

Air Power Review

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Why Airdrop?

Wing Commander Daniel Rich

**The Royal Air Force and the First Gulf War,
1990-91: A Case Study in the Identification
and Implementation of Air Power Lessons**
Dr Sebastian Ritchie

**The V-Weapons Offensive:
Its Impact upon the Allied War Effort and
some Reflections upon the Contemporary
Implications of Weapons of Mass Effect**
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Viewpoint

Dr Kenneth Payne

Book Reviews

Air Vice-Marshal (Ret'd) Tony Mason
Group Captain Clive Blount

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Royal Air Force Air Power Review

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Directorate of Defence Studies (RAF)
Room 202, Greenhill House
Shrivenham
Swindon
Wiltshire SN6 8LA

E-mail: enquiries.dds@da.mod.uk

Editor

Director Defence Studies (RAF)

Production and Design

Air Media Centre

General enquiries on Journal distribution may be made to the following address:

Deputy Director of Defence Studies (RAF)

Room 202, Greenhill House

Shrivenham

Swindon

Wiltshire SN6 8LA

Tel: 01793 314847

E-mail: enquiries.dds@da.mod.uk

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Air-to-air photograph of Spitfire PR.XI PL775/A of 541 Squadron based at RAF Benson in Oxon taken on 13 July 1944. It was delivered new to Benson on 22 April 1944 and allocated to 541 Squadron on 14 May. Withdrawn from RAF service on 8 September 1945 and struck off charge on 7 April 1946.



Chinook helicopters of 1310 Flt, 27 Sqn collect underslung loads to deliver to the FOBs and PBs. The Chinooks provide a vital link in keeping the guys on the ground supplied from water to ammunition. (Photographer: Flt Sgt Graham Spark-RAF)



Two Paveway-armed Tornado GR.1 strike aircraft on their way to attack an enemy target during Operation Granby, the First Gulf War.

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A German V-2 rocket fired by the British from a launch pad near Cuxhaven in Germany during Operation Backfire in 1945. Date October 1945
Source: Science Museum (UK) postcard W7, Crown Copyright 1946 stated on the card.



A Dakota drops supplies at a drop-zone near Mandalay as Indian troops recover the baskets of supplies.

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Jaguar and Tornado fighter-bombers in the distinctive sand camouflage applied to aircraft taking part in Operation Granby.

Foreword

By Squadron Leader Paul Baroni

Our spring edition sees us extend a warm welcome to Group Captain Paul Wilkins, the RAF's new Director of Defence Studies and Chairman of the APR Editorial Board, whose biography and career details are on page 7. Following on from our Autumn/Winter 'UAV special', this time our journal looks further into the past and we can say with some surety that there will be few air power publications that offer an analysis of air power from the 2nd Age of Middle Earth (all will be revealed!). The collected articles look back to the Second World War, Vietnam and the First Gulf War to consider a broad range of air power matters, but do so with accessible depth to be both thought provoking and relevant to the contemporary environment. Indeed, we hope that you will agree that the articles, viewpoints and book reviews in this edition have clear, significant pull-through and lessons for today's air power practitioner and academic alike.

The first article of our Spring Edition is written by Wing Commander Daniel Rich from the Royal Australian Air Force (RAAF) and a recent graduate from the UK Defence Academy. A tactical lift pilot by profession, the author examines the utility and applicability of airdrop – by his definition, the tactical delivery of stores and materiel from the air – in the contemporary context, contrasted with its original purpose which saw rapid development in the Second World War. Wing Commander Rich is careful to delineate the airdrop of materiel from that of personnel, arguing that airdrop as a concept, originated as a means to supply and subsequently resupply an airborne force. He outlines how, with the advent of the helicopter, airborne assault by parachute became a somewhat niche activity resulting in a lack of focus on airdrop operations, doctrine and understanding. Tracing the use of airdrop through the Second World War, through to the Vietnam War some 25 years later, the author goes on to contrast its use in more recent and contemporary conflicts in Iraq and Afghanistan by the US and NATO. Rich's thesis is that though the purpose of airdrop has been consistent across the decades, namely, as a means of supply to inaccessible areas, the dominant factor denying access has evolved from terrain to enemy air threat. New technologies have enabled 'airland' (tactical air transport) and vertical (helicopter) supply from the air to take primacy in the commander's logistic tool kit, but the author argues that airdrop is not merely a last resort when these other 2 methods are not viable or available. Wing Commander Rich articulates that airdrop has its own, unique characteristics that need to be clearly understood. Unique characteristics of speed, concealment (for both the land and air forces), aircraft survivability and protection that should inform the current doctrinal misunderstanding of airdrop as a logistic exercise of last resort that downplays its relevance and thwarts its effective employment.

Dr Seb Ritchie of the Air Historical Branch (RAF) follows 'Why Airdrop?' with a poignant, informative article on the RAF's involvement in Op Granby, the UK operation associated with the First Gulf War in 1991. Dr Ritchie's paper is not routine historical analysis of UK air power's

involvement in the conflict, rather, it focuses on how a modern armed service understands its operational and tactical experiences and then goes on to institutionalise a corporate method to identify and learn lessons. The author proposes that Op Granby is an especially useful case study as a conflict on the crest of the revolution in military affairs, at the dawn of the post-Cold War era, with the concomitant air power and military lessons to take forward into a more complex world. Dr Ritchie makes an effective assessment of the RAF's role and experiences in the First Gulf War and exposes the lessons that the Service identified as key to embrace and learn as an organisation. As a result of the conflict, the RAF evolved into a more agile, deployable force, with firmer, more general war-fighting capabilities and foundations. Similarly, its main ground attack platforms were transformed in terms of capability and tactical application. However, the author also points to lack of attention to Precision Guided Munitions and higher-level flying in the RAF's Gulf War lessons report but remains balanced in his analysis, pointing to the competing, political and financial pressures that the RAF faced after the conflict and highlighting that lessons learned are not usually implemented in a vacuum. The RAF bounced straight from the Gulf War into 2 decades of permanent operations enforcing no-fly zones in the Gulf, in NATO operations in the Balkans and then into full participation in the so-called Global War on Terror following the 9/11 attacks. Short-term imperatives may have undermined the full exploitation of the Gulf War lessons learned. Dr Ritchie concludes by considering whether the RAF can really be said to have a strong learning culture in light of the First Gulf War lessons report and subsequent approach to operations in the ensuing 20 years.

Our final article is written by Group Captain Martin Johnson who offers an interesting insight into the Third Reich's V-weapons offensive campaign from June 1944 to March 1945. Following this edition's theme of pull-through and contemporary relevance, the author offers an analysis of the V-weapons impact on the Allied war effort, before reflecting upon the current-day implications of weapons of mass destruction (WME). The V-weapons campaign is described as having had a dual effect on the Allies, particularly Great Britain, with a significant psychological impact on the British public living under the enduring, demoralising threat of V-bomb attack during a period that was characterised by Allied ascendancy and imminent victory. The second effect was the drain on Allied air power resources which Group Captain Johnson lucidly highlights. The conflict between political and military imperatives saw a split between the British Cabinet and Bomber Command on diverting resources from the strategic bomber offensive on Germany, to Operation Crossbow, the pre-emptive targeting and strike on V-weapons infrastructure. Similarly, Operation Crossbow conflicted with Op Overlord preparation whilst interception of the V-1 rockets pulled essential fighter resources including aircraft, anti-aircraft artillery and barrage balloons from other key areas of the Allied campaign. The author makes insightful parallels with the Iraqi regime's use of Scud

missiles during the First Gulf War and the disproportionate allocation of resources to counter the threat, predominately for political reasons. He also points to the powerful psychological impact of WME and the strategic need to protect – or being seen to protect – a key centre of gravity. In establishing the contemporary pull-through of the V-weapons programme on our current understanding of WME and ballistic missiles, Johnson is careful to acknowledge that certain analysts conclude that the ballistic missile only became effective once nuclear warheads were attached. But his central thesis is not how accurate, destructive and effective the missile is, but rather it is their ability to shape the strategic environment through the perceived destructive power and reach. This psychological game-changer, it is asserted, deserves serious reflection when it comes to considering ballistic missile defence measures in the future.

This edition's Viewpoint is certainly original in its choice of case study. Written by Dr Kenneth Payne from KCL's Defence Studies Department, *Lord of the Rings* as Air Power Theory may divide our readership in its assertion that Tolkien's classic has something to offer the air power debate. However, Payne effectively (though doubtless with tongue firmly in cheek) weaves the 4 air power roles of Intelligence Surveillance and Reconnaissance (ISR), Air Mobility, Attack and Control of the Air (COA) into his paper, to draw parallels with air operations from the Black Buck raids of the Falklands War (see COA) through to the Spanish Civil War (Attack). If the case study is too far-fetched for some, the author firmly anchors the debate within the context of the times in which Tolkien wrote *Lord of the Rings*, in the build-up to, and during the Second World War. Payne acknowledges that whilst Tolkien's book does not, perhaps, offer a conclusive case study for air power theory, the reader must accept he is a 'creature of his time' and that the nature of the book does not naturally allow for air maritime integration or inter-theatre mobility!

APR Spring concludes with the review of 2 important books that add considerably to the air power body of knowledge. First up, Air Vice Marshal (Ret'd) Tony Mason provides an excellent review of *Air Commanders*, a collection of biographies (by different authors) on 12 United States Air Commanders spanning the last 70 years, edited and introduced by John Andreas Olsen. Continuing the theme of command, Group Captain Clive Blount then reviews *The Generals: American Military Command from World War II to Today*, written by Thomas E. Ricks, whose insights are the result of a 4 year study of American generalship since the Second World War.

Director Defence Studies (RAF)



Group Captain Paul Wilkins MA RAF

Group Captain Paul Wilkins joined the Royal Air Force in 1983 and initially trained as an Air Electronics Operator (Radar) before going on to fly the Nimrod MR2 in the Maritime Patrol role. Commissioned in 1989, he trained as a fast-jet navigator before joining the UK Air Defence Force in 1992 flying the Tornado F3, completing 2 front-line tours and 2 instructional tours. Wilkins also flew the Lancaster B1 and Dakota C3 with the Battle of Britain Memorial Flight (BBMF) for several display seasons. Operational flying experience includes 2 tours flying in support of the United Nations operation in the Former Republic of Yugoslavia, several tours in the Falkland Islands including one as Officer Commanding (OC) No 1435 Flight, as well as UK Quick Reaction Alert (Interceptor) duties.

After Advanced Staff Training during which he completed an MA in Defence Studies with KCL, Wilkins joined the staff of the Joint Services Command and Staff College in 2004 where he was responsible for war-gaming exercises for both the Higher and Advanced Courses. In 2007, he was appointed Officer Commanding Operations Wing and Chief of Staff (COS), 135 Expeditionary Air Wing (EAW) at Royal Air Force Leeming, subsequently completing a 6 month period as Station Commander in 2009. In 2010, he was responsible for development of UK Air-Land Integration activities and the Executive Officer of Operations Division within the UK Air Warfare Centre.

Recent operational staff experience includes a plans appointment in the Headquarters of the Senior British Military Advisor to Commander US Central Command in 2006/7. In 2009, he was COS Operations, 904 EAW at Kandahar, Afghanistan. In 2011, Wilkins was seconded into a NATO appointment within the strategy cell of the Combined Force Air Component Commander Operation Unified Protector (Libya). Promoted Group Captain in 2011, he was appointed Senior Royal Air Force Liaison Officer to the Chief of the French Air Force, responsible for the delivery of all cooperation activity between the Air Forces under the auspices of the UK Defence & Security Cooperation Treaty 2010.

Group Captain Wilkins was appointed Director Defence Studies (RAF) in Feb 2014.

Notes on Contributors

Wing Commander Daniel Rich is a pilot in the Royal Australian Air Force. Daniel has spent the majority of his career within Air Lift Group (ALG) where he has had flying posts to 34 Squadron (VIP transport) and 38 Squadron (tactical transport). On staff, Daniel has had appointments in capability development and as the senior plans officer for the Air Mobility Control Centre. While within ALG, Daniel completed an operational tour serving in the United Nations Headquarters of the Peace Keeping Force in East Timor. Wing Commander Rich is also a Qualified Test Pilot, graduating from the United States Naval Test Pilot's School with the Navy League award as the Dux of Class 131. As a test pilot Daniel was posted to the Aircraft Research and Development Unit where he served as the Fixed Wing Flight Commander. Daniel is a graduate of the Australian Defence Force Academy and has a Bachelor of Science degree from the University of New South Wales. In 2013, he graduated from Advanced Command and Staff Course 16 where he completed a MA in Defence Studies from King's College London and was awarded the Andover Prize for the best Defence Research Paper written by an international student. Wing Commander Rich is currently the Deputy Director of the C-27J Transition Team, the organisation responsible to transition C-27J into operational service with the RAAF.

Dr Sebastian Ritchie is an official historian at the Air Historical Branch (RAF) of the Ministry of Defence. He obtained his PhD from King's College, London, in 1994, and lectured at the University of Manchester before joining the Air Historical Branch. He is the author of a number of official narratives covering RAF operations in Iraq, the Former Yugoslavia and Libya, and has also lectured and published widely on aspects of air power and air operations, as well as airborne operations, in the Second World War and post-war periods. His published books include *Industry and Air Power* (1997), *Arnhem: Myth and Reality* (2011), and *The RAF, Small Wars and Insurgencies* (two volumes, 2011).

Group Captain Martin Johnson joined the RAF in 1989 as a Fighter Control (now Aerospace Battle Management) Officer. His tours as a Junior Weapons Control Officer included RAF Neatishead, HMS ARK ROYAL, instructor at the School of Fighter Control RAF Boulmer, and a tour at the JFAC HQ. On promotion to Squadron Leader in 2001, he commanded Current Operations Squadron at RAF Buchan. This was followed in 2003 by a tour in PJHQ J5, responsible for the Balkans. He was posted to the Ministry of Defence as a DI analyst for the Gulf region in January 2005. Promotion to Wing Commander followed in August 2005 with a tour as HQ 2 Gp SO1 Training and Manpower for the ABM Branch. Following graduation from ACSC, he was appointed to the Joint Helicopter Command as a Specialist Project Officer. This was followed by a tour with ISAF as SO1 J5 responsible for counter narcotics. This was followed by a tour as Station Commander of RAF Fylingdales. On promotion to Group Captain in September 2011, he was appointed as the military representative on the Cabinet Office

team responsible for drafting the UK's National Space Security Policy. This was followed by an appointment as Deputy Head for Space Security Policy at the Ministry of Defence.

Why Airdrop?

