maxim that one man's terrorist is another man's freedom fighter.

Nevertheless, there are a number of essential elements that are common to most of the definitions, such

...terrorism is defined as the deliberate and organised use of violence, or the threat of violence, in order to attain leverage, influence, and power to effect political change through the exploitation of fear...

as the use of violence, psychological effect, and the attempt to gain leverage in order to achieve the group's stipulated aims. The use of violence, integral to terrorists, also encompasses the threat of violence, which is an important tool that has not been incorporated in many definitions of terrorism. The aforementioned violence has to be both deliberate and organised. Alongside the immediate physical and political effect of the use of violence, the psychological effect upon a wider audience, and the resultant

manipulation of fear, constitutes a crucial feature of the concept. Terrorists utilise violence and its effects in order to gain leverage, influence and power in the pursuit of change, generally within the political arena. Although the terrorists' goals may be political, religious or social, it is mainly political change that they seek. Thus for the purposes of this paper, terrorism is defined as the deliberate and organised use of violence, or the threat of violence, in order to attain leverage, influence, and power to effect political change through the exploitation of fear.¹ International terrorism can be considered to be terrorism that transcends national boundaries: for example in the planning or execution of an attack or the make-up of a group.

The changing nature of terrorism: 'traditional' and 'new wave' groups

BACKGROUND

One of the first manifestations of modern international terrorism was the Popular Front for the Liberation of Palestine's (PFLP) hijacking of an Israeli commercial flight from Rome to Tel Aviv in 1968.² Since then, international terrorism has been fluid, with terrorist groups continuously evolving. Since the 1980s, and especially after the end of the Cold War, international terrorism has been transformed by the emergence of a 'new wave' of terrorist organisations.³ Terrorist groups with a more religious motivation and orientation, such as Al – Qaeda, Hamas and the Armed Islamic Group (GIA), have become more prominent, increasing steadily in number and accounting for a higher proportion of acts of international terrorism. In 1980, only 3% of international terrorist organisations were classified as primarily religious.⁴ By 1995, however, this figure had risen to 46%.⁵ In addition, these 'new wave' groups have accounted for a disproportionate number of casualties. Furthermore, while there has been a decline in the number of international terrorist incidents since the end of the Cold War, the attacks have become more lethal: during the 1970s one or more people were killed in 17% of these acts; during the 1980s this figure rose slightly to 19%; in 1995 it had risen markedly to 29%.⁶

Although Islamic terrorists have received the most publicity and notoriety, the increase in 'religious terrorism' has by no means been restricted to the Muslim faith. There has also been a resurgence of terrorism within other established religions, for example Judaism, Christianity and Hinduism.⁷ Religious cults espousing millenarian aims, believing that the beginning of the new millennium would bring the end of the world, have also come to the fore, but their activities have mostly been restricted to the domestic arena.⁸ In addition, the post-Cold War era has witnessed the emergence of new categories of terrorism, such as eco-terrorism and narco-terrorism.⁹ Colombian drug cartels, for example, have attacked numerous American owned oil pipelines in Columbia.¹⁰ Nevertheless, as Islamic terrorist groups arguably pose one of the largest risks to the security of the UK and her allies in view of the events of 11 September 2001, they represent the primary focus of the following discussion.¹¹

THE FIVE MAIN CHARACTERISTICS OF TERRORIST GROUPS

The main attributes of international terrorism from the late 1960s up until the present day may be examined under five major headings, which are applicable both to the more 'traditional' terrorist groups that emerged in the 1960s and 1970s and the 'new wave' of organisations that were set up in the 1980s and 1990s. These are: motivation, organisational structure, state support, targeting policy and lethality.

MOTIVATION

Firstly, in terms of motivation, the 'traditional' international terrorist groups, such as the Palestine Liberation Organisation, PFLP, Red Army Faction and Provisional Irish Republican Army, were usually secular in their orientation. This is not to say that religion did not play a role, especially in determining the membership of some of these organisations. Nevertheless, it can be argued their over-riding objectives – for example independence or unification – were political and social rather than religious in character. These 'traditional' terrorist organisations mainly espoused nationalist, separatist or extreme left-wing views that were commensurate with their own distinctive ideological beliefs.



...traditional terrorist organisations mainly espoused nationalist, separatist or extreme left-wing views that were commensurate with their own distinctive ideological beliefs

Aftermath of an IRA bomb

...the 'new wave' groups, for example Al – Qaeda and Hamas, primarily claim to be motivated by long-term religious goals...

In contrast, the 'new wave' groups, for example Al – Qaeda and Hamas, primarily claim to be motivated by long-term religious goals, although they also espouse some short-term political ambitions. Hamas have attempted to achieve short-term objectives, such as the release of members held in Israeli prisons, and long-term goals, such as the destruction of their principal enemy, Israel, simultaneously.¹² Bruce Hoffman, an expert on terrorism, has stated that for these types of group, 'the religious motive is overriding; and indeed, the religious imperative for terrorism is the most important defining characteristic of terrorist activity today.'¹³

ORGANISATIONAL STRUCTURE

Turning now to the organisational structure of international terrorist groups, 'traditional' groups on the whole are formally organised with a hierarchical structure and a well-defined command and control (C2) apparatus. They tend to be very bureaucratic organisations with the leaders exercising tight control over those who commit the acts of terrorism. Additionally, in the aftermath of an attack, 'traditional' terrorist groups usually issue communiqués explaining their actions and taking credit for them, wanting the world to know who perpetrated an attack.

The 'new wave' of 'religious' groups, however, usually constitute loosely tied networks made up of small, dispersed units, which have a high degree of operational autonomy. These groups utilise both horizontal and vertical channels of communication within a relatively flat organisational structure. These small units tend to be inspired and encouraged by a spiritual mentor or terrorist leader rather than being directly controlled like 'traditional' groups. Simon Reeve, a leading writer on terrorism, has concluded that:

'Osama bin Laden is now more of a cult leader, inspiring terrorists to commit acts rather than actually controlling them.'¹⁴

Bin Laden and the other leading commanders can be perceived as being at the hub of the operations of these small, dispersed units, with the hub providing training, general guidelines concerning rules of engagement, technical assistance, such as skilled bomb makers, and possibly finance to these units. The hub of the network, however, exerts little direct control over the operations conducted by their members.

The 'new wave' groups have taken advantage of the information age and the availability of new technology, such as the Internet, which has facilitated the construction of this novel organisational structure.¹⁵ These 'new wave' entities are generally less bureaucratic than 'traditional' organisations, relying more on a shared identity and values and horizontal co-ordination than on a defined hierarchy and direct C2 in order to promote internal cohesion. Additionally, unlike 'traditional' terrorist organisations, 'new wave' entities do not tend to claim responsibility for every act of terrorism they carry out.

State sponsors have in the past tended to take an active role in the groups that they supported, asserting a higher degree of direct control than is apparent today

STATE SUPPORT

'Traditional' terrorist groups, especially within the Middle East, have often enjoyed state support in the form of material and financial resources, operating bases and training facilities.¹⁶ State sponsors have in the past tended to take an active role in the groups that they supported, asserting a higher degree of direct control than is apparent today. A prime example of state sponsorship was Iran's support for Hizbollah's activities against Israel.¹⁷

'New wave' international terrorist groups utilise alternative means of finance, including private funding based on a network of investments and companies wholly or partly owned by these organisations.¹⁸ In addition, a network of wealthy benefactors and charities also provides financial aid.¹⁹ Although state

sponsorship remains, its importance has been reduced in terms of finance. Moreover, state sponsors tend not to exert as much direct control over the activities of this 'new wave' of terrorist groups as they have done in the past with 'traditional' groups. But states continue to provide vital assistance by allowing terrorist organisations to run training camps and base their operations within their borders. Terrorist groups such as Al-Qaeda rely heavily on this support, which has provided them not only with the ability to train large numbers of people in the art of terrorism, but also with a safe haven where they were protected from their perceived enemies.²⁰