By Wing Commander Daniel Rich (RAAF)

The study of airdrop has been largely confined to issues around the insertion of an airborne force. This has resulted in airdrop's doctrinal purpose becoming misaligned with the reasons why the capability is employed. This article answers the question, 'why airdrop?', examining the utility of airdrop now compared with its original purpose. Using case studies where an airborne force was not directly involved or where the duration of airdrop operations outlasted the initial manoeuvre, combined with an analysis of the doctrine, command, organisation and development trends, the reasons why to airdrop are explored. The article concludes that the reasons why to airdrop are misrepresented in doctrine that describes it only as an emergency method of delivery when there is no other means available. It shows that developments in aircraft and airdrop technologies have altered the risk benefit equation of airdrop. The answer to the question, 'why airdrop?' is, therefore, airdrop as a means to maximise the survivability of the aircraft, increase the speed direct to the point of delivery or assist a land force in remaining concealed and should be employed as a means to minimise the risk to the transport system.

This article is adapted from a Defence Research Paper originally submitted to the Defence Academy of the United Kingdom and the King's College London in July 2012.

Introduction

Since 2001, the United States (US) has considerably increased the amount of airdrop resupply in Afghanistan, with the amount of materiel airdropped increasing exponentially.¹ Between 2006 and 2010 the amount airdropped by the United States Air Force (USAF) rose from 3.5 million pounds per year to over 60 million pounds per year.² Despite being active in Afghanistan and Iraq, Australia, however, has only provided resupply by airdrop once.³ Involved in the same conflict, operating with similar military structures and planning philosophies, why is there such a stark difference in the use of airdrop between the two nations? Although airdrop is expensive and imposes a greater aircrew training burden than airland resupply, properly employed airdrop can save lives.⁴ If the reasons for employing airdrop are not understood, the costs can never be justified and lives may be needlessly lost. This makes it imperative to understand the capability airdrop provides and to answer the question: ‘why airdrop?’

Airdrop was designed as – and remains – a means to fulfil the logistics requirements of an airborne force, specifically its need for resupply when isolated from ground lines of communication (GLOC) and displaced from a suitable airfield or landing zone (LZ). The underlying principle was that airland was always preferable to airdrop.⁵ This meant that airdrop has only ever been considered an emergency means of resupply.⁶ Helicopters made Second World War style airborne assault by parachute and glider largely redundant,⁷ and as the perception of airdrop resupply was linked to the deployment of an airborne force, there has been a reduction in the focus on airdrop doctrine as a whole.⁸ This article limits the discussion of airdrop to the delivery of stores by parachute, and deliberately delinks the airdrop of stores by parachute from the delivery of an airborne force by parachute. It examines the utility of airdrop now compared with its original purpose, contrasting the concept of airdrop as a method used by an aircraft to gain access to fulfil a land logistics demand to that of a tactic to maximise the survivability of the delivery aircraft. It shows that the capability is misunderstood doctrinally, and while the basic benefits of airdrop are unchanged, developments in aviation and other military technologies have altered the risk benefit equation on why to employ airdrop.

Research Methodology

To delink airdrop from the employment of an airborne force, the research for this article concentrated on case studies where either an airborne force was not directly involved, or where the duration of airdrop operations outlasted the initial manoeuvre which prompted employment of that airborne force. Central to the article’s thesis is the idea that reasons for employing airdrop have been articulated poorly, particularly in doctrine. While the doctrinal position shows established understanding of the capability, interviews were conducted to provide insight into the decision-making on when, why and how airdrop has been used and – importantly – why it has not. Additionally, developments to airdrop capability were used to identify what characteristics of airdrop commanders were seeking to either engineer away or capitalise upon. In doing so another perspective was gained on the reasons behind the decision to airdrop.

Using the above methodology, this article first examines the history of the capability, answering the question, 'why airdrop?' across two studies: the Second World War; and Vietnam. Following the examination of history it then examines the use of airdrop in the recent US-led conflict in Iraq and current US and North Atlantic Treaty Organisation (NATO) missions in Afghanistan. Answering 'why airdrop?' through these lenses highlights changes in the need for airdrop and how technological developments have influenced the decision on why to airdrop. The second part of this article examines current doctrine, command, organisation and development of airdrop. The US is used as the reference case for this study as it is by far the most prevalent user and developer of airdrop capability, and publishes the most complete set of unclassified doctrine. Additionally, Australia's approach to airdrop is examined as providing a useful counterpoint, presenting a fundamentally different experience in how it has used or not used airdrop, while being involved in the same conflicts.

Thesis

This article demonstrates that the purpose of airdrop has remained largely unchanged – it is a means to gain access to otherwise unreachable areas. However, technology has provided new methods of gaining that access and Van Creveld highlights new methods and vehicles lead to new and different costs and benefits.⁹ Therefore, while the need may be the same, the factors preventing access are not. As such, the elements of the equation to decide to airdrop also differ.

Developments in aircraft and airdrop technologies have altered the risk benefit equation of airdrop. Through accurate high-altitude and very fast low-level airdrop the military risk of the logistics chain can be effectively eliminated.¹⁰ Hannah and Ronsick highlight that, 'No one ever anticipates the need for sustainment by airdrop, but in today's world, everyone knows it exists.'¹¹ In the Second World War, the primary factor denying access was the terrain. Since then, the threat to aviation has increased in every conflict, requiring adaptation in technology and tactics.¹² The primary factor now denying access to an air element is the enemy threat and there is a need for the air component to realise airdrop can be a safer method of delivery than airland – unlike airland, airdrop allows the air asset freedom of manoeuvre.¹³ This article concludes that before the question 'why airdrop?' can be answered, the organisation or commander that answers the question must be able to assess the costs and benefits across the entire transport continuum. It is only then that it is possible to answer 'why airdrop?' – airdrop to maximise aircraft survivability, increase the speed of delivery direct to the point of need or because of the secondary benefit it can provide to a land force's concealment?

The History of Airdrop

Prior to the Second World War military airlift was neglected almost to the point of being completely ignored,¹⁴ and there was little development of dedicated resupply airdrop.¹⁵ The Second World War is important in our considerations, because it is then that airdrop became a viable capability.¹⁶

The Soviets were the prime developers of airdrop capability. They did not employ airdrop en-masse during the war due to lacking air superiority. While the USSR conducted numerous operations involving airdrop, apart from the battle of Rzhev and Demiansk in 1942, they were all essentially self-contained drops of men and their equipment with little to no resupply after the insertion.¹⁷ Demiansk was arguably the first use of a planned airdrop sustainment in the European theatre. The operation's failure only reinforced the Soviet pre-war view that airdrop brought high risk to the mission and should only be used in emergencies.¹⁸

The Germans also invested significant pre-war effort in developing airdrop and entered the war with an articulated doctrine. This doctrine stated that airdrop could only be used temporarily, and then only as the first or last part of the operation. Further, it described airdrop as generally only justified as part of an entry operation, in combination with airborne forces, to secure an airhead, its primary planning factor being the absence of a runway at the location to be supplied. German doctrine presented the problems of airdrop as: cost; high planning time; inefficiency; loss of goods to damage; inaccuracy and the absence of backhaul.¹⁹ These constraints on airdrop resulted in there being very few occasions where it was employed and resulted in the German view that the capability was only to be used when there was no other means available.²⁰

German thinking was echoed in the US, UK and Europe, shown by the fact that with the exception of the routine clandestine airdrops to resistance fighters, airdrop resupply by the allies in Europe was only ever used in emergencies. Furthermore, when it was employed the loss of stores, either through damage on landing or because they landed outside the drop zone (DZ), dominated analysis.²¹ Thus, the predominant view of planners in the European theatre was negative, reinforcing notions that airdrop was not a general means of resupply, but only useful when required by an airborne force.²²

In Burma, airdrop was used routinely due to geography. This in turn led to a different impression of success. There were still significant losses of stores, but as there was no other way to enable the operations, the capability was viewed positively.²³ Airdrops were described by the troops as presents 'like father Christmas, down the chimney.'²⁴ Influenced by operations in New Guinea,²⁵ 'transport aircraft [in Burma] became ubiquitous, and upon their efficiency and their capacity the whole strategy for war in South-East Asia was founded.'²⁶ Such widespread use makes the Burma theatre a useful case study to answer the question of 'why airdrop?' in the Second World War.

Air transport capability remained underdeveloped by the allies,²⁷ and because of technological limitations, airdrop was significantly constrained in what it could provide.²⁸ Nevertheless, General Slim's Burma campaign has been described as 'the singular World War II operation that required, not just benefited from, air mobility for access.'²⁹ Within Burma, roads were impassable during the monsoon, and where roads did exist even tracked vehicles were significantly restricted by the terrain and vegetation. The only reliable passage was on foot, by mule or by air – with air limited by the paucity of useable airfields.³⁰

Major General Wingate's initial Chindit operation was the first time resupply was achieved solely through aerial delivery, primarily airdrop. With the Chindits out of range of their GLOC and in contact with the enemy, airdrop was the only option. Although the operation was a failure, the resupply effort succeeded and proved the concept of airdrop, strengthening commanders' resolve to support the idea and enabling future success in theatre.³¹ The use of airdrop continued, with the second Arakan campaign in 1943 planned to be totally reliant on air for logistics.³² This was highlighted through the command-developed tactic of the 'admin box.' Here, Allied forces planned to engage the Japanese forces by securing a small isolated and defensible area that could be resupplied by airdrop. During the campaign, this tactic's employment over a 17-day siege (with over 3000 tonnes of supplies airdropped), facilitated the force's survival while reinforcements transited to the location.³³ This planned effort displayed a subtle change in the use of airdrop. While still used out of necessity, the planned nature of airdrop operations was contrary to the idea that they were justified only in emergencies.

Burma also highlighted the limitations of airdrop at the time. During the second Chindit expedition in 1943, growing Japanese understanding of airdrop tactics led to accurate targeting of the dropping aircraft by anti-aircraft artillery (AAA). Airdrop became too hazardous by day and weather made even night drops extremely dangerous.³⁴ Regardless, airdrop resupply provided substantially greater efficiency and effectiveness compared to road movement, freeing the army from land-based logistical constraints with a single aircraft providing the equivalent logistics effect of 54 trucks.³⁵ In spite of this, airdrop was still viewed as more expensive than road movement,³⁶ and the command did not believe there was a direct benefit of airdrop over airland resupply.³⁷ This is evidenced by Slim's decision to switch resupply from airdrop to airland during the 1944 Rangoon offensive when air assets became scarce. To achieve this, LZs had to be created and improvised,³⁸ an operation requiring substantial resources and often resulting in airfields only useable for one day. Deterioration to LZs occurred so quickly that aircraft began incurring damage while landing during the first day, with the LZ unusable by day two.³⁹ Therefore, in Burma, the understood answer to the question, 'why airdrop?', was that airdrop should be used when a ground force was isolated from GLOCs or displaced from airfields.⁴⁰

Examining aircrews' views of airdrop and the decision-making process underpinning the tasking in Burma, is instructive. Aircrews described the main hazard to aircraft as the weather, followed by mortar and ground fire when operating low level or on the ground.⁴¹ However, planning and control of airdrop missions were held within the G4 and, as noted, the decision on whether to airdrop or airland was made based on the availability or otherwise of an airfield. The role of the air component was simply to coordinate which and how many aircraft would execute the mission. Even the siting of DZs was a land function, which often resulted in failed missions and refused drops because the DZs were situated in locations inaccessible because of terrain or enemy action.⁴² Importantly, weather did not significantly hinder airdrop operations but did affect airland because of the effect it had on airfield conditions. Taylor highlights that this knowledge was not used by the G4 who were oblivious to the different effects weather

had on airdrop and airland, continuing to plan airland missions whenever there was a runway rather than looking for the best method given the conditions.⁴³ Therefore, in Burma, as in all other theatres of the Second World War, airdrop was seen as a method of delivery only to be used when there was no other option. Despite data showing it could be more efficient and reduce risk to aircraft and aircrews even Slim viewed airdrop as an issue of geography and not justifiable if an alternate means of supply existed.⁴⁴

Vietnam

Vietnam was a completely new fight for the US requiring a new logistics system. Forces were distributed with no defined front, operating from isolated base camps with no logistics stockpiles.⁴⁵ The US was further hampered by a lack of collective knowledge with the first official USAF doctrine in 1953 containing no mention of airdrop.⁴⁶ While Korea saw the limited use of helicopters for medical evacuation it was in Vietnam that the birth of the helicopter in a full military role occurred.⁴⁷ As discussed, at the conclusion of the Second World War airdrop was viewed as a capability to solve the problem of supplying a location without an airfield. Helicopters provided another means to achieve this but, in Vietnam, remained significantly limited by technology and the extreme threat to operations at low level. As such, they were only used for essential airmobile operations, evacuation of wounded and supply to isolated locations too small for airdrop technology of the day.⁴⁸ Thus, in Vietnam it remained possible to discuss airdrop as the only means to resupply an isolated location that did not have a fixed wing LZ.

American involvement in Vietnam regularly featured airdrop,⁴⁹ and while looking at the US effort in Vietnam holistically provides insight, two specific operations allow a focused study: Khe Sanh and An Loc.⁵⁰ Khe Sanh shaped the future US use of aerial resupply and tactical airlift thinking,⁵¹ while An Loc provides the ability to examine the application of the lessons drawn from Khe Sanh in a similar environment.

Khe Sanh was one of the most impressive examples of the use of logistics to enable a battle.⁵² The base contained a dedicated DZ near the runway, but the view that airland was cheaper than airdrop saw the logistics plan factored on landing all goods, with airdrop available in emergencies.⁵³ The airstrip at Khe Sanh, though, exposed aircraft to specific risks on landing and damage was common. The geography of the airfield required aircraft to spend extended periods manoeuvring on the ground. While smaller types could minimise taxi time, any time on the ground exposed aircraft to indirect fire.⁵⁴

The Khe Sanh siege lasted 70 days, during which 6000 US marines held off approximately 18,000 attackers.⁵⁵ The enemy could reach the entire base with indirect fire,⁵⁶ and a fortnight into the siege seven C-130s had been damaged by enemy fire whilst on the ground, with another lost to enemy fire on approach.⁵⁷ Enemy fire increased so markedly with the approach of an aircraft that aircraft became known as 'mortar magnets'.⁵⁸ By week three of the siege, the air component commander ended C-130 airland operations, significantly limited landings by

all other types and switched to airdrop. This decision was met with resistance by the land force which was concerned about increased cost and reduced efficiency. Conversely, the move was insisted upon by the air component to increase aircraft survivability. The decision was completely opposed to all established doctrine.⁵⁹

The move to airdrop allowed the air component to develop new tactics and methods to minimise time in the enemy's Weapon Engagement Zones (WEZ) and increase survivability. At the start of the battle, the only airdrop method available was the container delivery system (CDS). Unlike airland, CDS allowed aircraft to vary their approach path. Although they remained inside the WEZ of small arms and AAA and had to fly at a slow and vulnerable speed, the mortar threat was removed. Unfortunately, CDS was unable to deliver large quantities of stores. To overcome this, two additional methods were rapidly developed: Low Altitude Parachute Extraction System (LAPES) and Ground Proximity Extraction System (GPES). Both methods allowed significantly more stores to be delivered and although they placed the aircraft back in the mortar threat it was for a much shorter period than an airland delivery. The most critical airdrop development in Vietnam though, was non-visual airdrop in instrument meteorological conditions (IMC). Primarily developed to provide mission assuredness in bad weather, IMC drops greatly enhanced aircraft survivability. As the enemy's weapons all required visual tracking aircraft in cloud could not be targeted.