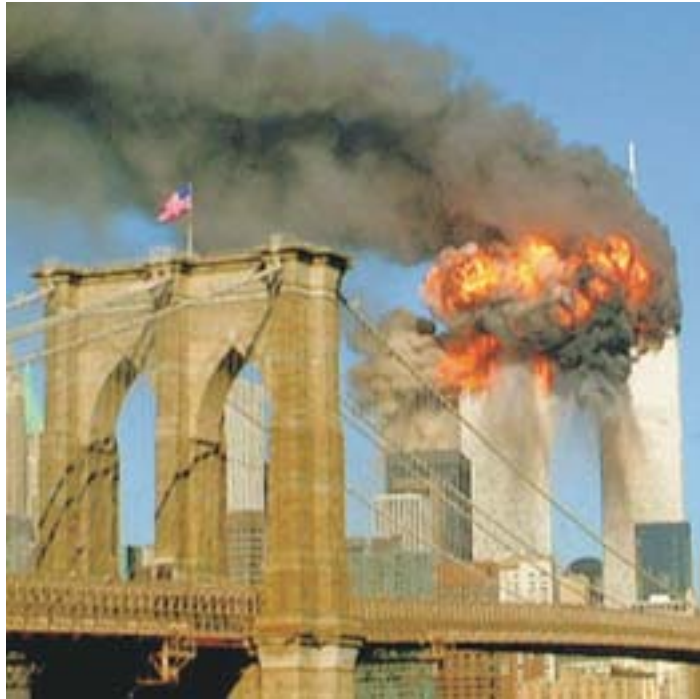
TARGETING AND LETHALITY

Targeting and 'lethality' represent the fourth and fifth major headings under which international terrorist groups may be considered. 'Traditional' organisations tend to execute highly selective and discriminate acts of violence against symbolic targets.²¹ As well as targeting their declared enemies, these terrorists also commit violent acts against civilians from third countries in order to maximise the attention and publicity they receive. Terrorist groups, such as the PFLP, targeted not only Israelis, their declared enemy, but also western nationals, thus increasing the attention they received via the western media. Media coverage of these events is essential to these groups in order to attract attention to their cause and themselves, while also spreading fear and alarm, the psychological element of terrorism. Further, these terrorist acts are intended to influence an audience far wider than their immediate geographical locale, thereby mobilising sympathy and support outside their own theatre of operations. Violence is generally perceived by 'traditional' international terrorist organisations as a means to an end, as they see themselves as reluctant warriors who are forced to take up arms [as a last resort] in order to achieve their aims.



Israeli people celebrate after the successful rescue of passengers from an Airbus A300, which had been hijacked and diverted to Entebbe in Uganda by Palestinian and West German terrorists in 1976

Media coverage of these events is essential to these groups in order to attract attention to their cause and themselves, while also spreading fear and alarm...



... 'new wave' terrorist groups have ventured towards more indiscriminate violence and greater lethality than more 'traditional' groups...

The collapse of the World Trade Centre buildings, after being rammed by hijacked airliners.

In contrast, 'new wave' terrorist groups have ventured towards more indiscriminate violence and greater lethality than more 'traditional' groups. This trend has been highlighted by the fact that the most destructive and headline-grabbing international terrorist acts since the end of the Cold War have been carried out by this 'new wave' of terrorist groups:

- 1992: The bombing of the Israeli embassy in Buenos Aires by Palestinian terrorists that killed 29 people.²²
- 1993: The attack against the World Trade Centre that was intended to collapse one of the twin towers onto the other.²³
- 1994: The bombing of the Argentine and Israeli Mutual Association in Buenos Aires which left 86 people dead and hundreds of others wounded.²⁴
- 1995: The car bomb that exploded in the car park of the Office of the Program Manager/ Saudi Arabian National Guard in Riyadh, that killed 7 people and wounded 42.²⁵
- 1996: The truck bomb that detonated outside the US military's Khobar Towers housing facility in Dhahran, killing 19 people and wounding 515 others.²⁶
- 1998: The bombing of the US Embassies in Kenya and Tanzania that left a total of 301 people dead and over 5,000 wounded.²⁷

- 2000: The attack against the USS Cole in which 17 were killed and 39 wounded.²⁸
- 2001: The 11 September attacks in the US that resulted in the death of around 3,000 people.²⁹

This increase in the lethality of international terrorism may be traced to several possible causes. It has been suggested that the attention given by the public and media to these types of incidents has decreased as the public have become desensitised to acts of terrorism and that conversely, survival rates have increased.³⁰ Thus modern terrorist organisations need to perpetrate ever more destructive acts in order to command the same amount of media coverage as international terrorism has received in the past. Additionally, it can be suggested that international terrorist groups have learnt from not only their own past experiences, but also from the experiences of other groups thus increasing their operational capabilities. Furthermore, new technology has also increased the capabilities of terrorists with the availability of more sophisticated weaponry and explosives etc.

...Religious terrorists' seem to operate with vastly different value systems and mechanisms of justification and legitimation than their secular counterparts

Finally, it can be argued that the most important influence on this area has been the rise of 'religious terrorism' perpetrated by fundamentalists. 'Religious terrorists' seem to operate with vastly different value systems and mechanisms of justification and legitimation than their secular counterparts. Violence is often viewed as a sacramental or a divine duty, carried out in response to a theological demand or imperative giving it a transcendental quality. By evoking the totality of the struggle, Fatwas and statements issued by prominent Muslim clerics and terrorist leaders justify the destruction of whole societies and large sections of populations.³¹ The defence of the Muslim faith appears to be perceived as a contest of good versus evil, with the Islamists attempting to repel the modern day 'Crusaders'.³² 'New wave' religious terrorists, therefore, are less discriminate in their choice of targets: for example, any American may be viewed as a legitimate target.³³ Critically, one of the key characteristics of fundamentalism, in general, is its unwillingness to compromise, and to view total destruction rather than defeat as a primary aim. Thus violence is no longer a means to end, but an end in itself.

The use of air power against 'new wave' terrorism

The next section of this paper analyses the utility of military force in general, and air power in particular, in combating 'new wave' terrorism. In the light of recent experience and the characteristics of the 'new wave' of terrorist groups highlighted above, both the contributions and the limitations of utilising air power will be examined.

AIR POWER'S CONTRIBUTION

Military force has a role to play within the panoply of instruments available to combat terrorism. Within military force, air power has the potential to make an important contribution to this effort in the following areas:

- Providing key C4ISTAR assets to the fight against terrorism.
- Inflicting costs upon terrorist organisations and their state sponsors through the disruption and destruction of operations and resources.
- Assisting in the prevention of terrorism.
- Communicating to the public/media that action is being taken in the wake of a terrorist attack, and possibly deterring further attacks by highlighting that those who commit and actively support terrorism will be punished.

C4ISTAR

Intelligence is the lifeblood of counter-terrorist actions, providing knowledge of key areas, such as capabilities, command structures and intentions. The organisational structure, motives and modus operandi of most of the 'new wave' terrorist groups, however, pose a particularly challenging problem to the intelligence services of those states to which they pose a threat. The fact that they do not always claim responsibility for their attacks makes it more difficult to discover who perpetrated them. Moreover, many of the perpetrators of these acts have little or no contact with either their co-conspirators or the organisation's leadership, further hindering attempts to collect information.³⁴ The adoption of a networked organisational structure, with 'new wave' groups utilising small, dispersed, cells with a relatively high-degree of autonomy, reduces the chances of reliable intelligence being obtained. The tangled web of contact and assistance within such groups also makes proving a direct link between the perpetrators of a particular act of terrorism and the groups' leadership very challenging. Direct linkages are required, especially when acting within a coalition, in order to persuade political leaders that action needs to be taken. Taken together these attributes make an attempt to build up a clear intelligence picture of the activities and contacts of such groups relatively difficult when compared to a state or more 'traditional' terrorist groups.

Air power through the utilisation of ISTAR assets, such as satellites, manned aerial vehicles and UAVs, has a potentially significant role to play in increasing the transparency of the 'new wave' terrorist groups...

Air power through the utilisation of ISTAR assets, such as satellites, manned aerial vehicles and UAVs, has a potentially significant role to play in increasing the transparency of the 'new wave' terrorist groups and ameliorating this difficulty. These assets are capable of providing a wide range of intelligence, including COMINT, ELINT, MASINT and SIGINT. The utilisation of imaging equipment, for example, can provide valuable information pertaining to a group's capabilities regarding the location and the level of

activity within and around training camps. Further, space and aircraft-based sensors possess the ability to intercept SIGINT/COMINT, which is important to networked organisations that are generally reliant upon communication for their operational effectiveness, thereby providing an important source of information, which may help uncover a terrorist's intentions. Within military operations conducted against 'new wave' terrorists, the linking together of C4ISTAR capabilities with strike assets in a 'network - centric capability' can produce a synergistic effect, enhancing situational awareness and increasing the level of co-ordination and reducing the 'sensor-to-shooter' time that can be important when combating a disparate organisation, whose constituent parts are difficult to locate and track and are relatively mobile.

Ultimately, however, the analysis of the intelligence provided by these capabilities is fundamental to its eventual use, as has been highlighted by the debate in the US over why the FBI and CIA failed to predict and prevent the events of 11th September.³⁵ Notwithstanding this limitation, air power, in concert with other agencies, retains the ability to utilise its strengths in order to help to increase knowledge and therefore enhance the government's ability to tackle international terrorism.

INFLICTING COSTS ON TERRORIST GROUPS AND STATE SPONSORS

After the perpetrator of a terrorist attack has been identified and their centre of gravity has been determined, air power is able to provide highly capable strike assets to be utilised as part of a 'network-centric capability', in order to inflict costs upon terrorist groups and their state sponsors. Through the striking of a 'new wave' organisation's centre of gravity it is hoped to undermine the opponent's ability, will and means to continue their terrorist activities. This desired effect might be achieved, for example, through the disruption and destruction of key facilities, such as headquarters and training camps, which can be considered as viable targets for air power.

Through the striking of a 'new wave' organisation's centre of gravity it is hoped to undermine the opponent's ability, will and means to continue their terrorist activities

US forces bomb terrorist hideouts in the hills of Afghanistan



Donald Rumsfeld, the US Secretary of State for Defense, emphasised the utility of this approach when he stated that, 'the only way to defend against terrorist acts is to take the battle to the terrorists'.³⁶ Air power's penetration, flexibility and versatility, and use of precision engagement enable it to take the fight to the adversary and make a positive contribution in this area. Penetration allows air power to strike terrorist targets even if they are contained deep within a hostile state. Air power's inherent flexibility and versatility means that air vehicles can strike various specialist target sets during a single mission. Thus it is possible for aircraft to be stationed on a CAP awaiting instructions from ground forces that are attempting to locate mobile targets. The increased accuracy offered by precision guided munitions can help to reduce the amount of collateral damage incurred within an operation, an important consideration given the need for governments to retain the 'moral high ground' when dealing with terrorists.

Air power can also be integral to the success of ground operations designed to disrupt and destroy terrorist operations and resources. Air vehicles facilitate the rapid insertion and extraction of land forces into and out of locations that might otherwise be more difficult to reach. In addition, air power is able to provide valuable indirect and direct fire support to such operations. Through the utilisation of the above attributes air power is able to play a major role in fulfilling Rumsfeld's desire to seize the initiative.



Nonetheless, air power can also make a contribution through Peace Support Operations in places such as Afghanistan or other regions where extremism may emerge

AMELIORATING THE UNDERLYING CAUSES OF TERRORISM

Thirdly, air power is able to play a supporting role in preventing the emergence or return of social conditions that allow terrorism to flourish. It has been argued that there is a direct link between extremist ideas, such as those that are prevalent within 'new wave' terrorist groups, terrorism, and social deprivation. The aftermath of Operation ENDURING FREEDOM in Afghanistan will be important in the prevention of instability and promote better social conditions for the Afghan population, which will hopefully mean that Afghanistan will no longer be a seedbed for fundamentalists and terrorists. By dealing with the underlying causes of terrorism rather than the symptoms, it may be possible to cut off support for terrorists and reduce the number of people who feel the need to turn to extremism.³⁷ The economic and political instruments of power will probably constitute

the main elements of government policy and action in this area, as they have during Tunisia's successful struggle against religious extremism during the 1980s and 90s.³⁸ Nonetheless, air power can also make a contribution through Peace Support Operations in places such as Afghanistan or other regions where extremism may emerge. The utility of air power in this respect has been emphasised since the end of the Cold War during operations in the Balkans, Somalia and Sierra Leone. Utilising its strengths air power has demonstrated an ability to fulfil certain tasks more effectively than land and naval power within PSOs, such as ISR, the rapid transportation of men and supplies, and the enforcement of no fly zones.³⁹

COMMUNICATION: PLACATING PUBLIC OUTCRY AND DETERRING FURTHER ATTACKS

Lastly, and probably most importantly, air power can provide a visible and timely response to an act of terrorism that can help to placate a public outcry for some form of action to be taken. Air power's global reach enables it to strike far-flung places inaccessible to other forms of military power. Its responsiveness allows it to respond in a timely fashion to terrorist attacks and above all, air power is a highly visible capability that can convey the message that something is being done. Operations INFINITE REACH⁴⁰ and ENDURING FREEDOM⁴¹ were both examples of air power being utilised to counter acts of international terrorism. Both operations provided a clear signal to the public/media, meeting their expectations for some sort of direct action to be undertaken.

In contrast to air power, other instruments of power are not as visible and are thus unable to convey such a powerful message to the public/media back home. Much of the work of intelligence agencies, for instance, is undertaken covertly, and therefore lacks the transparency of air power. Further, the pursuit of suspected terrorists by law enforcement agencies can take a relatively long time to produce visible results. The FBI, for example, took over 2 years to capture Ramzi Yousef, the main perpetrator of the 1993 attack on the World Trade Centre.⁴² Although the apprehension and subsequent imprisonment of Yousef can be viewed as an important step in America's fight against international terrorism, it did not produce the immediate response that air power is capable of providing.



The use of air power in Afghanistan helped to facilitate the Taliban's removal from power, the ultimate price for a regime that supports terrorism

In addition, air power can assist in attempting to deter the state sponsors of terrorist groups by forming an integral part of an overall military capability and by carrying out operations such as those mentioned above,⁴³ which can convey a message to potential attackers and those who support them. The use of air power in Afghanistan helped to facilitate the Taliban's removal from power, the ultimate price for a regime that supports terrorism. This success was due to a number of factors including the Northern Alliance's ground offensive, the betrayal and defection of members of the Taliban and tribal leaders, who had previously supported them, and the hatred felt by many members of the Afghan public towards the regime.⁴⁴ Nevertheless, air power acted as a force multiplier for the Northern Alliance's ground forces, rapidly destroying much of what little C2 and military infrastructure Afghanistan possessed, and thereby making an important contribution to the Taliban's fall from power.⁴⁵ The enforced regime change that occurred in Afghanistan may serve as a warning to other states that may consider harbouring the leaders of these 'new wave' groups, given that this action may lead to a similar response.

An essential element of successful deterrence is credibility, as an adversary has to believe that a state is willing to carry out its deterrent threats irrespective of how large a capability it possesses. Without the requisite amount of political will and the clear communication of resolve, threats and indeed actions may lack credibility and therefore fail to produce the desired effect in terms of deterrence. The efficacy of air power in this sector is therefore dependent to a certain extent upon the clear communication of political will and resolve. It can be argued, for example, that Operation INFINITE REACH lacked credibility as a deterrent threat owing to the ambiguous motives behind the attack. Despite President Clinton claiming that, 'our target was terror. Our mission was clear',⁴⁶ between 30% and 40% of the American public believed that the air strikes were an attempt by the US administration to divert public attention away from the Zippergate scandal.⁴⁷ Further, in many parts of the Muslim world, the military strikes became known as Operation MONICA.⁴⁸ Thus it is possible to suggest that the strikes did not convey the forceful message that Clinton's rhetoric suggests. In contrast, Operation ENDURING FREEDOM, backed by clearer political motives has probably had a more positive deterrent effect on terrorists and their supporting states.

AIR POWER'S LIMITATIONS

Despite air power's evident counter-terrorist applications and advantages, there are a number of limitations that can hinder its overall effectiveness in this area. These limitations are generally a consequence of the characteristics of 'new wave' terrorist groups that have been highlighted above, concerning, for example, their organisational structure and motives. Although most of these limitations also apply to other forms of military power, the fact that air power has been at the forefront of most of the military interventions made by western governments since the end of the Cold War make them important to consider at this point.

STATES ARE EASIER TO COERCE/DETER THAN 'NEW WAVE' TERRORIST GROUPS

In view of the major characteristics of the 'new wave' of terrorist groups emphasised above, it would seem that it is easier for a state to coerce/deter the state sponsor of a 'new wave' organisation rather than the group itself. The evidence would appear to suggest that this difference between state sponsors and 'new wave' terrorists may be the result of three main factors: terrorist groups are more resilient to attack, less willing to compromise and more fanatical in their beliefs.

Firstly, 'new wave' terrorist entities can be perceived as being relatively resilient to the disruption and destruction of their key nodes when compared to states, as they offer fewer targets; those they do offer are generally to be found in urban areas and are situated in both friendly and hostile states, their cells are spread out around the world, and they tend to operate more autonomously.

In comparison to most states – even impoverished states like Afghanistan – ‘new wave’ terrorists generally do not present a wide range of targets that air power can strike. In particular, they tend to lack the vast array of infrastructure that is usually associated with a state, which generally provides a lucrative target set for air power. Instead, they tend to utilise the infrastructure of a host state, either overtly or covertly. Thus, attempts to deny the terrorists access to their communications network, a vital asset of a networked organisation, that utilises mobile phones and the Internet, may prove difficult, if for example a mobile phone mast is contained within a friendly state. In addition, many of the operational cells of these groups operate in urban areas, which pose particular problems. Within these areas small groups are difficult to locate, track and target and there is an increased chance of collateral damage. Despite the better accuracy of PGMs, the use of Special Forces supported by air power may offer a greater chance of success.

Despite some of these problems, American and British air power has targeted Al-Qaeda’s leadership, infrastructure and fielded forces during the campaign in Afghanistan. US air strikes successfully destroyed C2 facilities and training camps,⁴⁹ which were integral to the operational efficiency of bin Laden’s organisation. Al-Qaeda, however, is unique among the ‘new wave’ groups in that it had fielded forces fighting a conventional war alongside the Taliban’s troops. Also, many of these targets were situated in sparsely populated areas. Thus it can be argued that Al-Qaeda presented a far more prominent and easier target to strike than either their operational cells or other ‘new wave’ terrorist organisations.