Mets argues the air component drew two lessons from Khe Sanh: the need for self-contained IMC airdrop with precision from high-altitude to increase aircraft survivability; and a requirement to develop vertical lift to minimise exposure to ground fire by enabling randomisation of approach and departure paths.⁶⁰ Khe Sanh marked a change in the reason to airdrop in that geography may not be the primary determinate with aircraft survivability now an independent reason to airdrop vice airland.

After Khe Sanh and the Tet offensive the requests for airdrop decreased and with that came a loss of experience and qualified aircrews who understood the benefits airdrop provided. By the time of the battle of An Loc in 1972 many of the lessons of Khe Sanh had already been lost or discarded.⁶¹ Mets suggests:

[t]he problem with aerial delivery lay not so much in the area of technology, but rather in the matter of policy. The Air Force [had] long been urging the Army to accept new [airdrop technologies] as standard procedures. The army, in effect, [held] a veto power over the development of all new areal delivery systems because it [was] responsible for the acquisition of the equipment.⁶²

The cost of new equipment resulted in the USAF requests not being actioned by the Army. By 1972 ground based air defence (GBAD) had matured with radar and infrared targeting more common. This meant conducting airdrop operations in IMC became almost as hazardous as in visual conditions.⁶³

During the battle of An Loc the US initially attempted to use helicopters for resupply. This resulted in significant aircraft losses. Airdrop was then attempted, but the tactics and procedures used placed the fixed-wing aircraft at similar risk with comparable loss rates. Consequently, the air component developed the Ground Areal Delivery System (GRADS) to take aircraft out of the AAA WEZ, enabling airdrops to be conducted at 6,000 to 9,000 feet. This, though, markedly reduced accuracy: only six of the first 116 GRADS CDS drops were recovered. Despite constant pressure from the land component to return to conventional low-level airdrop, GRADS continued until the introduction of the SA-7 into theatre. The increased WEZ of the SA-7 rendered the GRADS system unusable and the air component was forced to return to low-level drops. Again, the air component and not the capability owner, land, drove development to overcome the threat, introducing high-speed low-level airdrops. While partially successful this technique again reduced the accuracy of the airdrops and increased the cost to the Army. An Loc, like Khe Sanh, highlighted that the need for, and methods of, airdrop can be as much about aircraft survivability as any other factor.⁶⁴ Weather and enemy firepower thus entered the equation of why to airdrop, and began the development of airdrop technologies focussed upon increasing aircraft survivability.⁶⁵

Iraq and Afghanistan

Iraq and Afghanistan mirror the conditions of Burma in the non-contiguous nature of the theatres,⁶⁶ and the terrain in Afghanistan makes air the only effective way to move.⁶⁷ These similarities have brought some of the previous lessons of airdrop to the fore again, providing an opportunity to examine the effect changing technology has had on the question, 'why airdrop?'

Afghanistan is not without unique challenges, all of which combined to require the operation to be completely established by air for the first time in US history.⁶⁸ Iraq and Afghanistan also present a conflict in which helicopter and tilt-rotor craft provide a reliable and capable means of stores delivery – an alternative to airdrop.⁶⁹ In both theatres, there was a choice to be made when a ground force was isolated without access to a fixed wing LZ – airdrop or vertical lift.⁷⁰ Examining Iraq and Afghanistan highlights a paradigm shift for both the USAF and US Army. The Army has had to move out of the mind-set that it is easier to use organic ground transportation while the USAF has had to understand that airlift and airdrop is not only for emergency and time-critical supplies.⁷¹

Airdrop and air mobility now underpin the American military posture; in Afghanistan the US airdropped over 85 million pounds of stores in 2011 alone.⁷² This was not always so. In Iraq, a country dominated by large open areas, locating a DZ only a few kilometers outside urban areas would have provided an area free from all conceivable indirect fire as well as surface to air missile systems (SAMS). This would have allowed aircraft almost complete freedom of maneuver in approach, maximizing aircraft survivability.⁷³ However, just as in Vietnam, the US Army and Air Force looked at the problem independently. Ireland highlights this point, citing the absence of airdrop into the 'Sunni triangle' in 2004. Here, the results of single service

thinking were shown by the experience of an Artillery Battalion which, due to the improvised explosive device (IED) threat, had to increase the armour on its logistics vehicles and re-task combat units to protect logistics patrols. The result was a substantial deterioration in combat mission effectiveness. Their 22-kilometre resupply route became a 72-hour return journey. The land component did not see a need for airdrop, while the air component refused to airdrop because of the risk. Airdrop could have been conducted with significantly lower risk and greater efficiency than the method employed.⁷⁴

The IED threat saw a shift to helicopter resupply, however, with an increase in helicopter losses to man portable SAMs (MANPADS) on landing, resupply in Afghanistan changed again and in 2004 moved to airdrop.⁷⁵ The first attempts included airdrops to the 10th Mountain Division with 76 airdrops of food and water being conducted. Sorties were flown twice a week and at least two aircraft were hit by enemy ground fire in the initial missions. This resulted in a change of tactics to low-level drops to mitigate the threat while meeting the DZ requirements. This did not provide any substantial improvement in survivability and an operational needs statement for a precision high-altitude system was developed.⁷⁶ Repeating the experience of Vietnam, the Army, due to perceptions of need and the high cost of new ADE, did not support the development.⁷⁷ As the Army owned the capability, the final version of the need statement highlighted the requirements of small DZs and the IED threat as driving the need for precision, not aircraft protection.⁷⁸ Therefore, despite the stated reasons behind the development of precision airdrop systems (PADS) the main drivers were lowering the forward logistics footprint, aircraft survivability and the protection of helicopter assets by reducing their need to enter hostile environments.⁷⁹ In this instance, airdrop was employed to protect ground forces and helicopters, independent of the cost to the airdrop aircraft. Therefore the question, 'why airdrop?' again changed. Airdrop was not used as a means to access a location inaccessible by other transport, but was employed to mitigate the risk to part of the transport system.

The process of how to request an airdrop is critical to the discussion on why to use it, since the cost benefit analysis alters depending on the reference point of the decision maker, with disadvantages carrying more weight than advantages in decision making.⁸⁰ In Afghanistan the process begins with the end user who, after determining airdrop as the required method, submits a request to the G4.⁸¹ With the cost of an airdrop estimated to be about ten times that of land or sea transport, the decision to drop or not is often primarily driven by the financial cost.⁸² However, the prevalence of airdrop to non-airborne forces has shown a change in thinking as airdrop is not simply about resupplying isolated airborne forces. The vast quantity of materiel airdropped demonstrated that, in Afghanistan, the air force has become more relevant to army operations. In turn, the US Army has become more reliant on air and is beginning to trust a delivery mechanism not organic to its command.⁸³

American pilots have described aspects of the environment in Afghanistan as the biggest threat – altitude, heat, darkness, brown-out and weather. While most of these threats can be

mitigated if the aircraft remains at high-level and does not have to land, reducing this risk is not part of the decision process with the end-user driven by financial considerations.⁸⁴ Ireland concludes this is a problem with US doctrine, primarily in the lack of information on the process of integrating the army and air force parts of the airdrop capability. USAF doctrine only deals with the process after a request to drop has been obtained, while army doctrine does not cover why to request a drop.⁸⁵ Afghanistan and Iraq, therefore, add another complexity to the question of why to airdrop – who asks the question matters. For aircrew, airdrop is preferred as it allows the aircraft to avoid the main threat. For the land component, airdrop is a means to save lives in convoys, but then only if the cheaper option of vertical lift or airland is not possible.

Doctrine, Command, Organisation and Development

'Doctrine represents the basic and enduring beliefs and principles that guide the use of aerospace forces in military action. It ordains how we intend to operate and fight.'⁸⁶ As command is the 'art of decision-making'⁸⁷ requiring an understanding of the capability and an ability to balance risk, accurate doctrine is essential.⁸⁸ As already discussed, the quality of airdrop planning has eroded due to the lack of understanding of what the capability brings. Tokar argues that 'Airdrop operations more than other operational and logistic endeavours are inherently joint,' yet airdrop remains a joint capability managed on single service lines.⁸⁹ This has led to adverse effects on force structure and doctrine.⁹⁰

Doctrine

Practitioners argue that there is no good joint doctrine on airdrop, with most understanding passed by word of mouth.⁹¹ Airdrop, as a subset of tactical airlift, was a product of the land component's need for battlefield mobility and with the air component's focus on strategic air power, American doctrine largely developed by default.⁹² With tactical airlift often overlooked for strategic airlift, most US airdrop doctrine exists in land publications.⁹³ Nevertheless, airdrop cannot be delinked from its method of delivery, the aircraft. Tokar argues that it is dangerous to plan to use a resource without the knowledge of its capabilities and limitations.⁹⁴ While the primary purpose of airdrop is supporting the land component, it is a joint logistic function, requiring joint oversight and understanding.⁹⁵ Despite this, the highest level of US logistic doctrine does not directly discuss airdrop.⁹⁶ The only joint publication dealing directly with it is Joint Publication 3-17 (JP 3-17), which limits the applicability of airdrop and implies a need to avoid it due to the threat posed to the aircraft.⁹⁷ At the joint level then, US doctrine says little on why to airdrop, only implying that it should be avoided – a position not justified by its historical employment.

American joint doctrine is in stark contrast to US-endorsed NATO doctrine. In the Military Concept of Employment (CONEMP) for Precision Airdrop Systems, NATO outlines six scenarios for the employment of PADS. Each of these clearly articulates that the underlying reason to airdrop at high-altitude versus airland or airdrop at low-level, is the reduction in threat to the aircraft.⁹⁸ In direct conflict with JP 3-17 the NATO CONEMP outlines:

[t]he great advantage of delivery from high altitudes lies in allowing the aircraft to fly out of range of ground based threats including small arms and MANPADS... Further, the higher altitude allows the load to exit the aircraft from a greater horizontal offset distance from the desired point of impact, decreasing again the likelihood of the aircraft coming under hostile fire.⁹⁹

NATO, then, provides a qualified answer to the question of 'why airdrop?'; that is, use PADS to increase survivability of the aircraft. This reason is consistent with the history outlined in the first part of this article.

The Australian perspective on joint doctrine appears slightly better than the American having joint airdrop doctrine. However, Australian Defence Doctrine Publication 3.9 (ADDP 3.9) concentrates on the employment of an airborne force and only briefly deals with airdrop in support of this activity. As outlined by Group Captain Kourelakos, Australian doctrine is significantly lacking.¹⁰⁰ There is little to no air doctrine on airdrop and disparate groups wrote ADDP 3.9, none of which looked at the capability holistically or attempted to deal with the logistics considerations.¹⁰¹ Air Commodore Oddie describes Australian airdrop doctrine as having 'no strategic foothold,'¹⁰² and Air Vice Marshal Evans argues Australian doctrine on airdrop has not been well developed or accepted at high levels.¹⁰³ This results in there being no clearly defined need for airdrop with no resources permanently allocated. Despite tactical doctrine and procedures existing, this does not justify resource or provide understanding of the larger risk benefit equation. Therefore, expenditure for airdrop has to be justified every time its employment is planned.¹⁰⁴ Australian joint doctrine then says little on why to airdrop, except when in support of an airborne force.

In environmental and tactical level US doctrine, the reasons for airdrop become more specific. From the air environment USAF doctrine focusses on efficiency, which leads the primary discussion to be about airland.¹⁰⁵ USAF doctrine lauds airland, describing it as the most efficient, safest and cheapest method of delivery.¹⁰⁶ Where information on why to airdrop is provided, it ties airdrop to entry operations and specifically describes it as a method of delivery only to be used in extremis or if surprise is required.¹⁰⁷ As American doctrine assigns overall responsibility to determine whether to airdrop to G4 staff, doctrine provides little guidance to them on the benefits to air in deciding to airdrop.¹⁰⁸ Therefore, US land doctrine must be examined to determine the American doctrinal answer to the question 'why airdrop?'

American land doctrine cites aerial delivery as the mode of choice as US forces become smaller and more distributed on operations.¹⁰⁹ However, its comparison of the advantages and disadvantages of airdrop and airland provide the planner with a bleak picture of airdrop. It reiterates the Second World War and Vietnam view that airdrop is only useful as a means of last resort, with the articulated advantages of airland appearing to exceed those of airdrop.¹¹⁰ This bias is further expanded with airdrop expressed as an emergency means of supply only. Airdrop is seen as expensive and unwarranted if there is another means available. FM 4 20.41

acknowledges that there is a paradigm shift required to see aerial delivery as per any other means of delivery – a request for stores, not a request for a specific transport asset with a predetermined method.¹¹¹ This paradigm shift is highlighted by the recent decision to move from the system where the end user specifically requests airdrop to a generic request for supply with the higher headquarters G4 determining if airdrop is to be used. However, the same logic can be used to move the decision past the G4 and to the transportation system – at the US strategic level Transportation Command (TRANSCOM), or at the tactical level into the Air Mobility Division within the Air Operations Centre. This would allow the transport system to decide the best method to produce the required logistics effect.

US doctrine further highlights single service thinking on airdrop through its description of sling load operations. The single service nature of sling-load operations is highlighted as a contrast to the joint operation of airdrop with the conclusion that being single service provides a more responsive, easier to plan and hence more desirable method of delivery.¹¹² US land doctrine then paints a mixed picture, describing airdrop as becoming a method of choice while only to be used in emergencies.

Lieutenant Colonel Armstrong suggests that Australian tactical level doctrine is weak on airdrop, and the situation has now become worse with the retirement of conventional airborne capability removing the perceived direct link to the army.¹¹³ To logisticians, Australian doctrine instructs that after the initial assault, airland of supplies is always preferred,¹¹⁴ and guidance is given to solve problems in the following order – road, helicopter, airland then airdrop.¹¹⁵ AVM Evans argues that most of Australia's recent doctrine and planning is based on what has been done in Afghanistan. The problem with this is that Australia chose what forces it wanted to send to theatre and what roles these forces would perform. He highlights that Australia knows it has the luxury of calling on alliance partners to provide what it does not have, advocating this can be an extremely dangerous cycle, resulting in a force structure that can only do what you chose to do last time. In Afghanistan there is almost a complete absence of airdrop by Australian assets. Australian forces on operations are regularly using airdrop but as Australia chose not to deploy airdrop assets, coalition and contractors are providing this support and not the RAAF.¹¹⁶

Australian planning methodologies also rely on mission analysis. As airdrop capability requires elements outside the air mobility system, a decision to request supporting assets in this early phase of planning must be undertaken.¹¹⁷ To do this, doctrine must enable the commander to understand the capability. As Gp Capt Kourelakos points out, Australia is holding onto a Second World War mind set of airdrop only supporting a large airborne force during theatre entry. He argues that while the Australian need has changed, the doctrine and understanding of the capability have not.¹¹⁸ If airdrop assets have not been requested in the mission analysis phase of planning, planners tend to look for ways to solve problems with the resource they have rather than revisit the initial analysis.¹¹⁹ This was highlighted in Iraq, as AVM Evans notes, in that the capability he could plan on using was factored around what was there and not what he needed.¹²⁰

Unlike NATO doctrine, there is no clear guidance in the US or Australian doctrines on why to airdrop. This presents a major problem in that the cost of airdrop is clearly articulated but not the benefits.¹²¹ The doctrinal position on airdrop has therefore remained virtually unchanged from the Second World War – airdrop when there is no other means.

Command and Organisation

Within the US, airdrop capability has been tied to airborne and special forces. This is evidenced by all airdrop capability either being organic to these units or distributed to the Quartermaster department of an established brigade or division, when specifically requested. This scenario has remained effectively unchanged from the end of the Second World War.¹²² The placement of the capability organic to the end user sees the receiving unit deciding how to deliver stores, including the aircraft type, the means (airdrop or airland) and the method (PADS or conventional airdrop). FM 4 20.41 lists planning considerations for the type of airdrop to be a factor of: what must be dropped, the accuracy required, the threat and the ADE available.¹²³ While academia argues the sole purpose of airdrop is to support the land component, and defines the need in terms of being when 'the operational situation demands an airborne assault of troops and air-drop equipment,' the question remaining unanswered is, 'whose operational need?'¹²⁴

In the Australian system, Commander ALG is responsible for the air transport system, charged with providing air mobility to the Australian Defence Force.¹²⁵ However, the air transport system encompasses more than the airlift aircraft that he has under command. It also includes the terminal and the MHE,¹²⁶ which for airdrop is provided by the Australian Army's 176 Air Dispatch Squadron (176 AD SQN).¹²⁷ Further complicating the issue, when airdrop is decided as the means of delivery, 176 AD SQN is assigned in support of the land unit receiving the airdrop.¹²⁸ This scenario almost directly mirrors the US system and again brings into question who the reference point is for determining operational need.

Focused on the land component's operational need, airdrop is generally characterised as being unresponsive. While it is true that rigging a load takes time, particularly as the load complexity increases, this aspect is eliminated if the airdrop is pre-planned, or becomes insignificant if the mission is conducted over a long distance. The implication is that rotary wing is more responsive for short distances and, therefore, another reason must be found to airdrop.¹²⁹ Airdrop must compete in cost, speed, reliability, simplicity and manpower and to the G4, located within the in-theatre land component, airdrop appears uncompetitive.¹³⁰ Benney argues that there is no understanding if it is more effective or efficient to airland trucks into an LZ and drive to the point of need or fly overhead and airdrop. There is also no clear comprehension of joint risk – in an IED threat area how far is too far to drive, versus putting an aircraft overhead with a low threat of MANPADS and airdropping?¹³¹ Without the ability to refocus the reference point outside G4 staffs, this understanding is unlikely to occur, as highlighted by AVM Evans' recollections of his time as commanding officer of 37 Squadron in the lead up to the Australian intervention into East Timor. He recounts that airdrop was

never considered despite the early intelligence estimates, 'look[ing] terrifying... a couple of snipers located at Dili airport could have completely destroyed the entire airland operation. Airdrop could have been a means to overcome this.'¹³² Therefore, with the reference point fixed within a theatre's land component, the answer to, 'why airdrop?', will only ever be 'to overcome an otherwise inaccessible location'.

Benney highlights that US command and control of airdrop is all about the Army need and that there is a requirement to revisit this structure, suggesting the method to deliver precision munitions as a possible model.¹³³ This view is supported by Herring's thesis advocating the introduction of an on-call airdrop capability to deliver critical stores similar to the on-call delivery of munitions through close air support (CAS).¹³⁴ Air Cdre Oddie considers airdrop to be a specialist response. To be effective it needs to be treated similarly to the concept of bombing, with a joint targeting cycle deciding when the specific method of airdrop needs to be applied. It must, though, remain predictable and responsive with procedures similar to CAS adopted to allow on-call response.¹³⁵ This method would change the reference point allowing the operational need to be viewed holistically across the entire spectrum of the aerial resupply continuum, from fixed wing airland, through helicopter vertical lift to airdrop. The decision on which part of the continuum to use could be based on a risk analysis of what is safest for the delivery asset while providing the resupply effect required.¹³⁶

There is another problem in disconnecting airdrop from its means of delivery in that readiness levels can become separated. While Australia has had some problems accessing terminal services because of differences in readiness to the aircraft, Mortis argues that this has become a significant problem in the US.¹³⁷ Airdrop support organisations are located in the low readiness arms of the services despite their primary doctrinal role being to enable entry operations.¹³⁸ As noted by Lt Col Armstrong's experience in Afghanistan that it was easier to get contractors and coalition partners to conduct airdrops than the RAAF.¹³⁹ Therefore, the question of why to airdrop can be made for the wrong reasons when essential components of the capability are delinked organisationally.

Airdrop Development

While airdrop began as a means to supply isolated airborne forces, its employment developed slowly to include operations where airdrop was selected as the preferred means of delivery despite others being available. The doctrinal position, airdrop when there is no other means, remains virtually unchanged with organisational structures based around airborne and special forces. Examining current development of airdrop technologies offers a means of addressing this conflict of ideas, showing the underlying reasons of why to airdrop.

As discussed, in Vietnam and Afghanistan developments in airdrop to increase the survivability of aircraft were largely unsupported by the land component due to their limited direct gain with increased cost. Betson argues this problem is only becoming worse with technologies to improve aircraft survivability increasing the cost and decreasing responsiveness.¹⁴⁰ This situation

was exemplified in 1998 when the major developments in airdrop technology were, bar one exception, exclusively of benefit to the Air Force. The most pronounced of these, the Advanced Precision Aerial Delivery System, was not progressed by the Army due to the high cost and low-payload of the technology – aircraft survivability was not part of their primary remit.¹⁴¹ It is for this reason that Benney highlights the primary driver of all airdrop development in the US is now TRANSCOM, the owner of the transport system and not the Army, the capability owner.¹⁴²

Thompson argues that logistics by air is in some ways easier than land because it is harder for the enemy to interdict, but brings with it complexities often not understood by the other environmental components.¹⁴³ Further, Van Creveld proposes the theory that despite substantial increases in range, speed and capacity of transport the distance an army can move per day has remained relatively fixed since the end of Second World War.¹⁴⁴ Therefore, the need for new and inventive airdrop technology has, for the land component, been relatively unjustified. The principal developments in US airdrop are currently: precision technologies, high-speed low-level, airdrop from helicopters, low-cost ADE and humanitarian and disaster relief (HADR) airdrop.¹⁴⁵ As Australia is effectively not participating in any airdrop development,¹⁴⁶ it is these US developments that will be investigated.

Of the five areas being developed in airdrop, all bar low-cost ADE have been brought about by the needs of the USAF and three are primarily related to the aircraft survivability: precision technologies, high-speed low-level airdrop and airdrop from helicopters.¹⁴⁷ To land, a fixed wing aircraft must overfly the final quarter-mile of ground directly off the end of the runway without manoeuvring. This procedure places a significant burden on the ground element to secure large amounts of terrain for hours while still exposing the aircraft to high risk. This is not the case for airdrop where the approach path can be varied and the aircraft manoeuvred up to the release point. Even more advantage is gained if the aircraft can conduct the drop from high-altitude or at low-level from high-speed.¹⁴⁸ Increased accuracy is only important as it allows higher altitude drops in order to reduce the risk to the aircraft while providing the same accuracy that was being obtained through dropping from low-level at slow-speed.¹⁴⁹ Similarly for a helicopter to land, while there is more flexibility on the direction of approach, the helicopter must still be low and slow, thereby increasing its vulnerability to both enemy and environmental hazards.¹⁵⁰ Additionally, unlike an airfield, an established DZ does not need to be changed to maintain security for the aircraft as simply altering the direction of approach will afford substantially more protection to an aircraft conducting a drop than would be received from an aircraft returning to a previously used LZ.¹⁵¹ This is most strikingly shown by the loss of two British C-130s, one each in Afghanistan and Iraq. The first was destroyed by an anti-tank mine buried under the runway at Lashkar Gar in 2006,¹⁵² and the second by an IED placed on the runway at an LZ in Maysaan Province in 2007.¹⁵³

High-altitude airdrop also gives benefits beyond increasing survivability of the aircraft. Through precision technology, providing guided and steerable parachutes, airdrop can be

conducted with offset from the DZ. This in turn assists the ground force in remaining concealed, ensuring resupply does not compromise the commander's ability to generate surprise.¹⁵⁴ This often makes airdrop more attractive to Special Forces,¹⁵⁵ as shown by the original reasons for the establishment of NATO's Joint Precision Airdrop Capabilities Working Group (JPACWG) that explicitly linked precision airdrop technology and special forces.¹⁵⁶ Therefore, the development trends in precision technologies, high-speed low-level airdrop and airdrop from helicopters all describe survivability of the aircraft as a primary reason to airdrop with secondary advantages gained through benefits to the ground force's concealment and ability to generate surprise.

Unlike the three paths of development already discussed, low-cost ADE clearly has financial imperatives, reinforcing the already stated importance of the financial cost and not, of itself assisting in finding the reasons to airdrop. While a non-warlike application such as HADR airdrop may appear out of place with the other airdrop methods, dealing with survivability, this is not the case. Distribution of aid must be controlled due to the risk to delivery crews from rioting and violence and that protection is also required from potential hazards associated with the disaster, such as nuclear fallout. Airdrop provides a means to control this distribution, providing the required force protection. With airdrop, stores can be delivered without placing troops on the ground.¹⁵⁷ While the main advantage airdrop brings to HADR is in meeting the immediacy of need, as airdrop is often able to get stores to the point of need quicker than any other mechanism and can be independent of any infrastructure at the delivery point. The advantage in force protection cannot be overlooked,¹⁵⁸ particularly in the reaction to a nuclear, biological or chemical (NBC) event. For example, if the Fukushima disaster had resulted in a serious radiation leak then airdrop would have enabled the delivery of stores while keeping the aircraft and aircrew out of the threat.¹⁵⁹ The development trend in HADR airdrop then clearly shows airdrop not just as a method of delivery when nothing else can provide the service. Instead airdrop for HADR provides a method to capitalise on the air power characteristic of responsiveness¹⁶⁰ while providing a secondary benefit of force protection to the aircraft and aircrew.

Conclusion

Airdrop is a capability that can save lives, yet is poorly understood.¹⁶¹ It is imperative that the reasons for airdropping are accurately captured in doctrine, providing commanders with the insight required to know when to employ the capability.

In the Second World War, airdrop's employment was limited to a method to overcome an otherwise impossible logistic problem – reaching a force inaccessible to land transport or airland aviation. German and Allied forces in Europe only ever used airdrop as a last resort, but in the Pacific, specifically in Burma, it was a routine method of delivery. Primarily a product of the theatre's geography, airdrop underpinned Slim's operations. Planners still only employed airdrop out of necessity, but operations were pre-planned and in some circumstances airdrop was both more effective and efficient than road transport.

The Second World War also suggested that airdrop could provide benefit in mitigating some risks and reducing attrition, from enemy action – be that AAA or indirect fire against LZs – and from weather conditions at lower altitudes, even if airdrop technology meant that low-level flying could not be avoided. Although not considered in the decisions on why to airdrop, the Second World War data indicated that it could provide a safer and more effective means of supply. Yet the underlying reason for airdrop remained a factor of geography or lack of other means of access. In the Second World War, no matter the theatre, airdrop was not the preferred option if alternatives existed.

Without a conventional front, and with helicopters removing the need for airborne insertion of troops by parachute, the reasons to airdrop changed in Vietnam. The Khe Sanh operation was planned with airland as the primary means of support, but when enemy fire made landing too hazardous the air component was forced, against the wishes of the ground commander, to cease airland operations and begin airdrop. This represented a fundamental change to the answer of the question, ‘why airdrop?’ In an attempt to increase aircraft survivability, at Khe Sanh, airdrop became the delivery method of choice despite the presence of an airfield.

While the move to airdrop at Khe Sanh provided some protection from enemy fire, airdrop technology prevented the delivery of sufficient stores. The result was that the air component was required to rapidly field new methods and ADE. The expense of these new methods meant that the Army, the capability owner, did not support their continued development and by the battle of An Loc airdrop had returned to slow-speed, low-level CDS. The threat of improved AAA and the SA-7 missile drove the air component to develop new methods and technologies to protect its aircraft. The Vietnam war showed airdrop could be justified as a method of choice to ensure aircraft survivability, rather than simply to provide access to an otherwise isolated land force.

By the early 21st Century, helicopter technology had improved, and vertical lift provided planners with a direct alternative to airdrop. The lack of a runway was no longer a reason to justify airdrop. With the doctrinal position still reflecting Second World War conceptions, airdrop was almost non-existent in Iraq and only gained prominence in Afghanistan in 2004 following a string of attacks against helicopters and the increased IED threat to land forces. Since then, airdrop in Afghanistan has undergone a vast increase in usage. Just as in Vietnam, though, the organisational structure managing this capability initially stifled development and forced the air component to step in and insist on new technology. The introduction of PADS added the nuance of how to airdrop as well as when to drop becoming an important consideration. The decision to airdrop became one based on what provided the lowest risk delivery method to the transport system.

Afghanistan highlighted that who asks the question, ‘why airdrop?’, matters. While airdrop began to be recognised as having the potential to reduce military risk, the net result of the question being asked by an organisation outside the transport system meant cost became a

primary determinant. This issue remains – airdrop is expensive and is still employed if vertical lift or airland is not available.