‘Our war on terror begins with Al-Qaeda, but it doesn’t end there. It will not end until every terrorist group of global reach has been found, stopped or defeated’.⁵⁰

As President Bush suggests, some of the ‘new wave’ terrorist groups possess the ability to perpetrate acts of terrorism on a worldwide scale. Al-Qaeda, for example, has a presence in about 60 countries and has carried out attacks in the Middle East, Africa and America.⁵¹ Unlike states, ‘new wave’ groups tend to be very disparate entities encompassing cells that are spread throughout the world. Thus any simultaneous operation directed against a number of these cells would require a great amount of co-operation, co-ordination and resolve in order to achieve a high degree of success.

While bin Laden may represent ‘public enemy number one’ in many western states, it is Al-Qaeda’s operational cells that will perpetrate any future attacks

Notwithstanding the success of Operation ENDURING FREEDOM emphasised above, there remains a large force of Al-Qaeda operatives spread throughout the world. Colin Powell, US Secretary of State, has estimated that between 10,000 and 30,000 Al-Qaeda operatives were still at large.⁵² Thus it is not unreasonable to suggest that Al-Qaeda’s remaining active operatives and ‘sleepers’ continue to pose a potent threat despite America’s actions in Afghanistan. It is possible that Al-Qaeda will be able to survive the current campaign and the possible capture or death of bin Laden, albeit with a reduced operational capability, and that they will retain the ability to perpetrate acts of international terrorism.

Paul Wolfowitz, US Deputy Defense Secretary, has highlighted the danger of the international community becoming focused solely on bin Laden to the detriment of other aspects of the ‘war against terrorism’.

It’s also important to emphasise I think [that] there’s a danger in the fascination with Bin Laden ... [and] that we might forget that there is a whole network outside Afghanistan – there’s a whole network that we have to get rid of, its more than just Bin Laden’.⁵³

While bin Laden may represent ‘public enemy number one’ in many western states, it is Al-Qaeda’s operational cells that will perpetrate any future attacks. In addition, it has still to be established whether the finances of these groups are dispersed or centrally controlled. If it is proven that they are centrally controlled, it will be much more difficult for Al-Qaeda to mount operations on anything like the scale of September 11. Nevertheless, it is possible to suggest that the destruction of Al-Qaeda’s operations in Afghanistan may only disrupt, and not destroy, the capability of its other nodes to perpetrate acts of terrorism.

Secondly, the unwillingness of many of these groups to compromise, and of their preference for total destruction rather than defeat, as a primary aim, may also have important ramifications for efforts in this area. Hence, as highlighted above, one of Hamas’ main objectives is the total destruction of Israel, and there seems little prospect of compromise on this issue. But it is possible that through policy initiatives or PSOs, governments may reduce the support offered to these groups and thus their legitimacy within their own and wider-world communities, which would constitute an first important step towards limiting their effectiveness.

It would seem very difficult to deter fanatics who believe that they will enjoy the riches of ‘paradise’ if they carry out the action that their adversaries are seeking to deter

Thirdly, the difficulty in coercing/detering these groups is also a reflection of the fanatical nature of their members and the different value systems that they possess. The fact that many of these ‘new wave’ groups view violence as a divine duty and believe that they will enter ‘paradise’ if they die in defence of their faith, threatens to shatter the rational actor model and cost-benefit analysis upon which much of deterrence is based. It would seem very difficult to deter fanatics who believe that they will enjoy the riches of ‘paradise’ if they carry out the action that their adversaries are seeking to deter. Thus, in this respect, they can be more difficult to deter than states that are generally perceived as being more rational and pragmatic. On 11 September 2001 Al-Qaeda attacked the homeland of the world’s pre-eminent military power, an act that would be unthinkable for most states given the fatal consequences of their action.

While the evidence seems to suggest that air power is of more utility against state sponsors than against ‘new wave’ terrorist groups, it is likely that by attacking their state sponsors, air power can indirectly affect the operational capability of the terrorists they support. The removal of the Taliban has serious implications for the operational capability of Al-Qaeda: bin Laden’s organisation’s operational effectiveness as a terrorist group has been reduced, while the hub is pre-occupied with its own survival. Al-Qaeda also lacks the protection that the Taliban had previously afforded. Although states that sponsor terrorism generally offer a wider range of targets that air power is able successfully to locate and strike than ‘new wave’ terrorist groups, these ‘new wave’ organisations remain reliant upon the support that they receive from states, without which their operations would be far more difficult.

THE USE OF AIR POWER CAN, IN SOME INSTANCES, PROVE COUNTER PRODUCTIVE

It has been remarked that the use of military force, including air power, has in some ways proved counter-productive in the fight against terrorism in this area by increasing popular support for terrorists and increasing the standing of men like bin Laden. Operation INFINITE REACH, for instance, helped to increase bin Laden's standing within the wider Muslim community and attracted more volunteers to his cause by radicalising sectors of the Muslim population.⁵⁴ Peter Bergen, a writer on terrorism, has remarked that Operation INFINITE REACH, 'turned bin Laden from a marginal figure in the Muslim world into a global celebrity'.⁵⁵ The US air strikes were very unpopular in many parts of the Muslim world and while this, on balance, may not over-ride the value of air strikes, it remains an important consideration when deciding whether to respond to international terrorism with military force.

Since the 1980s, 'new wave' terrorist groups have become more prominent both numerically and in terms of the proportion of attacks that they carry out and the number of casualties that they cause. This change in the nature of international terrorist organisations has presented opportunities and difficulties with regard to the employment of air power in an effective counter-terrorist role. Air power's visibility and responsiveness allow it to help ameliorate demands from the public and media that action should be taken in the wake of an incident of international terrorism. But the organisational structure of these groups complicates the task of ascertaining responsibility for acts of terrorism.

Air power, by utilising its inherent strengths of penetration, flexibility and versatility, and its ability to carry out precision engagement, is well placed to take offensive action against terrorist organisations and their state sponsors. While 'new wave' groups may be less dependent than their more 'traditional' counterparts upon state support in terms of finance they remain reliant on states for the provision of training facilities and safe havens. Thus there seems to be an opportunity for air power indirectly to affect terrorist groups by inflicting costs upon the states that provide these resources, an opportunity magnified by the fact that states usually offer a wider range of targets that air power is able to strike. By contrast, 'new wave' organisations are generally structured into loosely tied networks that are often relatively resilient to attack. Similarly, air power can contribute to the potential deterrence of terrorism by demonstrating its offensive capability. But the 'new wave' terrorists' religious fanaticism and their perception of violence as an end in itself means that their state sponsors may prove easier to deter. Even then, the strategic effect of such deterrence will be difficult to predict, for states tend to exert little direct control over these 'new wave' terrorist groups. Although air power possesses the potential to be utilised as an instrument of counter-terrorism, even against 'new wave' groups, it seems to be more effective when confronting the state sponsors of terrorism.

Notes

1 See Bruce Hoffman, *Inside Terrorism*, Gollancz, 1998, and Walter Laqueur, *The New Terrorism*, Phoenix Press, 2001.

2 See Hoffman, *Inside Terrorism*, pp. 67-9.

3 The use of the term 'new wave' reflects the fact that religious terrorism, at the forefront of this trend, is not new, but has experienced a marked revival. Religion has always been a feature of terrorism, for example the Order of the Assassins were committing acts of terrorism in the 11th Century, but it's relative importance in modern international terrorism was limited until the 1980s.

4 Hoffman, *Inside Terrorism*, p.90.

5 Hoffman, *Inside Terrorism*, p.91.

6 Ian Lesser, et al, *Countering the New Terrorism*, RAND Report, 1998, pp. 12-3.

7 See Walter Laqueur, 'Post-modern Terrorism', *Foreign Affairs*, September/October 1996.

8 The Aum Shinrikyo Sect in Japan, who successfully perpetrated a terrorist act using Sarin, a chemical agent, in an attempt to precipitate the end of the world, offers a prime example of this trend.

9 See Terry Terriff, et al, *Security Studies Today*, Polity Press, 1999.

10 See CIA, *Patterns of Global Terrorism 1998*, US Department of State, 1999.

11 See *The Strategic Defence Review: A New Chapter*, HMSO, 2002.

12 See Ransford, 'Terrorism in the Name of Religion', and Walter Laqueur, *The New Terrorism: Fanaticism and the Arms of Mass Destruction*, Phoenix Press, 2001.

13 Hoffman, *Inside Terrorism*, p.87.

14 Simon Reeve, 'A new breed of terror', *The Guardian*, 12 September 2001, pp. G2/4-5.

15 See Michele Zanini, and Sean Edwards, 'The Networking Of Terror In The Information Age', in John Arquilla, and David Ronfeldt, ed., *RAND Report*, 2000.

16 See Magnus Ransford, 'Hizbollah's Command Leadership: Its Structure, Decision-Making and Relationships with Iranian Clergy and Institutions', St Andrews University, Centre for the Study of Terrorism and Political Violence, at <http://www.st-and.ac.uk/academic/intrel/research/csttp/publications2c.htm>, and Laqueur, *The New Terrorism*, pp. 156-83.