This fits in with the concerns noted above about the absence of clear guidance on why to airdrop in either American or Australian doctrine. Indeed, where doctrine discusses reasons to airdrop these are often contrary to those found in examining the employment of the capability. At the joint level, US doctrine advocates the avoidance of airdrop, describing it as a method that decreases aircraft survivability, while Australian doctrine is poorly developed offering no guidance on reasons to airdrop other than in support of an airborne force.

American tactical level doctrine on airdrop focuses on efficiency, with airland resupply always the preferred option. While US land doctrine highlights the need for a paradigm shift in how airdrop is perceived, guidance remains that airdrop is a costly, emergency option. Australian tactical doctrine, too, always prefers airland to airdrop. It is in danger of defining what is required based on what it has chosen to do in Afghanistan, rather than on broader considerations.¹⁶² The incredible difference in the airdrop figures between Australia and the US is not based on different needs but instead a result of the lack of understanding of the reasons to airdrop.

The only clear doctrine on airdropping comes from NATO, where scenarios clearly define when PADS airdrop, in place of airland, vertical lift or conventional airdrop, is preferred. This is only part of the story and notwithstanding how airdrop has been employed, doctrine has remained unchanged from the end of the Second World War, advocating airdrop only when there is no other means.

Command and organisation arrangements of airdrop capability are also lacking. In both America and Australia, airdrop capability has been delinked from its method of delivery, the aircraft, effectively splitting the transport capability in half with airlift controlled by the air force and airdrop organisations by the army. With airdrop defined as being about the operational need, the brigading of airdrop agencies outside the transport system brings into question the reference point for whose operational need airdrop is to meet. When focused on the land component, airdrop appears unresponsive and costly and it becomes difficult to assess holistic risk to the transport system. The decision on whether to airdrop or not must be made through assessing the operational need and risk across the entire transport system. Delinking airdrop from airlift also brings issues of readiness levels between different parts of the same capability as evidenced both in the US and Australia with the airdrop terminal often at lower readiness than the airlift. When these factors are combined, the decision to airdrop can be made for the wrong reasons.

Development trends also showed the effects of the conflict of ideas between how airdrop is described and employed. Although the US airdrop capability system is owned and funded by the Army, TRANSCOM is the main driver of airdrop development, as the Army primary remit

does not include aircraft survivability. While development has focused on methods to increase aircraft survivability – something that by itself reinforces the understanding that airdrop can be justified solely on the grounds of providing aircraft and aircrew survivability – development trends allow an investigation of the secondary benefits to airdrop. Analysing the development of PADS, high-speed low-level and rotary wing airdrop shows that minimisation of risk to the entire transport system has become the primary driver for airdrop. Through the guided and steerable parachutes required for PADS technology, offset airdrop has become possible. This assists ground forces in remaining concealed and ensuring they can maintain surprise so while the question, ‘why airdrop?’, is primarily answered by the need to protect aircraft, secondary benefits to the land force also matter, and in certain circumstances may be sufficient justification alone.

HADR development also provided insight. Fundamentally a method to capitalise on the air power characteristic of responsiveness, it allows rapid delivery directly to the point of need without the requirement for any local infrastructure. Even in a non-warlike environment, there is risk to military forces and it is here that HADR airdrop provides a secondary benefit. In keeping with the idea of airdrop providing a degree of force protection to the aircraft and aircrew, airdrop provides a means of delivery without placing troops on the ground. Particularly relevant in a NBC event, PADS technology could allow an aircraft to remain at high-altitude, clear of any threat. Overall development trends in airdrop provide the clearest picture on the question ‘why airdrop?’ Airdrop provides an alternative means of delivery focused on force protection of the airlift asset, while speed of delivery direct to the point of need, maintaining surprise and adding concealment are also considerations.

Through an examination of the history of airdrop employment, its current use, the doctrine, command, organisation and development this article has sought to illustrate why airdrop matters and why to choose it as a method of delivery. Airdrop is not simply a method applicable only when airland or vertical lift is not available, but is a means to maximise aircraft survivability of the aircraft, increase the speed direct to the point of delivery or assist a land force in remaining concealed, but this is not well understood. It is, therefore, critical to ensure the person answering the question ‘why airdrop?’ can view the risk to the entire transport system. Only then will the answer to the question move from the current doctrinal position, where airdrop is a method of last resort only. Airdrop provides the required logistics effect while minimising the risk to the transport system, but until doctrine catches up, this critical factor will continue to be dangerously downplayed.

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The Royal Air Force and the First Gulf War, 1990-91: A Case Study in the Identification and Implementation of Air Power Lessons

By Dr Sebastian Ritchie

Précis

Historians have long puzzled over the consistent failure of military organisations to learn from the lessons of past conflicts. An apparent tendency to repeat decisive errors may be identified throughout military history and this has generated substantial literature, as well as many different explanations for the military's inability to profit from past experience. Analytical approaches have varied from 'micro' surveys of different campaigns and periods of history to 'micro' investigations of specific conflicts or operations. However, the results have too often been based on theory rather than detailed consideration of the processes by which lessons are – or are not – implemented, and there has been little historical interest in the military's record in more recent conflicts.

This essay seeks to address this gap in the historiography of military lessons by focusing on a modern armed service – the Royal Air Force – and a relatively recent conflict – the first Gulf War. It describes the RAF's experiences in the Gulf War, the lessons process subsequently initiated, and the various factors that determined whether or not specific identified lessons were acted upon.

Introduction

Historians and other analysts have spilled rivers of ink on the apparent failure of military organisations to exploit the lessons of past conflicts and operations. It is often alleged that learning does not come naturally to the military, that they have a regrettable propensity to repeat past mistakes, and that, all too frequently, this trait more than any other has been responsible for failure or even outright defeat. Investigating what they term 'the anatomy of failure in war', Eliot Cohen and John Gooch singled out a failure to learn as one of the three principal sources of military misfortune. They also concluded: 'One of the most obvious ways to improve performance is by learning.'¹

The UK defence community has devoted considerable effort to the improvement of lessons processes over recent years, but the shift in nomenclature from 'lessons learned' to 'lessons identified' has at the same time openly acknowledged that lessons exploitation may be far from straightforward. Yet it is often extremely difficult to pin down exactly why this should be, and many historians, although happy to blame military misfortune on a failure to learn, have been unable to explain this failure convincingly. The most common type of explanation highlights the role of 'guilty men', suggesting excessive conservatism and resistance to change on the part of particular individuals, groups or organisations. A variation on this theme, less overtly critical via the use of deliberately vague modern parlance, involves the assertion that organisations lack a 'culture of learning'.² However, while such allegations are easily made, they can often be far more difficult to substantiate with any reasonable degree of objectivity.

Individual case studies provide one useful means of addressing the problem but, while many have been conducted, surprisingly few have examined the lessons process in the specific context of the air environment. More work in this area would appear desirable, not least to test the common perception that air forces are not, as a rule, inclined to learn lessons from past events, but prefer instead to seek solutions to their problems through the acquisition of ever more advanced technology that tends to promise more than it can deliver. With this requirement in mind, this paper considers lessons exploitation by the RAF following the first Gulf War, an event that appeared all the more worthy of attention as it marked the dawn of the post-Cold War era and inaugurated a veritable revolution in military affairs with particularly far-reaching consequences for the application of air power. After a broad survey of the RAF's role and experiences in the conflict, focusing particularly on air combat, the aim is to highlight the main lessons identified in its aftermath, before assessing the progress of implementation in subsequent years, and finally offering some concluding observations.

In the winter of 1989 and the spring of 1990, world affairs were dominated by the collapse of the Warsaw Pact and the end of the Cold War. Statesmen across the globe heralded a new era of peace, and there was a headlong scramble to collect the so-called peace dividend - substantial savings in public expenditure based on defence cuts. The RAF and the other UK Armed Services nervously waited for the axe to fall. Then, without any warning, it was committed to its largest operation since the Suez crisis - the First Gulf War, known in the UK as

Operation Granby. Ultimately, the RAF's deployed force in the Gulf would number 157 aircraft, including 49 Tornado GR-1s, 12 Jaguars, 18 Tornado F-3 fighters, Nimrod maritime reconnaissance and intelligence collection platforms, Hercules transports, tankers and support helicopters. During the Desert Storm phase of the operation alone, they flew 6,108 sorties; in the Gulf operation as a whole, they flew many more. The RAF also deployed two RAF Regiment Wing Headquarters, two surface-to-air missile Squadrons and four Light Armoured Squadrons and Field Squadrons; the number of deployed RAF personnel totalled around 7,000 at peak.³

Yet Granby was inevitably very different from the type of operation that the RAF had been preparing to conduct in the later years of the Cold War, and it was accompanied by a multiplicity of challenges. The conflict raised serious questions about the utility of the RAF's basic offensive doctrine, a number of its most modern aircraft and several aircrew were lost in combat, and there were many other problems relating to equipment, weaponry and tactics that sometimes impacted upon its contribution within the US-led coalition.

Following the UK's withdrawal from empire, RAF training and equipment was overwhelmingly shaped by the perceived demands of a conflict with the Warsaw Pact on the Central Front. The various air combat platforms illustrate this point most clearly. The Tornado F-3 fighter was, for example, intended to fulfil the highly specialised role of low-to-medium altitude interception of Soviet long-range bombers flying missions against the UK through the Greenland-Iceland-UK gap. It was never viewed as a dogfighter, capable of matching contemporary Warsaw Pact fighters, and the F-3's performance and manoeuvrability at higher altitudes were poor. Moreover, its relative inferiority in air-to-air combat was rendered all the more pronounced at the end of the 1980s by the emergence of advanced Soviet fighters like the MiG 29. Additionally, as the F-3 was expected to operate in the UK Air Defence Region, its self-defence capability was limited; it was not well equipped to fly missions within enemy airspace - a feature that it shared with most other types of aircraft in the RAF at that time.

The two attack platforms deployed to the Gulf, the Tornado GR-1 and the Jaguar, had similarly been developed to fulfil the demands of NATO-area operations. The strength and sophistication of Warsaw Pact air defences had persuaded the RAF that medium or higher-altitude flying over Eastern Europe would be hazardous in the extreme. It seemed that offensive missions would stand a better chance of penetrating hostile airspace at very low levels, exploiting speed and terrain to impede detection and interception. Attack aircraft were therefore optimised for low-level flying and performed less effectively at higher altitudes, and they were largely equipped with weapons designed for low-level release, normally during direct over-flight of the target. Self-defence suites were likewise optimised for lower-altitude flying, and aircrew training was predominantly geared to low-level operations.

Beyond this, the F-3 and GR-1 were technically sophisticated platforms that made significant logistical and maintenance demands. These could be fulfilled without difficulty at their main operating bases in the UK and northwest Europe, but no deployed out-of-area role was

envisaged for either aircraft in 1990, and there had consequently been few preparations to address the logistical challenges involved. The Jaguar - an older and simpler aircraft - had a dedicated overseas role, for which it was very much better prepared, but in the majority of other respects it lacked the Tornado GR-1's operational capability.⁴

The initial deployment phase of the Gulf operation had the objective of establishing a defensive line to protect Saudi Arabia. If Iraqi forces crossed the frontier, they would initiate hostilities with coalition forces. It would ultimately transpire that they had no short-term plans to advance further south in August 1990, but their intentions were unclear at the time and, in the absence of any response from Western countries, Saddam Hussein might well have been tempted to threaten other Gulf States. It thus appeared essential to deploy forces to the Gulf immediately. As it was deemed that such forces should be defensive in character, the first RAF aircraft sent to the Gulf were Tornado F-3s, which had been on exercise in Cyprus at the beginning of the crisis. They were dispatched to Dhahran, Saudi Arabia, on 11 August 1990, and, after five days of theatre-familiarisation flying, mounted their first operational combat air patrols on the 17th.⁵

They were soon joined in theatre by a number of other force elements, including a detachment of Jaguars. Although the RAF would have preferred to send the Tornado GR-1 to the Gulf, the Jaguar force's declared mobile role ensured that it was far better prepared for rapid out-of-area deployment. However, the Jaguar detachment was positioned in Oman, well to the south of the potential area of operations, for its role was primarily symbolic: it was intended to bolster Arab support for the nascent US-led coalition. There were no plans to fight from bases in Oman.⁶

These first deployments, added, of course, to the movement of American forces to the Gulf on a very much larger scale, secured their primary objectives by quickly drawing what was termed a 'line in the sand'. It is true that the RAF's combat capability in theatre was at first limited. The F-3s initially deployed were later described by their detachment commander as 'blatantly below the minimum requirement' and 'manifestly non-operational',⁷ while the Jaguars were based too far away from the potential battle area, and were by no means the most capable offensive platforms in the RAF's inventory. But such considerations were at first less important than the basic fact that a coalition presence had been established in the Gulf only days after Iraqi troops entered Kuwait.⁸

Between the end of August 1990 and the start of Operation Desert Storm on 16 January 1991, the RAF's presence in the Gulf was substantially reinforced, and all of the deploying aircraft - combat or otherwise - received an extensive series of enhancements. The F-3s initially flown out were replaced by aircraft that boasted environmental adaptations and upgrades to their weapons systems, engines, electronic warfare equipment and armament.⁹ Their operational capability was thereby substantially improved, but the various modifications were never likely entirely to offset some of the more fundamental shortcomings of the F-3's original specification. Furthermore, having been rushed into service to meet the immediate

contingency of the Gulf conflict, it could hardly be expected that the enhancements would all be entirely successful. In such circumstances, normal evaluation and trial processes must necessarily be accelerated, and the potential for error may then be increased. Equipment defects may not be spotted, or it may be that equipment does not fully match specified requirements, or is installed in such a way that it is difficult to use in operational conditions. Deployed aircrew and groundcrew are likely to find innumerable upgrades hard to accommodate in the middle of large-scale and very demanding operations.

In the meantime, the RAF's offensive posture in the Gulf was also being strengthened. Tornado GR-1 detachments deployed to Bahrain and Tabuk, in Saudi Arabia, in August and October 1990 respectively, and a further eighteen aircraft arrived at Dhahran in December. The Jaguars were also repositioned forward to Bahrain.¹⁰ More than 60 attack aircraft would thus be committed to the air campaign when Operation Desert Storm began in January 1991. But what role would they play?

It has been noted already that the Tornado GR-1 had been designed to undertake very specific low-level attack duties on NATO's Central Front. As its primary task, it was expected to conduct counter-air missions against Warsaw Pact airfields, using the runway-cratering bomb, JP-233, delivered via high-speed low-level overflight of the target. In the Gulf, the Iraqi Air Force was in a position to operate from a number of very large and well-prepared air bases, and the USAF lacked dedicated airfield-denial platforms and munitions, so the American Air Component Commander warmly embraced an early British offer to employ the GR-1 in this role.¹¹

The Jaguars, on the other hand, were not so rigidly tied to specific tasking. The broad expectation was that they would execute ground-attack missions, targeting the Iraqi army in Kuwait with unguided 1,000 lb bombs and the cluster bomb, BL-755 - another munition designed for release at low altitude. However, within a short time, doubts were being expressed about this scenario. In October, the British Joint Headquarters pointed out that the Jaguars would be very vulnerable at low level, and suggested that they might operate at higher altitude. But the only munition in their inventory that was suitable for high-level release - the 1,000 lb bomb - was not an effective weapon with which to attack small, mobile or dispersed ground targets. An alternative was needed, and the Jaguar detachment commander therefore recommended the acquisition of the American CBU-87 cluster bomb. Not only did CBU-87 meet the requirement for high-altitude release; it was also immediately available from USAF stocks in theatre.¹²

There are several reasons why the risks of low-level operations were viewed more seriously in relation to the Jaguar than the GR-1. While the Jaguar could only operate in daylight, the GR-1 secured at least some protection by flying at night, and was also fitted with more effective electronic counter-measures. Furthermore, while Jaguar tasking was chiefly in the restricted airspace over Kuwait, where the Iraqis had positioned a formidable array of ground-based air defences (GBAD), the GR-1s were not so rigidly confined, and could thus make more use of

evasive routing. Finally, on missions with JP-233, which the RAF had effectively 'sold' to US commanders, there was no choice, but to operate at low altitude. Yet a shift to higher-level flying was also envisaged for the GR-1s after the Iraqi Air Force had been dealt with. The RAF proposed that they should fly interdiction missions employing laser-guided bombs (LGBs), and the USAF confirmed their willingness to provide F-15s as laser designators.¹³

It would be wrong to suppose that the RAF only began operational flying in the Gulf at the beginning of Desert Storm in January 1991. In fact, most detachments effectively became operational as soon as they reached the Gulf. The F-3s again provide an especially notable example. Ultimately, between August 1990 and March 1991, they flew in excess of 2,000 combat air patrol (CAP) sorties. Yet their limited performance and self-defence capability caused them to be employed overwhelmingly in a supporting role to the coalition's main air defence effort, flying rear CAPs to give protection to so-called high-value assets, like airborne C2 platforms. Their patrol areas were located some distance behind a forward barrier of American and Saudi interceptors, which proved more than a match for the meagre Iraqi opposition dispatched against them after hostilities began. Nor were the F-3s risked on offensive missions into Iraqi airspace. At best, it can only be noted that their absence could have caused the coalition air defence effort to become unduly stretched, as platforms with the capabilities that the F-3 lacked might have been burdened with the rear CAP task, so detracting from the offensive effort. Only once did airborne F-3s come remotely close to combat, and there were no opportunities to intercept Iraqi aircraft.¹⁴

Meanwhile, the GR-1s found themselves confronted by an exceptionally difficult baptism of fire. The RAF later assessed that their JP-233 attacks achieved their aim by disrupting Iraqi Air Force operations following the launch of Desert Storm, but it was hard to draw any more positive conclusions, as the coalition's offensive counter-air campaign effectively secured air superiority within days. Moreover, four GR-1s were lost during these early missions, four aircrew being killed, while four more were captured. Three aircraft were shot down by SAMs during low-level missions against Iraqi airfields with conventional free-fall bombs, and one was lost on a JP-233 mission, although it is not certain that enemy air defences were responsible.¹⁵

Low-level flying thus proved extremely hazardous. Consequently, as soon as any tangible threat from the Iraqi Air Force had been eliminated, the UK Air Commander decided that GR-1 missions should in future be flown at higher altitude. Their only effective higher-level weapon was the Paveway LGB, but the GR-1s had no laser self-designation capability at this time and had to rely on other aircraft to function as third-party designators. However, the American F-15s originally earmarked for this task had in the meantime been reassigned to counter-Scud operations. Laser-designating aircraft, in the form of ageing Buccaneers, had therefore to be flown out from the UK, along with two experimental Thermal Imaging Airborne Laser Designating (TIALD) pods, which the GR-1s themselves could carry. While waiting for this capability to become fully operational in theatre, the three GR-1 detachments had no option but to fly higher-level missions using unguided 1,000 lb bombs. These attacks were mostly

very inaccurate; aircrew were not trained to operate in this way, and the aircraft were not optimised to do so either.¹⁶ On the other hand, no more GR-1s were brought down by the Iraqis during this phase of the campaign. The only aircraft loss resulted from self-damage caused by the premature explosion of munitions; the crew ejected safely, but were taken prisoner.¹⁷

Then, early in February, the GR-1s began laser-guided bombing and there was a pronounced change in their fortunes. Indeed, executing a wide range of interdiction strikes, they achieved what was, at the time, probably the most accurate bombing in the RAF's history. With TIALD alone, they hit 229 pin-point targets in a period of eighteen days.¹⁸ One aircraft was shot down by an Iraqi SAM on 14 February, but this was the only casualty incurred during an LGB mission.¹⁹

By contrast with the GR-1s, the tactics to be employed by the Jaguar detachment remained uncertain during the final countdown to Desert Storm. Although concerns were mounting over the potential risks involved in operating over Kuwait at low altitude in daylight, the proposed solution - the procurement of CBU-87 cluster bombs for higher-level release - was subject to some delay. In the meantime, the Jaguar's lower media profile and a lack of clear direction from higher command levels left the detachment commander with greater freedom to decide how to deploy his aircraft. He duly concluded that they would face too great a threat at low level, and that they should therefore operate higher up, in an environment where they would at least derive some protection from coalition SEAD platforms, such as USAF Wild Weasels and EF-111 Ravens, and air superiority fighters.

Early Jaguar missions flown with free-fall 1,000 lb bombs provided ample evidence of extremely heavy Iraqi AAA throughout the area of operations, so the detachment continued to fly at higher altitude. Clearance to carry the CBU-87 was ultimately received at the end of January, increasing the range of targets that the Jaguars could attack, but a combination of software and carriage limitations reduced the weapon's effectiveness. These were a direct consequence of its relatively late acquisition. Until the final week of the campaign, the Jaguars therefore flew the majority of their missions with 1,000 lb bombs.

The Jaguars would eventually execute more than 600 sorties without loss during Desert Storm. They fulfilled their interdiction tasking to the extent that they delivered a high proportion of their weapons into their target areas, although with far less accuracy than the level associated with precision-guided munitions (PGMs). Moreover, they also mounted a number of anti-shiping missions, targeting Iraqi fast patrol boats with their cannon and with CRV-7 rockets. CRV-7 was, however, another late acquisition, and it proved difficult to launch accurately until computed weapon aiming became available during the final stages of the campaign. After that, it was successfully employed against a variety of Iraqi ground targets.²⁰

In assessing the RAF's performance in the Gulf, it is important to consider the problems it faced in context. Nearly two decades had been spent preparing for a conflict in the NATO area conducted from British and European main operating bases. Personnel had exhibited

a high degree of resourcefulness and adaptability in deploying and sustaining so many aircraft beyond European frontiers and in mounting operations from unfamiliar, crowded and sometimes poorly prepared airfields. The logistical strain had been immense; as one RAF supplier later recorded, 'we had shown that we could effectively project air power, but the cost had been exorbitant: we had taken too much equipment, we had not used it at all well, and we had lost far too much'.²¹

And yet, with American and Saudi support, the challenges were in due course overcome.²² Although they had all required extensive modification for Operation Granby, the air transport fleet, tankers, support helicopters and Nimrods all fulfilled their assigned tasks very effectively. RAF transport aircraft moved approximately 25,000 passengers and 31,000 tonnes of freight into the Gulf; in theatre, Chinook and Puma helicopters carried more than 12,000 troops and over 1 million kgs of freight. During the period of hostilities alone, the tankers offloaded 13,000 tonnes of fuel to both RAF and other coalition aircraft; Nimrod MR2s helped to enforce the UN economic embargo of Iraq, challenging no fewer than 6,552 ships in Gulf waters, and they subsequently assisted coalition naval units with the identification and interception of Iraqi naval vessels. The Jaguars and Tornado GR-1As proved their worth as reconnaissance platforms, providing valuable targeting and battle damage intelligence.²³

Nevertheless, the Gulf conflict did to an extent undermine confidence in the RAF's front-line combat capability. The anticipated role within the NATO area had resulted in an over-commitment to a limited number of tasks, and a loss of tactical flexibility. A short-term solution of sorts had been found via the last-minute procurement of new weapons and equipment, and equally accelerated on-the-job training for the air and ground crew involved, but this was far from ideal. It worked - to the extent that it did work - because of the exceptionally high calibre of so many RAF personnel, and because the Service could still call on the support of a very large engineering, supply and industrial infrastructure. But short-term measures could never fully address some of the more fundamental questions that the Gulf War raised about doctrine, training and equipment.²⁴

After British forces were withdrawn from the Gulf at the end of the war, a major lessons-gathering exercise was launched. Originating at unit level, identified lessons were then staffed upwards through the command chain, and compiled into overall reports for the air, land and maritime environments.²⁵ These were then endorsed by the high command, and finally by the Ministry of Defence.

There were good reasons why the RAF report might have been decidedly defensive in tone. Its operations had come under the media spotlight far more than those of the other Armed Services during Desert Storm; this reflected the fact that the RAF participated in the entirety of the campaign, whereas the Army only became involved at the very end, and maritime operations, although important, were peripheral in character. Some reporting had predictably been critical due to the losses sustained by the Tornado GR-1 force.

Additionally, there was the issue of the impending post-Cold War reductions in defence spending. While British forces were engaged in their largest overseas operation in decades, in London the Ministry of Defence was putting the finishing touches on the *Options for Change* defence review, which ushered in a series of swathing cutbacks. The Armed Services harboured no illusions about what was in store, and it would have been entirely logical, in the circumstances, to reason that compelling evidence of war-fighting prowess in the Gulf might offer a measure of protection from the forthcoming economies. Some such perspective could have led to pressure within the Services to ensure that the various after-action reports presented their respective contributions in a favourable light.

Finally, the truth is that the war had seriously undermined a number of the more basic assumptions that underpinned the RAF's operational posture. It suggested that low-altitude tactics did not provide the anticipated degree protection against GBAD, and simultaneously offered abundant evidence of the capability of precision-guided air weapons released from higher up. US SEAD had substantially reduced the threats that the RAF had identified to aircraft operating at this level. Hence, the war appeared to suggest that future air operations were likely to be conducted at higher altitude, something that implied a radical shift in RAF doctrine, training and tactics, which could well have been difficult to accomplish quickly even if appropriate equipment had been available. As it was, most combat aircraft were not due to be replaced for some years. In such circumstances, the RAF high command might reasonably have hesitated before accepting that some far-reaching reforms were required.

Viewed from this perspective, the post-Gulf War air lessons report can only be described as a very honest and thorough document. There was no attempt to deny that the conflict had raised some serious questions about war-fighting preparedness and operational capability. The front-line aircraft fleets were all in need of improved communications, navigation and self-defence equipment; better interoperability with potential coalition partners was required, together with enhanced logistical provisions to support future out-of-area operations, and more AAR capacity to provide greater reach to aircraft operating away from main or forward operating bases. More air transport was needed, and there had been an over-dependence on the US for SEAD. There were proposals to rationalise the provision of mission support, and it was argued that the offensive effort would have benefited from the supply of more up-to-date and accurate battle-damage assessment (BDA).²⁶

The Tornado F-3 came in for some surprisingly direct criticism. However, this is not difficult to explain. By 1991, it was well known that the aircraft suffered from a number of serious shortcomings and it was hoped - optimistically - that the F-3's place in the RAF's order of battle would be taken by the Eurofighter at the turn of the century. Thus, while the report contended that the F-3 had broadly fulfilled the role for which it was designed, it also acknowledged the aircraft's limitations, although pointing out that these were fully understood and that measures had already been implemented to procure a very much more capable air defence platform.

It was when the report turned to the subject of offensive air warfare that its tone became noticeably more cautious. Full recognition was accorded to the vital role that PGMs had played in the Gulf, and the RAF stressed that more of these weapons would be used in future. Specific requirements were similarly identified for anti-armour munitions and stand-off missiles that would reduce the exposure of offensive aircraft to hostile GBAD. Equally, it was accepted that aircrew should be better trained and equipped to fly offensive missions at higher altitudes. And yet these matters were only addressed quite broadly, alongside an explicit commitment to the existing low-level capabilities. If there was now an acknowledged need for increased tactical flexibility, it did not appear that there was to be a general shift in offensive doctrine towards higher-altitude flying.²⁷

The financial constraints imposed on the Armed Services during the 1990s inevitably complicated the task of implementing the lessons of the first Gulf War. Successive defence reviews were initiated by *Options for Change*, culminating in the *Strategic Defence Review* of 1998. In real terms, between 1990 and 2002, UK defence expenditure fell by more than 20 per cent; defence spending absorbed around 4 per cent of GDP at the beginning of this period but about 2.5 per cent at the end. The RAF's front-line force shrank from 63 squadrons to 43; the number of RAF personnel was reduced from 88,000 to 53,000.²⁸ Such reductions in scale did provide scope for improving the standard of equipment; one Conservative Defence Secretary championed the concept of 'smaller but better' in the early 1990s.²⁹ Yet this was only true to a limited degree, and it is quite clear that the funding cuts impeded the exploitation of some Gulf War lessons.

The operational environment imposed further restrictions. Behind the defence cuts of the early 1990s lay the assumption that, following the end of the Cold War, operational pressures upon the Armed Services would decline. Understandably, perhaps, at least some policy-makers and senior officers had difficulty envisaging how the changed situation would in fact generate entirely new commitments, with major resource and financial implications. No-fly zones were created over northern and southern Iraq, and NATO forces were deployed into the Former Yugoslavia. In 1995, Operation Deliberate Force was mounted against Serb forces in Bosnia, Operation Desert Fox marked the culmination of the UNSCOM crisis in 1998, and the Kosovo conflict followed in 1999. The central role of air power in all of these operations ensured that the RAF remained the British government's weapon of first choice, and yet this simple truth was seldom openly acknowledged, and it exerted minimal impact on defence policy. The Service was thus committed to a decade of live operations while simultaneously its front-line strength was drastically cut back - ironically on the basis that operational commitments were reducing.

Beyond this, it should be added that priorities inevitably changed as time went by. Managing the broader defence drawdown and the accompanying organisational changes, and simultaneously conducting a series of major operations - all of this represented a significant and challenging task, but also a current task. These were the dominant factors shaping present and future defence policy. It was difficult to maintain any comparable focus upon a past conflict, which faded further from view as each day went by.