17 See Laqueur, *The New Terrorism*, pp. 172-8.

18 See Triffin Roule, et al, 'Investigators seek to break up Al - Qaeda's financial structure', *Jane's Intelligence Review*, November, 2001, pp. 8-11, also Peter Bergen, *Holy War Inc: Inside the Secret World of Osama bin Laden*, Weidenfeld and Nicolson, 2001, and Yossef Bodansky, *Bin Laden: The Man Who Declared War On America*, Forum, 2001.

19 Bodansky, *Bin Laden*, p. 315.

20 Osama bin Laden left Afghanistan and moved to Sudan in 1991. His operations were based there until international pressure on the Sudanese government forced him to move back to Afghanistan in 1996 under the protection of the Taliban regime.

21 Hoffman, *Inside Terrorism*, p. 67.

22 See Central Intelligence Agency (CIA), *Patterns of Global Terrorism 1997*, US Department of State, 1998.

23 See Reeve, *The New Jackals*.

24 See CIA, *Patterns of Global Terrorism*, 1997.

25 CIA, *Patterns of Global Terrorism 1995*, US Department of State, 1996.

26 CIA, *Patterns of Global Terrorism 1996*, US Department of State, 1997.

27 CIA, *Patterns of Global Terrorism 1998*.

28 CIA, *Patterns of Global Terrorism 2000*, US Department of State, 2001.

29 CIA, *Patterns of Global Terrorism 2001*, US Department of State, 2002.

30 Hoffman, *Inside Terrorism*, p. 201.

31 See Salah Najm, 'Transcript of Interview with Usama Bin-Laden', *The Terrorism Research Centre*, 10 June 1999, at <http://www.terrorism.com/terrorism/BinLadinTranscript.shtml>.

32 See Simon Reeve, *The New Jackals: Ramzi Yousef, Osama bin Laden and the future of terrorism*, Andre Deutsch, 1999.

33 See CIA, *Patterns of Global Terrorism 1997*.

34 See Bodansky, *Bin Laden*.

35 Economist, 'A Systematic Failure', *The Economist*, 23 May, 2002, at http://www.economist.com/printedition/PrinterFriendly.cfm?Story_ID=1143638.

36 Rumsfeld, US Department of Defense News Briefing, 29 October, 2001.

37 Geoff Hoon, '11 September - A New Chapter For The Strategic Defence Review', Ministry of Defence, at <http://www.mod.uk/index.php3?page=43&mid=2466&view=1054&cat=33>.

38 Anver Versi, 'How Tunisia won the war against terrorism', *Middle East*, November 2001, pp. 1-4.

39 See Craig White, 'Is There A Role For Air Power In The Post-Cold War World?', *Air Power Review*, Vol. 4, no 3 (Autumn 2001), pp. 29-43.

40 Operation INFINITE REACH was the US designate for the cruise missile attacks it carried out against terrorist related facilities in Afghanistan and Sudan in August 1998.

41 Operation ENDURING FREEDOM is the US designate for its military operations in Afghanistan that commenced 7 October, 2001.

42 See Reeve, *The New Jackals*.

43 The use of air power in order to inflict costs upon terrorists and their state sponsors will be analysed in more detail below.

44 See Paul Wolfowitz, US Department of Defense News Briefing, 21 November, 2001, at http://www.defenselink.mil/news/Nov2001/t11212001_t11212dsd.html, and John Keegan, 'Success for the alliance, but it's not over yet', *The Daily Telegraph*, 14 November, 2001, at <http://www.dailyleague.co.uk/dt/?ac=006542137455052&rtmo=qkRdxpL9.../do01.htm>.

45 Rear Admiral John Stufflebeem, US Department of Defense News Briefing, 23 October, 2001, at <http://www.defenselink.mil/news/Oct2001/t10232001/t1023.asd.html>.

46 President William Clinton, 'Text of President Clinton's statement at the White House on military strikes to terrorist related facilities in Afghanistan and Sudan', *TIME Daily*, 8 August, 1998, at <http://www.time.com/time/daily/special/asbombling/clintonspeech2.html>.

47 Michael James Heron, 'Operation Infinite Reach', at <http://www.drakos.pwp.blueyonder.co.uk/politics/reach.html>, and Arianna, 'The Cruise Missile Follies', 24 August, 1998, at <http://www.ariannaonline.com/columns/files/082498.html>.

48 Sardar Lodi, 'US air strikes against Afghanistan and Sudan', September, 1998, at <http://www.defencejournal.com/sept98/usairstrikes.htm>.

49 Geoff Hoon, Transcript of Ministry of Defence Press Conference, 23 October, 2001.

50 President George W. Bush, Address to a Joint Session of Congress and the American People, 20 September, 2001, in Lawrence Freedman, 'The Third World War?', *Survival*, Vol. 43, no. 3 (Winter 2001/02) p. 62.

51 See Giles Whittell, 'Al - Qaeda's agents still a threat in 60 nations', *The Times*, 22 May, 2002, at <http://www.timesonline.co.uk/news/pa/per0.../172-303701.00.html> and Donald Rumsfeld, US Department of Defense News Briefing, 29 October, 2001, at http://www.defenselink.mil/news/Oct2001/t10292001_t1029dsd.html.

52 Whittell, 'Al - Qaeda's agents still a threat in 60 nations'.

53 Paul Wolfowitz, Department of Defense News Briefing, 21 November, 2001.

54 See Tim Weiner, 'In Islamic World, Bin Laden's Esteem Rises', *The New York Times*, 8 February, 1998, and Bergen, *Holy War Inc*, Bodansky, *Bin Laden*, and Reeve, *The New Jackals*.

55 Bergen, *Holy War Inc*, p. 137.

Captain James McCudden

Reprinted from Tee Emm, April 1941



Captain James McCudden
two days after receiving the
Victoria Cross

Exactly twenty-eight years ago this month, in April, 1913, a certain lad of eighteen joined the Royal Flying Corps as an Air Mechanic, or to be accurate, transferred from the Royal Engineers, in which for three years he had served as a bugler. Five years later, on April 6th, exactly twenty-three years ago this month, he attended, as a Captain RFC, an investiture at Buckingham Palace. He was by then a few days past his twenty-third birthday – quite elderly as RFC pilots went – but he hadn't been wasting his time, for he was there to receive from the King not only the Victoria Cross, but also the DSO, a bar to it, and a bar to his Military Cross.

That young Captain was James McCudden, probably the most famous of all British Great War pilots. His total of victories at his death was fifty-seven, and not only had he been the first pilot to bring down four Germans in one day, but on one occasion he had managed to destroy three enemy aircraft in twenty minutes. This last feat, remember, was in the days when anything over 100 mph was fast and when fighter-planes were only armed with two guns, so it must be considered pretty good going. Here is his own story of that triumph, taken from his published memoirs. Even at this distance of years there are still one or two fighting tips to be picked up, still one or two lessons to be learned.

'January 13 turned out to be a morning after my own heart, so I left the ground at about 9.30 am to fly with the red spinner for the first time. (McCudden had just had a spinner, taken from a German plane he had shot down, fitted to his own SE5 to increase his speed, and painted red so that his patrol could keep him in view). I gained height towards the lines, at which I arrived at 16,000 feet, and not seeing any Huns near the lines, as the visibility was not too good, I crossed over the find Huns getting height over their aerodromes. I was about ten miles east of the lines at 17,000 feet when I saw a two-seater below, and west of me, flying over the canal towards Le Catelet.

'Knowing that I was too high for him to see me I thought I would try to surprise him. I closed my radiator-blind and throttle, and, gliding in between the sun and the Hun, got down to his level at 9,000 feet and saw that the machine was an LVG, gliding down, with his engine just ticking round. I flew up to him and knew he hadn't seen me, for his rear gun was pointing vertically upwards, showing that the gunner was not holding it, so when I got within good close range, about 100 yards, I pressed both triggers; my two guns responded well, and I saw pieces of three-ply wood fall off the side of the Hun's fuselage. Then the LVG went into a flat right-hand spiral glide until it hit the ground a mass of flying wreckage, just north of Lehancourt, where it was also seen to crash by our Archie gunners.

'I hate to shoot a Hun down without him seeing me, for although this method is in accordance with my doctrine, it is against what little sporting instincts I have left.'

'I hate to shoot a Hun down without him seeing me, for although this method is in accordance with my doctrine, it is against what little sporting instincts I have left.

'I then saw three V-strutters on my right. I preferred to fight them nearer our own ground, so after they had followed me towards the lines, I suddenly turned round and pointed my red nose at them, and they were off like a shot, and away miles east of the lines in no time.



An LVG of the German
Army Air Service

'I now flew north, and saw two DFWs at a height of 5,000 feet being shelled over our lines by our AA batteries. I went down at once and got into position behind the nearest, into whom I fired a burst at 300 yards range, when he at once burst into flames and went down vertically and hit the ground like a blazing comet, west of Honnecourt. This DFW was my fortieth victory.

'I now paid attention to the remaining DFW who was determined not to share a like fate to his comrade, and so we fought for nearly five minutes, but he knew every trick and worked the fight very skilfully over his lines, as a two-seater can, for he is usually defending while the scout is attacking most of the time. We were now east of the trenches and as there were plenty of enemy machines about I returned west, for I was fairly low down.

I was so interested in noting details of the machine that I forgot all about his front gun until he opened fire . . .

'As soon as I crossed the lines I saw our Archies banging off above me, and, on looking carefully, saw two LVGs flying west at about 9,000 feet. I climbed and whilst getting up to their level I was hit in many places by a British shell that burst near me. This, however, did not deter me, and I very soon got up to their level while they continued to circle round over our lines. They saw me coming up, and no doubt said, 'Ach! Only a miserable SE; we need not worry!'

'I flew behind the one who was closest to me; so they drew in together to get both their rear guns to bear on me. Apparently they thought I was still out of effective range when I opened fire at fully 400 yards. The first one at which I fired burst into flames and then fell to pieces, the wreckage falling in our lines near Lempire.

'This was a third two-seater that I had destroyed in a space of twenty minutes, and so naturally I was convinced that my red spinner was bringing me luck . . .'

Even after his 'hat-trick' McCudden was not satisfied. Indeed he nearly got a fourth. For we learn that 'the second LVG had now cleared off to the east, so I went north and saw a DFW crossing our lines over Gouzacourt at about 13,000 feet, but I wanted him to come farther over our lines, so that I could get him in our territory. I turned west and he followed me, and came up so close behind me that I could see the faces of the pilot and gunner, who was looking over the side of his fuselage at me. I was so interested in noting details of the machine that I forgot all about his front gun until he opened fire . . . However, I soon pulled myself together, did a climbing turn, and got behind the DFW who now turned east, and I attacked him all the way back to the lines and well over, but that DFW crew knew how to handle a two-seater in defence, and so they got home to dinner, and they deserved it too . . .'

It was for these and many similar exploits that Captain James McCudden received his Victoria Cross, his DSO and bar, and his MC bar at the hands of the King that April 6th, 1918.

Three months later he was killed – after his many fights – in a trivial accident. He was flying out from England to take command of No 60 Squadron and landed at an intermediate aerodrome in France. On leaving the ground again on the last stage of his journey, his engine stopped, and, in trying to turn in order to get back into the aerodrome, he side-slipped into the ground, a type of accident that even today costs England the lives of so many pilots.

RHETORIC AND REALITY IN AIR WARFARE

THE EVOLUTION OF BRITISH
AND AMERICAN IDEAS ABOUT
STRATEGIC BOMBING, 1914–1945

TAMI DAVIES BIDDLE

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Review Essay by Gp Capt Peter W Gray RAF

In espousing the 'Transformation of Warfare', the United States Secretary of Defence recently confirmed that forces must think, train and exercise with the transformational mindset with which they are going to fight (Foreign Affairs, Vol. 81, No 3, May/June 2002). As an experienced politician, Donald Rumsfeldt can be forgiven for leaving out three further key elements that also contribute to eventual success on the advanced battlespace of the future. The first of these is the need to transfer the conceptual thinking into a body of coherent doctrine that will articulate the 'fundamental principles' necessary for the guidance of his military forces. To be scrupulously fair, Rumsfeldt's audience of Foreign Affairs readers would not necessarily see doctrine as anything other than an issue exclusive to those in the military who use it on a regular basis. Furthermore, he may have had the nagging doubt (shared by many in uniform) that doctrine actually reduces down to turgid manuals whose sole utility is the mechanism for justifying tribalism between the services in the next round of extravagant equipment expenditure.

The second element that Rumsfeldt omitted was the need to equip adequately to meet the laudable aspirations inherent in a new, revolutionary or transformational way of fighting. That he chose not to do so is again totally understandable in a fiscal environment where legacy weapon systems still have to be paid for; where the global war on terrorism still has to receive its share of monies allocated and finally the enabling technologies have to be developed. In a transformational warfare scenario, these technologies are effectively as fundamental as the principles of flight are to air warfare in general – or indeed to a strategic bombing campaign. The complexity, however, of the digitally aware battlespace is such that the order of magnitude of difficulty is huge.

New 'ways of war' are open to varying interpretations with no one service, or nation, having intellectual copyright over the thinking at issue...

The third area into which the Defence Secretary chose not to venture is the fraught issue of conducting transformational warfare in some kind of combined or coalition environment. This can be difficult for a number of reasons. New 'ways of war' are open to varying interpretations with no one service, or nation, having intellectual copyright over the thinking at issue. It may well be that the best way for a small player to get his views incorporated is to persuade the more dominant partners that they thought of them first. Development of new equipment is also problematic in that thinking, doctrine and capability are inextricably interlinked. Secrecy has always been part of the military exploitation of technology; but arguably never so much as in the field of communications, associated cryptography and software. Yet without these a real transformational war cannot be fought.

COALITION BANNER

The final two elements of the dilemma could be dealt with under the coalition banner. But they are, arguably, too important to lump together. The first of these involves what today would be termed 'intelligence preparation of the battlespace'. Going to war (into conflict or whatever terminology one cares to use) with differing views as to the enemy vulnerabilities, weaknesses, intentions, potential for recovery or mindset does not lend itself to a conventional campaign – let alone one predicated on effects-based or transformational warfare. The final element is the legitimacy of the operation per se and, within that, the legality of the targeting, the rules of engagement and so forth. These are extremely contentious issues with scope for serious intra-coalition strife. The same themes are starkly evident within Professor Biddle's time period – yet they are no closer to resolution.

If we therefore broaden the process to incorporate all of the elements: thinking, formulating doctrine, equipping, training, exercising and working in a coalition environment the scale of difficulty (and cost) increases many fold. Yet these elements must be tackled in a rigorous and determined manner – not least because failure so to do will result in the various elements only fusing together in the crucible of warfare. The more complex the nature of the warfare, the less the chance of us getting it right on the day, with those whom we send into harm's way paying the ultimate price.

The dangers of missing a vital link, or of advancing with faltering step, spread the responsibility far and wide. All those involved should therefore have this book — *Rhetoric and Reality in Air Warfare* — as mandatory reading. It is evident from Professor Biddle's excellent account of *The Evolution of British and American Ideas about Strategic Bombing* that there were flaws, missing links, self-delusion, blind optimism and poor planning in the handling of what could be argued to have been a transformational way of going to

war. Even those sceptical of drawing lessons from history need to sit back and apply the levels of masterful analysis evident in this scholarly work. Those that would seek to distinguish the precedent likewise miss the essential point.

FIELDS OF DEVASTATION

The revolution in military affairs brought about by the ability to mass produce weapons on a vast scale, and mobilise the citizen armies with which to wield them, resulted in the bloody end that characterises most revolutions. The devastation on the fields of France and Flanders brought its own version of casualty aversion. The strategic bomber – to the enlightened as they saw themselves – represented a new, or transformational, way forward. But the rhetoric of the advocates was at odds with the reality of the doctrine, the training, the exercise programme, the equipment and so forth. As Professor Biddle expertly chronicles, those sent in harm's way paid the price. Professor Biddle takes the experiences of the First World War as the backdrop for the development of the rhetoric, the ideas, the ensuing doctrine and the equipment. Her comprehensive treatment ensures that the training and exercise elements also receive full coverage. Professor Biddle's analysis of the rhetoric extends to the experiences of those on the receiving

The strategic bomber – to the enlightened as they saw themselves – represented a new, or transformational, way forward...

An Avro Lancaster III, 103 Squadron, RAF Bomber Command, preparing to depart for the Ruhr, 1943





end of the bombing in Britain during the Great War with particular emphasis on the need to retaliate – or at least be seen to be so doing. Ironically this clamour for revenge was at variance with the later assessments of the disproportionate effect of bombing on morale as against the physical damage wrought. Here Professor Biddle points out that Trenchard, by being increasingly outspoken in private as well as with the Press, manoeuvred himself into a position where this morale factor was the only justification for the ever rising casualty figures in the face of little damage and even sparser 'effect' on the German military effort.

As thinking matured, too many lives had been staked and lost...

Trenchard had even less room for manoeuvre when appointed Chief of the Air Staff for the second time. As thinking matured, too many lives had been staked and lost; reputations built; honours awarded; and the very survival of the fledgling Service was at stake. The time was propitious neither for a recant nor a sober reflection on the real lessons learned.

INDEPENDENT SERVICE

From this baseline, Professor Biddle expertly chronicles the development of thinking on both sides of the Atlantic through the interwar years. She highlights the parallels and, more importantly, the areas where the RAF as an independent Service diverged from their US counterparts who were still under the aegis of the Army. Professor Biddle follows the arguments over the ideal ratio between fighter and bomber squadrons shedding a few myths en route. She points out, for example, that RAF procurement

expenditure actually increased between 1924 and 1932 and that the UK aircraft industry was as large as any other (on a par with the US, France and Germany). Biddle goes on to assert that the customary excuses for Britain not being ready to fight Germany were less of a factor than the inability of the Service to match its declaratory policy of a major strategic bombing offensive with the realistic demands that it would have to meet in the prosecution of such an ambitious aim.