It was possible to implement some lessons from the Gulf War quite easily. A new entity, the Air Warfare Centre (AWC), emerged from the recommendations for rationalising mission support, and was assigned responsibility for the development and implementation of operational and tactical doctrine, and for the provision of integrated mission support to RAF units. In addition to its doctrinal functions, the AWC's duties would range across operational analysis, equipment evaluation, air intelligence, electronic warfare, and air warfare training.³⁰ These activities, previously assigned to several different organisations, were now to be placed under one roof. However, as few new capabilities or additional personnel were required, the AWC's establishment did not have especially significant financial implications.

Otherwise, the 1990s would witness a substantial investment in the air transport fleet, including a C-130 upgrade, the procurement of new support helicopters, and ultimately the leasing of American C-17s.³¹ It was deemed unnecessary to enlarge the air-to-air refuelling fleet, as reductions in the number of combat squadrons lowered the demand for AAR to levels more in line with existing provisions,³² but there were changes in the RAF's logistical training and organisation, which reflected a renewed commitment to mobility and overseas deployments; augmentations were approved for certain dedicated mobile elements, notably the Tactical Communications Wing, despite the cuts being made across the Service as a whole.³³ To facilitate the task of deploying the Tornado out of area, air-portable spares packages known as Priming Equipment Packs were also prepared.³⁴ Thus, as the 1990s progressed, there was some improvement in the RAF's capacity to operate detachments from relatively austere overseas bases.

Yet it is probable that the need for enhanced mobility in the post-Cold War era would have led to the implementation of at least some of these measures in any case; the influence of the Gulf War should not be exaggerated. As the focus of British defence policy shifted outside the NATO area, some additional investment in air transport and mobile support units would have been essential. Furthermore, we should not overestimate the extent of such improvements as were achieved. The chief overseas commitments of the 1990s - in Saudi Arabia and Kuwait - exposed the RAF's support capabilities to a rather less rigorous audit than they received during Operation Granby. Indeed, they were quickly transformed into extended commitments, underpinned by significant logistical backing from the UK and vital host-nation support. And even this was not enough to ensure that aircraft of the Tornado's technical sophistication became much easier to operate away from their main bases. At the turn of the century, to fulfil a coalition mission involving just two aircraft, the RAF had six F-3s deployed in Saudi Arabia, which received priority in the allocation of spares over those based in the UK. For some key items, overseas spares holdings were twice the size of holdings at UK F-3 bases.³⁵

The *Strategic Defence Review* cast doubt on the capacity of the UK's military logistics infrastructure to support extended or concurrent overseas commitments. It proposed 'enhancing the ability of the Royal Air Force to conduct operations from remote locations with

little or no infrastructure by providing logistic support needed for deployed operating bases.'³⁶ Very similar recommendations had been made following the Gulf War.

A variety of important aircraft enhancements were undertaken in the 1990s. As we have seen, virtually all of the aircraft originally deployed had required extensive modification during the operation to provide effective self-defence capabilities, including the installation of chaff and flare dispensers, radar warning receivers, electronic counter-measures, missile advance-warning systems and towed radar decoys.³⁷ In subsequent conflicts, aircraft normally deployed with this equipment already fitted.³⁸ But the ongoing reductions in defence spending prevented a number of the post-Granby equipment recommendations from being implemented. In 1999, the MOD's report on the lessons of the Kosovo conflict listed a series of requirements for the RAF, including improved anti-armour munitions, better electronic warfare equipment and secure air-to-air communications. It was also noted that the RAF had relied heavily on the US for SEAD, and that there had been a lack of timely BDA.³⁹ Eight years earlier, after the Gulf War, the same deficiencies had been recorded; at least some were being dealt with by specific measures, which had yet to deliver, but a number of noteworthy capability gaps were still in evidence.⁴⁰

The scope for exploiting the air combat lessons of the Gulf War was predictably constrained by the fundamental design features of the various fast jets. Thus, while the F-3's self-defence capability could be enhanced, there was no point in attempting to transform it into an accomplished dogfighter, nor could its higher-altitude performance be significantly improved. For an aircraft with vastly superior air-to-air combat characteristics, the RAF would have to wait for Eurofighter. Unfortunately, however, its introduction was repeatedly delayed. To provide an improved interim air defence capability, it was necessary to undertake an F-3 upgrade programme, which primarily involved the installation of both ASRAAM and AMRAAM.⁴¹ Similarly, while the Tornado GR-4 standard superseded the GR-1, the aircraft's operating parameters and performance did not represent a very substantial advance on the original GR-1 specification, with its emphasis on low-level missions. The employment of Storm Shadow, the stand-off missile ordered after the Gulf War, promised to reduce the GR-4's exposure to hostile GBAD, but it was only suitable for use against larger fixed targets, such as command bunkers, communications facilities and other military infrastructure.⁴²

And yet, probably the most important air combat lesson identified during the Gulf War was in fact implemented. The main air lessons study may not have accepted outright that the war potentially marked a fundamental tactical shift, but subsequent combat operations were overwhelmingly conducted at higher altitudes by aircraft equipped with PGMs. The Paveway LGB was used by the RAF in preference to any other air weapon over Bosnia in 1995, Iraq from 1998, and Kosovo in 1999. Indeed, Paveway's utility was such that its carriage was extended beyond the Tornado fleet to the Jaguar and Harrier.⁴³ Bombing accuracy was in this way radically improved by comparison with the standards recorded when non-precision weapons were carried, adding at least some weight to arguments that more could now be achieved with less.

But the transformation of offensive air tactics had to be accomplished within rigid financial limits, with predictable consequences at squadron level. Following the withdrawal of the Buccaneer from service, together with its Pavespikes laser designator, the only airborne designator left available to the RAF was the TIALD pod. The pods that had been intended for the Tornado then had to be shared with the Harrier and Jaguar fleets too, and assigned to detachments deployed in the Gulf, and on operations over the Former Yugoslavia. Very few were left behind in the UK for training purposes. At the turn of the century, ten years after Iraq invaded Kuwait, the UK Defence Procurement Executive advised the House of Commons Select Committee on Defence that a total of only 23 TIALD pods had been bought for the three aircraft fleets. The scope for further purchases was restricted by the pod's high unit price (£2.7 million per pod in the year 2000), which reflected the limited scale of production; TIALD was never manufactured in quantity, as it was not widely exported.⁴⁴

The RAF published figures in the aftermath of the Kosovo conflict indicating that it had been unable to raise the accuracy of laser-guided bombing since the Gulf War; and yet very few of the Tornado GR-1 aircrew who deployed to the Gulf in 1990 had previous experience with LGBs. Officially, at least, the weather was blamed for many of the difficulties encountered over Serbia and Kosovo, but some aircrew felt that they had not been adequately prepared for the use of the TIALD-Paveway combination.⁴⁵ Despite the operational pressures confronting the RAF in the 1990s, and Paveway's critical importance within each consecutive operation, their views suggest that funding may have been insufficient to support the essential parallel training activity.

Additionally, there is a case for arguing that the switch to higher-level tactics and precision-guided bombing stemmed from the specific requirements of air warfare in the 1990s as opposed to a conscious implementation of post-Gulf War lessons. Higher-altitude flying reflected the need to align RAF tactics with those of the USAF, and also the SAM and AAA threats confronting low-flying aircraft over Yugoslavia and Iraq. A continued commitment to low-level tactics may at the same time be inferred from the fact that a new LGB, Paveway 3, was at first ordered in the early 1990s as a low-level munition, although it was also suitable for higher-level release.⁴⁶ Finally, broader considerations also lay behind the tactical reorientation. The popular perspective was that higher-altitude missions flown with PGMs were casualty-free and caused the absolute minimum of collateral damage - characteristics that inevitably appealed to politicians.⁴⁷

Conclusion

The RAF did not ignore the main air lessons identified after the Gulf War. Having experienced an extremely challenging initiation into the problems of post-Cold War operations, it mounted an extended and thorough lessons-gathering exercise that exerted a significant influence in subsequent years. There was a Service-wide determination to learn the lessons of the conflict, which helped to ensure that, a decade later, a smaller front-line force could boast superior general war-fighting capabilities, and improved deployability, while the Tornado GR, Harrier

and Jaguar forces had undergone a veritable tactical revolution. Yet the lessons of the Gulf War could have been more fully acted upon. Some identified lessons were only implemented to meet the operational requirements of later conflicts over Yugoslavia and Iraq, some elicited only a slow or partial response, and others failed to secure the necessary funding or support.

There is nothing particularly unusual in this. Indeed, historically, it would have been far more remarkable if all the post-conflict lessons had been exploited. The difficulties involved have a variety of explanations. To begin with, there is the lessons report itself. The importance of learning lessons may be well understood; a robust lessons process may be in place; and yet this does not automatically ensure that the most fundamental deficiencies are pinpointed. Within military organisations, there is an entirely understandable reluctance to draw public censure, to invite criticism from other parts of the defence establishment, or to present senior officers or ministers with recommendations that are certain to be deemed unrealistic because they are too numerous, or too costly, or both. Viewed from this perspective, the RAF's Gulf War lessons report must be considered quite a pragmatic document, but it might have dealt more thoroughly with the issue of offensive tactics - with the wartime shift to higher-level flying and PGMs.

That more space was not devoted to this particularly important subject stemmed partly from entirely genuine concerns that past errors should not be repeated. The lesson was not that RAF combat aircraft should operate at low level or high level; rather, it was that there should be sufficient flexibility to operate at both. It also seemed certain that any general attempt to revise tactics would be hindered by the basic design features of the main offensive air platforms - by the fact that they were optimised for low-altitude flying. But the RAF high command was, nonetheless, unwilling to draw too much attention to the very obvious failure of low-level tactics in the specific circumstances of the Gulf operation.

If lessons reports must be honest, then it is also essential that they are focused. If, for example, an operational-level report is allowed to become submerged under a plethora of tactical details, the lessons implementation process may end up being spread across an excessive number of separate projects, to the detriment of many, if not all. It is better to identify a narrower range of realistic goals, and it is vital that these are understood to command priority status by all personnel concerned. This, in turn, is likely to have far-reaching organisational implications. It is possible that, to some extent, insufficient prioritisation lay behind the fact that some of the RAF's Gulf War lessons were exploited less fully than others. This was certainly the view held by a number of officers involved in later lessons studies.⁴⁸

Third, we should note that lessons are rarely, if ever, implemented in a vacuum; attention and resources may well be diverted by competing pressures, and this was certainly true after the Gulf War. Indeed, even if the air lessons report had offered more direct criticisms and made stronger recommendations, even if prioritisation had been better, or follow-up action had been less constrained by technological factors, the 1990s political and financial environment would

have erected a series of truly formidable obstacles. At the time, defence was dominated by the fallout from *Options for Change*, the accompanying structural reforms, and the sequence of air operations mounted over Iraq and the Former Yugoslavia. There was minimal opportunity to pause and reflect on past experience. In this challenging environment, it is hardly surprising that the RAF should have become increasingly engrossed in issues of day-to-day command, management and planning for the future, even if this was, to an extent, detrimental to the Gulf War lessons exploitation process.

Finally, there is the more difficult question of whether or not the RAF can legitimately claim to possess a learning culture. The answer must inevitably be somewhat subjective and imprecise but, to this author at any rate, the picture appears mixed. On the one hand, it cannot be denied that a great deal of valuable work has been done in the tactical and sub-tactical lessons area since the first Gulf War. Subsequent operations have given rise to a multiplicity of detachment and unit lessons reports; IT modernisation across defence during the 1990s led to the development of improved lessons collection, storage and retrieval processes, and to the construction of lessons databases from which it has become far easier to spot recurring themes and monitor the progress of implementation. Augmenting the work of the individual Armed Services, the Directorate of Operational Capability (DOC) at the Ministry of Defence has been assigned responsibility for the preparation of defence lessons reports, which inevitably incorporate some air lessons, as do such joint reports as emanate from the lessons section at the Permanent Joint Headquarters (PJHQ).

On the other hand, however, there are indications that the RAF has not always paid sufficient attention to lessons exploitation at the operational level. The only operational lessons report that it produced between the Gulf War and the Kosovo conflict was a very brief paper on Operation Deliberate Force in 1995, written while hostilities were still in progress. No overall air lessons report was prepared on RAF operations in response to the crisis in Bosnia, in which eight types of fixed-wing aircraft flew more than 15,500 sorties over a period of five years, in addition to a very substantial flying effort mounted by the support helicopters and transport aircraft. The Tornado GR-1s and GR-4s between them flew 13,200 sorties in the southern Iraq No-Fly Zone over more than a decade, while GR-1s, Harriers and Jaguars mounted 9,700 in the northern zone;⁴⁹ a number of other aircraft types were also involved, such as tankers, reconnaissance platforms and F-3s; but the RAF did not conduct operational-level lessons studies of its contribution to Southern or Northern Watch.

Furthermore, the RAF did not create a permanent, dedicated, lessons staff during the 1990s, so temporary ad hoc teams had to be formed to prepare reports in the aftermath of the Kosovo conflict and following the manoeuvre phase of the second Gulf War (Operation Telic) in 2003. No overall air lessons report has been prepared on the subsequent counter-insurgency phases of Operation Telic, nor, after 12 years, have air operations over Afghanistan been the subject of an RAF lessons study. Ultimately, a permanent lessons cell was created within Strike (subsequently Air) Command Headquarters, but with a staff far smaller and of far more junior rank than that

of its counterpart at the Army's Lessons Exploitation Centre; again, it is primarily concerned with tactical lessons collection activity. The operational level has largely been left to PJHQ and the DOC. The disadvantages inherent in this situation from the RAF's perspective should be obvious. To all intents and purposes, there is currently no organisation within the defence community that is clearly tasked and resourced to conduct the identification of UK air power lessons. None of this necessarily means that the RAF lacks a culture of learning, but it is also hard to avoid the conclusion that this culture could be more deeply rooted and that, until it is, at least some opportunities for identifying, learning and exploiting lessons will probably be missed.