...American conceptual thinking on air power never ceased to contemplate the indirect, or psychological, effects of bombing...

Notwithstanding a shared understanding of the fundamental offensive nature of air power, the US Air Corps had to develop its policies within the constraints of American security posture which circumscribed the potential uses of aircraft. Bomber aircraft had to find, and then attack, naval threats to the US coastline. As thinking developed, Professor Biddle highlights the dual personality that air power thinkers had to adopt: superficially they had to conform with Army thinking. But internally, they developed an altogether more independent concept. Nowhere was this more evident than at the Air Corps Tactical School which became the alma mater for many of the leading proponents of strategic bombing.

ENDURING THEME

Professor Biddle rigorously assesses the ACTS syllabus with the implicit broad definition of doctrine – that which is taught. Notwithstanding the requirement to cover army co-operation, she points out that American conceptual thinking on air power never ceased to contemplate the indirect, or psychological, effects of bombing. A key area for development, however, and one that would later cause much stress between the wartime allies, was the scope for economic analysis leading to specific targeting of the enemy structure. In what has become an enduring theme in US targeting psyche, interest increased in urban and industrial power grids. Concentration on the social and economic 'sinews that held together modern societies' would undermine the enemy will to fight. Biddle very shrewdly points out that this has to be seen through the eyes of a nation that had been very hard hit by the Great Depression and therefore had seen at first hand the fragility of modern economic systems.

Professor Biddle deals with the alternatives to the bomber in a characteristically thorough manner with, in particular, some excellent analysis of the development of fighter aircraft and air defence systems. The inevitable, and to the theorists very uncomfortable, corollary to this was the means by which the bomber (or its formation) would survive the sortie in the face of determined defence. The rhetoric at the time was, after all, that the 'bomber would always get through.' The reality was that it would take considerable losses to convince first the British, and then their American counterparts, that fighters were indeed a potent threat – no matter how 'well the formation was flown and tightly maintained'. Biddle disposes of the Trenchardian-style rhetoric in short order.

BRITISH EXPERIENCES

The most depressing parts of this book are the two – extremely comprehensive – chapters on the realities of the British experiences through to 1942 and then the combined efforts thereafter. Although as Professor Biddle makes abundantly evident, the two Allies agreed to differ, fudged the issue – or just plain disagreed – all too often. As indicated at the outset of this essay, differences in intelligence appreciation, and the relative importance of different target arrays, can prejudice not only the effectiveness of the campaign, but also the lives of those charged with its prosecution. During the inter-war years, the legitimacy of strategic bombing was discussed at some length. In the UK, Neville Chamberlain laid down guidelines for Bomber Command based on extant interpretations of draft international law. Slessor recorded the



Both the British and American teams sought answers to the hugely difficult questions on the impact of bombing on civilian morale...

pragmatic Air Staff view that this was all very well, but at some stage the 'gloves would have to come off'. History records that the gloves were well and truly discarded in practice — not surprisingly in an extremely vicious total war that neither the UK nor America wanted. But as Professor Biddle, and others (including this reviewer), acknowledge, there were increasing attempts by those charged with the prosecution of the war, at the grand strategic level, to attempt to distance themselves from some of the consequences. Churchill's belated, and unjustified, squeamishness over Dresden was a classic case in point. Biddle, along with the more enlightened of US authors,

bluntly states that American 'wartime and post-war emphasis on 'precision bombing' was for public consumption'. The central theme of rhetoric and reality again emerges, with area bombing a serious pastime for both forces.

Professor Biddle ends her account of the combined bomber offensive with a sobering account of the results of the campaign — and by direct implication, of one of the most taxing military conundrums of the century — the real effectiveness of air power. The seriousness of this question cannot be overstated. For the Americans, the culmination of many years of thought, doctrine formulation (at Langley and then Maxwell), equipping, training, exercising and finally going to war with allies was but the starting point. The advent of nuclear weapons opened further vistas for the employment of air power, and by an independent service at that. The scale of destruction evident in German cities raised eyebrows, particularly amongst those who sought the moral high ground with the Nuremberg trials looming. The ensuing surveys raised as many questions as they answered and have become a specific section of research into the bomber offensives in their own right. As Professor Biddle points out, the initial assessments stressed the incontestable:

- The contribution to the achievement of air superiority over Germany and hence over Normandy prior to the invasion
- Diminution of German oil supplies
- Interdiction of supplies and areas of battle
- Destruction per se
- Neutralisation of V and other special weapons

...air power was one of the levers of warfare that would have cumulative effect on an enemy...

CIVILIAN MORALE

Both the British and American teams sought answers to the hugely difficult questions on the impact of bombing on civilian morale. In the case of Germany, it was hardly relevant as surrender had followed total and utter defeat in all strategic areas — air, land, sea, diplomatic, ideological, economic and so forth. Likewise, the air campaign against Japan was but one element of total war. As Professor Biddle points out, the high levels of pain endured by the respective populations, from London in 1917 through Guernica to Germany and Japan, does not necessarily correlate with surrender. The discussion has continued ever since in a multitude of fora, books and articles. But this not render the debate either sterile or merely of academic interest. If one looks at the valid criticism that either element of the bomber offensive had been ineffective, this begs the question where the finite resources — of men and materiel — could have been better expended. The emphasis on effect is made deliberately in this era of effects based operations. The effectiveness of an air campaign, or indeed any military operation, cannot just be measured in terms of weight of bombs dropped etc. At the end of the day, if you have not won . . . Biddle concludes that, notwithstanding the continuing debate, the strategic bombing offensive was 'decisive'. The real achievements of air power made final victory possible. As the more genuinely enlightened strategists such as Tedder realised, air power was one of the levers of warfare that would have cumulative effect on an enemy. What air power's detractors missed in the aftermath of the Second World War — and continue to miss (or ignore at their peril) — is that, in the vast majority of cases, exploitation of the medium is here to stay. Those who previously sought to denigrate the threat by suggesting that none would challenge the might of the USAF were rudely awoken on 11 September 2001.

In her conclusion, Professor Biddle highlights that the ideas expounded by British and American airmen were not 'pulled from thin air. The[ir] expectations — and hence their arguments — revealed the way in which they interpreted the world around them and in which they sought to promote their own interests'.

The same is true today. She goes on to point out there has always been an endemic problem in air forces in that they establish their institutional identity around the future. The same is again still true. The downfall in this blind faith in potential may only become apparent in conflict — to the detriment of those in harm's way. Sober analysis of the real lessons of the past was, and remains, vital.

FINE PIECE OF SCHOLARSHIP

Early in the essay, the reviewer recommended this book as mandatory reading for all involved in the development of a transformational route to future warfare. The potential readership must be wider than this as the book is a fine piece of scholarship. The old adage that prose should be so tight that the removal of a word or a sentence should be immediately obvious is well represented in this work — every phrase adds to the sum of the parts with no wasted words. The choice of sources is exemplary with an outstanding blend of primary and secondary material from both the United Kingdom and America.

The strategic bombing campaign, the development of the doctrine and quest for the aircraft have all been well covered by other authors. Many of these are now out of print and tend to deal with the strategy in isolation — few, if any, actually cite the Air Publications that represented the doctrine manuals of the time! This volume, however, brings so many of the points together that it truly becomes a magnum opus. It is therefore an essential working document and a vital starting point for any study, at any level, of the strategic bombing campaign.

The Hunt for Zerzura *The Lost Oasis and the Desert War* by SAUL KELLY

Price: £8.99
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Publisher: John Murray, London 2002

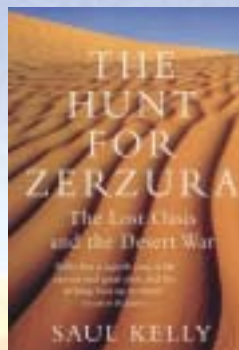
Reviewed by Group Captain Peter W. Gray

At first sight, the vast majority of readers would be at a loss to either identify the relevance of the Zerzura Oasis, or even why it may be familiar to them. Saul Kelly relieves the doubt with the inclusion on his front cover of informal sub-title 'The true story behind The English Patient.' The Zerzura Oasis became something of a Holy Grail for explorers in the inter-war years and the Zerzura Club met once a year for dinner in the Café Royal in London. Michael Ondaatje won the Booker Prize for his novel in 1992 and it was subsequently turned into an Oscar winning film. But as Kelly points out in his introduction, the basic story had inspired at least two other novels and associated films since the end of World War II. The real story shows that the explorers had considerably more on their varied agendas than merely searching for water in the desert and the associated traces of lost civilisations.

As motor transport, and very soon thereafter the advent of air power, made the distances involved in desert exploration marginally easier to cover, the surveys were of increasing military importance. For the British, the Suez Canal was absolutely vital in the protection of her lines of communication with the Empire. As Mussolini became increasingly determined to build an empire incorporating Libya and Egypt, his experts sought routes across the desert that would enable him to threaten the upper reaches of the Nile. This would extend British defence lines, strain Imperial relations with the Egyptian government and drag reinforcements away from other theatres. There was more to the survey work than merely seeking water supplies - important though this factor indubitably was. The nature of the desert surface was critical as this dictated the 'going' and hence the route and make-up of convoys. Scope for re-supply, ambush and the development of navigation techniques were all vital factors. Air power was involved throughout with reconnaissance and re-supply two of the critical factors. As tension increased between Britain and Italy the impermanence of air power became a major strength in that the two sides could probe and put down markers without risking confrontation on the ground - and hence a *casus belli* was avoided.

When war broke out for real the techniques, and results of the surveys, were utilised by both sides (Britain and Italy) – and subsequently by Rommel's forces when the Germans became involved in Africa. One of leading exponents on the British side was instrumental in the formation of the Long Range Desert Group and Kelly is extremely informative on the detail of their operations - both in isolation and subsequently with the Special Air Service. On the Axis side, the Hungarian aviator, and explorer, Count Almásy (the 'English Patient') was equally active. Kelly's primary source research is again outstanding as he details the attempts to insert German spies along overland routes into Cairo. This element of the story has again been well used in the popular fiction arena. Kelly's version is all the more gripping because it is a true rather than a fictional account.

Overall this book is extremely well researched, using sources in Germany and Hungary as well as interviews with survivors. The story embraces the high politics of international relations, the technical detail of desert exploration, espionage, counter-espionage, tales of military daring and a review of the existence or otherwise of the mythical oasis. Does it exist, with the associated remnants of a lost civilisation? The final answer to the quest is certainly not to be imparted in a mere review!



Skies of Fire *Dramatic Air Combat* by ALFRED PRICE

Price: £18.99
ISBN: 0-304-35947-5

Reviewed by Group Captain Chris Finn



Skies of Fire is the third in a series of books by the historian Dr Alfred Price. Before becoming a full-time aviation writer in 1974 Alfred Price flew as an air electronics officer in the V Force and his knowledge of electronic warfare and tactics is evident throughout this book. The book is a series of 22 vignettes of varying length looking at aspects of air power from its first expeditionary use by the Italians in Libya in 1911 and 1912 to the employment of Unmanned Aerial Vehicles (UAVs) over Kosovo in 1999. Some of the chapters are very short and give no more than a brief overview of the subject, and the lack of footnotes or bibliography means that the book's primary value is in stimulating an interest and awareness in the history of air power as opposed to providing a more academic analysis. That said, other chapters provide detailed and informed comment on specific operations. The chapter on the use of electronic warfare in Operations TAXIBLE, GLIMMER and others, as one tactical part of the enormous deception plan in the lead-up to D Day, is a particularly good example. Three linked trends also emerge in the book, which are the impact of technical advances upon aircraft themselves; the development of equipment, tactics and countermeasures; and the constant impact of the human dimension throughout the history of air power.

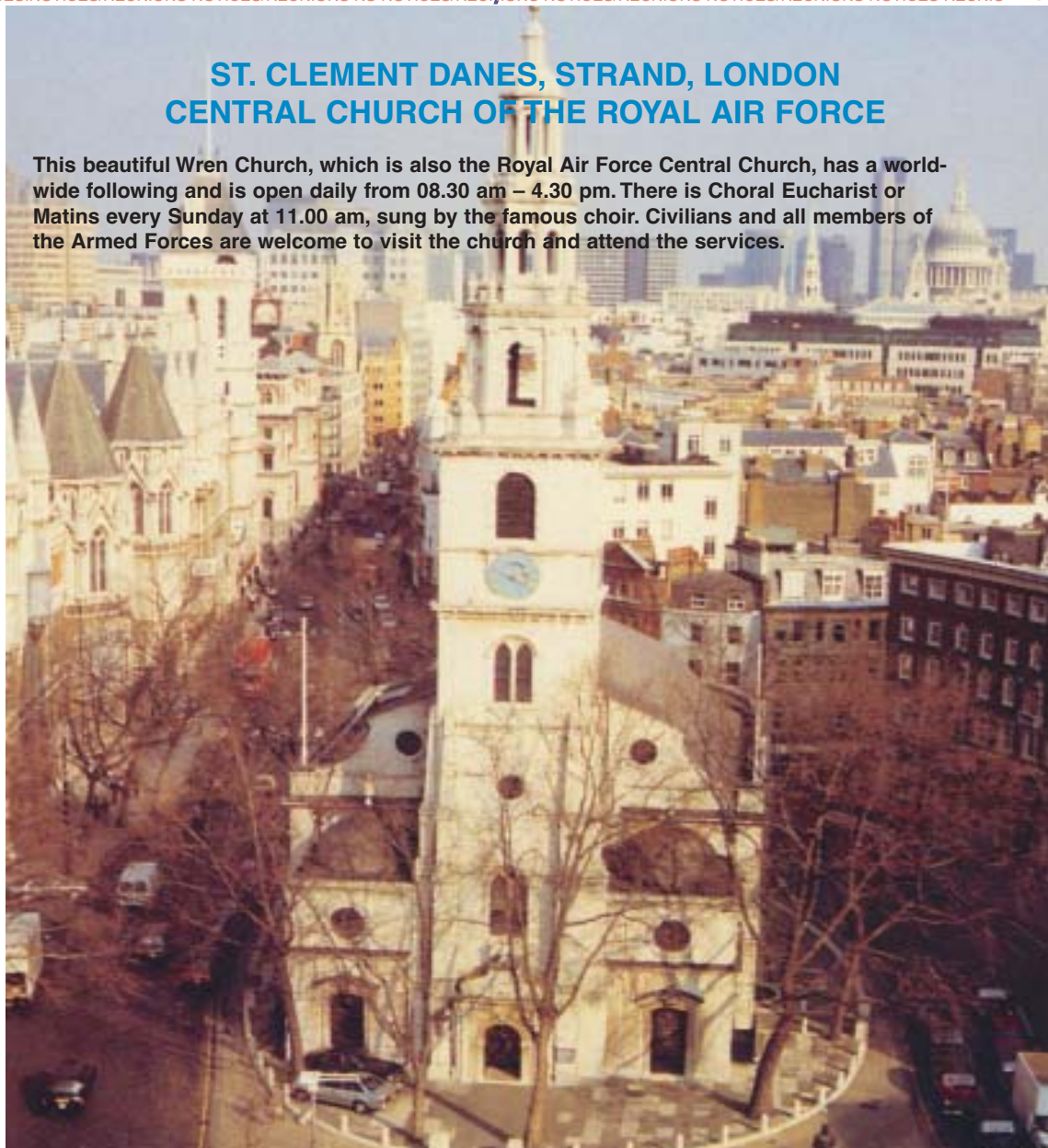
The technological issues are well illustrated by his comparison of the Italian Bleriot fighters of 1912 with the DH4s of only 5 years later, which had twice their speed, carried 5 times their bomb load, operated as reconnaissance aircraft at altitudes as high as 20,000 feet and were also highly effective Zeppelin killers. The second thread starts with an article concerning the loss of a Dornier DO 217 bomber in October 1941, due not to fighters or anti-aircraft fire but to the meaconing of German radio beacons which led to the bomber running out of fuel and landing near Rye in Kent. The story continues with the D Day jamming referred to above, and finishes with a detailed description of the USAF responses, both technical and tactical, to the deployment of the SA2 missile system near Hanoi during the Vietnam war.

The final thread is that of people, which is best exemplified by comparing the story of No 266 Squadron during its short time in combat during the Battle of Britain where losses soon rendered it ineffective with that of the pilot of a German Messerschmitt ME410 heavy fighter who was transferred to Focke-Wulf FW190 single-engine fighters in July 1944 and with only minimal training, thrown into dog fights against American fighters. The story of Captain Roger Locher's 23 days evading capture in Vietnam when his F4 was shot down, and the pilot was killed, is at one level a story of courage and resourcefulness but is also a reminder of what may happen to any aircrew involved in current operations. The final article, on UAVs, makes the point that they still require a man in the loop to make different although equally time-critical decisions as do those in the cockpit.

In summary, this is a very readable book which at one level will provoke 'I didn't realise that' comments from readers, but which also has enough substance for readers to draw their own conclusions about some of the more enduring aspects of the employment of air power.

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

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



ROYAL AIR FORCE HISTORICAL SOCIETY

Formed in 1986 to study the history of air power, the RAF Historical Society examines such topics as the Strategic Bomber Offensive of World War II, the V-Force, various air campaigns, and aspects of modern air power. The society holds lectures, seminars, and discussions, bringing together those involved in RAF activities past and present, at a membership fee of £15 a year.

Please contact:

Dr Jack Dunham, Silverhill House, Coombe, Wotton-u-Edge, Glos, GL12 7ND, Tel: 01453 843362.

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