Notes

- ¹ Eliot A Cohen and John Gooch, *Military Misfortunes: The Anatomy of Failure in War* (Free Press, New York, 2006), pp. 26, 233.
- ² Cohen and Gooch, pp. 6-16.
- ³ RAF press release, 'Operation Granby – Fact Sheet', 9 May 1991, pp. 2-4 (held at Air Historical Branch).
- ⁴ Sebastian Cox and Sebastian Ritchie, 'The Gulf War and UK Air Power', in Sebastian Cox and Peter Gray (eds), *Air Power History: Turning Points from Kitty Hawk to Kosovo* (Frank Cass, London, 2002), p. 288.
- ⁵ Ibid., p. 290.
- ⁶ Ibid., p. 291.
- ⁷ Air Publication 3040, 5th Edition, p. 3 (held at Air Historical Branch).
- ⁸ Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 290-291.
- ⁹ John Lake, 'Panavia Tornado Variant Briefing Part Two, Air Defence Variant', *World Air Power Journal*, Autumn 1997, p. 126.
- ¹⁰ RAF press release, 'Operation Granby – Fact Sheet', 9 May 1991, pp. 1-2.
- ¹¹ Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 292-294.
- ¹² Ibid., p. 295.
- ¹³ Ibid., pp. 295, 297.
- ¹⁴ Ibid., pp. 290-292; Command Paper (CM) 1559, *Statement on the Defence Estimates, 1991* (HMSO, London, 1991), p. 18. Command Papers are British government publications presented to Parliament.
- ¹⁵ CM 1981, *Statement on the Defence Estimates, 1992* (HMSO, London, 1992), p. 75.
- ¹⁶ Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 297-298.
- ¹⁷ CM 1981, p. 75.
- ¹⁸ *TIALD: The Gulf War* (GEC Ferranti corporate publication, 1991), p. 48.
- ¹⁹ CM 1981, p. 75.
- ²⁰ Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 295-297; Lindsay Peacock, 'Cats in Action: Jaguars in the Gulf', *RAF Yearbook Special: Air War in the Gulf* (Royal Air Force Benevolent Fund, Gloucester, 1991), p. 28.
- ²¹ Group Captain Robin Springett, 'Logistics in the Post Cold War Era', *Royal Air Force Historical Society Journal*, 19 (1999), p. 105.

²² Air Commodore Paul Crotty, 'Logistics Support in the Gulf War', *Royal Air Force Historical Society Journal*, 19 (1999), pp. 103-104.

²³ RAF press release, 'Operation Granby – Fact Sheet', 9 May 1991; pp. 4, 6-9. Personnel and freight were also flown into theatre by civil charter aircraft.

²⁴ Cox and Ritchie, 'The Gulf War and UK Air Power', pp. 299-300.

²⁵ CM 1559, p. 26.

²⁶ Sebastian Ritchie, *Operation Granby: Jaguar Operations* (unpublished Air Historical Branch narrative), Appendix B.

²⁷ Ibid.

²⁸ www.dasa.mod.uk/natstats/ukds/2002, Tables 2.8 and 3.3, accessed 10 October 2008.

²⁹ CM 1981, p. 32.

³⁰ www.raf.mod.uk/rafwaddington/aboutus/airwarfarecentre.cfm; www.raf.mod.uk/rafwaddington/aboutus/otherunits.cfm; accessed 10 October 2008.

³¹ CM 2550, *Statement on the Defence Estimates, 1994* (HMSO, London, 1994), pp. 59-60; CM 3999, *The Strategic Defence Review* (The Stationary Office, London, 1998), p. 25.

³² CM 4724, *Kosovo: Lessons from the Crisis* (The Stationary Office, London, 2000), Chapter 7, Air Operations – Conduct and Lessons, para 7.45.

³³ S. McLaughlin, 'Ubique Loquimur – Tactical Communications Wing', *RAF PR Magazine*, 1998, p. 16 (held at Air Historical Branch).

³⁴ Sebastian Ritchie, 'The Decline of Mobility: The RAF and Deployed Operations since 1945', *Royal Air Force Historical Society Journal*, 19 (1999), p. 72; Group Captain Robin Springett, 'Logistics in the Post Cold War Era', pp. 105-106.

³⁵ www.parliament.the-stationery-office.co.uk, Select Committee on Defence Thirteenth Report, 26 July 2000; Select Committee on Defence Sixteenth Special Report, 25 October 2000, ANNEX, accessed 10 October 2008.

³⁶ *The Strategic Defence Review: Supporting Essays* (The Stationary Office, London, 1998), Essay 6, p. 6-5, para 19.

³⁷ RAF press release, 'Operation Granby – Fact Sheet', 9 May 1991, p. 10.

³⁸ See for example Lake, 'Panavia Tornado Variant Briefing Part Two', p. 127.

³⁹ CM 4724, Chapter 7, *passim*.

⁴⁰ For example, the Brimstone anti-armour munition project, which dated back to the 1980s, was revived after the Gulf War. However, the weapon was not ready for service in 1999, and subsequent protracted delays finally resulted in the purchase of American Maverick anti-armour missiles in 2001 to provide a stop-gap capability.

⁴¹ The Advanced Short-Range Air-to-Air Missile and the Advanced Medium-Range Air-to-Air Missile; see CM 3223, *Statement on the Defence Estimates, 1996* (HMSO, London, 1996), p. 61.

⁴² CM 4446, *Defence White Paper* (The Stationary Office, London, 1999), p. 26. Although the Storm Shadow stand-off munition was used during the second Gulf War (March-April 2003), the vast majority of GR4 offensive missions employed Paveway 2 laser-guided bombs and involved over-flight of the target.

⁴³ www.parliament.the-stationery-office.co.uk, 11 Feb 2000, Column 344W, John Howe, Chief Executive of the Defence Procurement Agency, to Menzies Campbell MP, 11 February 2000,

accessed 10 October 2008.

⁴⁴ Ibid.

⁴⁵ www.harrier.org.uk, *RAF's Kosovo Performance Revealed*, August 2000, accessed 10 October 2008.

⁴⁶ CM 2270, *Statement on the Defence Estimates, 1993* (HMSO, 1993), p. 70.

⁴⁷ See for example CM 4724, Chapter 7, paragraphs 7.8-7.14. In this official report on the Kosovo conflict produced by the British government, the accuracy of bombing was primarily measured in terms of the minimization of collateral damage. The report also emphasized the link between higher altitude flying and casualty limitation.

⁴⁸ The author's conversation with the Kosovo Lessons Team, 6 September 1999.

⁴⁹ Data held at Air Historical Branch.

The V-Weapons Offensive: Its impact upon the Allied War Effort and some Reflections upon the Contemporary Implications of Weapons of Mass Effect

By Group Captain Martin Johnson

Hitler's use of the V-weapons was intended to change the course of the war. While it succeeded in bringing terror, it failed to have a decisive effect in the outcome of the war. The weapons caused significant psychological impact, which in turn affected strategic considerations. Arguably the greatest impact was reflected in the significant diversion of resources necessary to counter the threat. Modern conflicts and periods of tension have highlighted that there are many parallels with current implications associated with WME. Specifically, the psychological impact of WME will continue to dominate strategic considerations and decision making, including in meeting the various challenges associated with countering the modern complex threat.

"Who can think without horror of what another widespread war would mean, waged as it would be with all the new weapons of mass destruction"¹

The Times, 28 December 1937

Introduction

Between June 1944 and March 1945, Germany launched 15,500 V-1 'flying bombs' and V-2 rockets at targets in England and Europe.² While the V-weapons offensive did not succeed in meeting Hitler's aspiration of altering the course of the war by attacking the morale of the population,³ this belies their broader effectiveness as weapons that delivered significant strategic influence. The Germans' overall strategy for the use of the weapons was incoherent and included disagreement as to whether they should be used against the civilian population or as weapons to strike at military targets.⁴ Nonetheless, the indiscriminate nature of the weapons resulted in an impact that outweighed their capabilities as military weapons. This effect was magnified by the threat that they might be used to deliver chemical and biological agents.

The broader impact and influence of the V-weapons has endured beyond WWII. As the forerunners to cruise and ballistic missiles, the V-1 and V-2 marked the introduction of the use of missiles and rockets to deliver strategic influence and as such have provided a template for the contemporary implications of weapons of mass effect (WME). British Doctrine defines WME as "weapons capable of a high order of effect...beyond the traditional lethal domain".⁵ By definition therefore, WME include all previous weapons that could be categorised as weapons of mass destruction (WMD), such as nuclear, chemical, biological and radiological. A key area of difference, however, is the emphasis on the ability of WME to deliver psychological effect and therefore their ability to influence the cognitive domain as well as the lethal. In assessing the implications of modern WME, the paper will consider cruise and ballistic missiles with the potential to deliver traditional WMD warheads. As observed by former US Secretary of Defense William Perry, such weapons in the hands of rogue or 3rd world states could "constitute the greatest single danger to...world security."⁶ While recognising their overall importance in the debate, the paper does not specifically consider implications of the threat posed by nuclear weapons, or the unique nature of the evolving implications posed by cyber warfare as a potential WME.

By examining historical analysis of the V-weapon offensive, the paper shows that the psychological impact of the threat posed by the weapons had a major influence on strategic thinking and had a tangible impact through the diversion of resources to counter the threat. It will conclude, however, that this did not have a decisive effect on the outcome of the war. Extrapolation from more recent campaigns highlights many parallels between the impact caused by the V-weapons and the implications of modern WME, particularly in terms of strategic considerations. Finally, the paper will argue that the implications associated with allocating assets to counter today's threat is likely to be more complex and challenging than at any previous time due to pressures and imperatives caused by resource and fiscal constraints.

Psychological Impact

Although Hitler did not succeed in his objective of destroying the will and undermining the support of the English population, the fear caused by his 'Vengeance' weapons undoubtedly affected morale and had a psychological effect that impacted allied considerations for the remainder of the war. The first V-1 landed in London on 13 June 1944; this was followed by the first V-2 on 8 September 1944. Between June 1944 and April 1945, more than 8,600 V-1 and V-2 weapons attacked England;⁷ nearly 1.5 million people had evacuated London by September 1944, and by the end of the war 24,165 had been killed or seriously injured by the V-weapons.⁸ Although the V-1 and V-2 both brought terror and fear, they did so in different ways. The V-1 was an inherently inaccurate weapon which was used indiscriminately by the Germans. The fear this engendered was enhanced by the fact that its distinctive droning noise became silent once the engine cut, giving a terrifying notice of the destruction that was to follow. Although more accurate, the V-2 was silent and therefore gave no notice prior to impact. While this may have engendered a "fatalistic attitude,"⁹ the V-2 also marked a shift in the way civilians could be targeted; Coblenz describes this effect as "the introduction of chaos... into human affairs."¹⁰

There was strong concern that the psychological impact of prolonged exposure to the V-weapon attacks would lead to a loss of public support with calls for the British Government to seek a peaceful settlement of the war. A further consideration concerned the impact that the V-weapon offensive had on the morale of those soldiers engaged in Normandy who were distracted and worried for the welfare of their loved ones at home in England.¹¹ Deliberate efforts were taken to mitigate this risk, including through the use of the press. This was reflected in an article in *The Times* in June 1944, which suggested, "The aim of these nuisance raids is no doubt to shake the morale of the British public, which has never been stronger than today."¹² This was one example of the leadership and authorities playing down the level of fear and the psychological effect of the V-weapons as a way of maintaining the support of the people.

But there is plenty of evidence to suggest that the V-weapons did have a significant effect on the morale of the population. Johnson highlights the level of fear the V-weapons caused by quoting a London resident, "The flying bombs were the terror of our lives... we sat under the table with our hearts in our mouths until the dreadful explosion came."¹³ Furthermore, the overall psychological effect and impact on morale was formally recorded by Squadron Leader Herbert Bates in a 1945 (although not released until 1994) study for the Air Ministry which stated, "The toll of death, injury and damage to property from the flying bomb attacks was greater than anyone imagined."¹⁴ He went on to add, "In reality it did a great deal to morale."¹⁵ Although not used, it was also believed that the V-weapons had the potential to deliver chemical and biological agents. It is likely, therefore, that passive defence measures, would have increased the psychological effect and level of fear of the weapons, particularly amongst members of the public who had long ceased to carry their gas masks with them at all times, confident that the much-feared threat of gas warfare had passed. This threat also affected the political and military leadership who were immensely relieved to discover that the V-weapons used against England did not carry chemical and biological weapons.¹⁶ The attacks

also caused a mass exodus of workers from London; those that remained were terrified and exhausted, and stayed away from work to deal with damage to their own properties.¹⁷ As a consequence, it is estimated that the V-weapon offensive resulted in war production in London being reduced by 25%.¹⁸ Despite this reduction in capacity however, it is unlikely that the attacks would have materially affected the war effort because of the proximity of the end of the war in 1944-45; moreover, the attacks would not have affected the industrial effort of the other Allied powers.

More recent events have shown that WME are likely to be used by an adversary as a weapon of strategic influence by capitalising on the fear and psychological impact that the asymmetric use of such weapons would cause. Pastel and Ritchie describe these weapons as “effective agents of terror”,¹⁹ and this would be borne out by the devastating effect of Iraq’s use of chemical weapons in its war with Iran in 1980-1988 which caused over 30,000 casualties.²⁰ The psychological effect of Saddam’s use of WME during this war was significant. As well as witnessing the horror, the impact on morale caused by publishing the medical effects of the chemical weapons was such that volunteers for Iran’s Revolutionary Guard fell by one third; moreover, the fear that Saddam’s Scuds would be used to deliver chemical weapons during the ‘War of the Cities’ also reportedly resulted in up to one half of Tehran’s population evacuating the city.²¹

Domenici argues, however, that chemical and biological weapons do not have to be used to cause fear and have a psychological effect; rather, their potential use could be sufficient.²² This was very much the case with Saddam’s use of Scud missiles in 1991 which was intended to alter the course of the war through their psychological impact.²³ Although he did not use chemical and biological weapons on this occasion, the threat that they might be used had a strong psychological effect on Israelis and resulted in gas masks being issued to the civilian population. By the same token, though, the warnings issued to Saddam by letter from President George HW Bush and then face-to-face by Secretary of State Baker to Tariq Aziz over possible Iraqi use of WMD also had a clear psychological effect. Baker spoke of the American public demanding ‘revenge’ and of the United States having the means to exact such vengeance, hinting that the US would aim for the eradication of Saddam’s regime rather than merely his eviction from Kuwait, while Bush’s letter spoke of Iraq paying ‘a terrible price’ were WMD to be employed.²⁴

Therefore, through delivering psychological impact, WME have proven to be effective weapons that could be used by a potential adversary to achieve asymmetric advantage by attacking civilian targets. The extent to which the V-weapons, and the threat that they could carry chemical and biological agents, affected the strategic considerations of the Allied leadership will now be explored, alongside related contemporary strategic implications.

Impact on Strategic Considerations

In order to minimise the risk of the V-weapons being effective in targeting civilians, the highest

political priority was placed on pre-empting and neutralising the V-weapon threat before the first weapon could be launched; as King and Kutta argue, it would have been unacceptable for the civilian population to suffer again as they had during the Blitz.²⁵ The V-weapon threat was exacerbated by reports of Hitler's chemical and biological programme. This became an imperative in strategic decision making as the Allies embarked on a massive programme for developing their own chemical and biological weapons because they had to "prepare for the worst".²⁶ Although intended for retaliation, Churchill's serious consideration of the pre-emptive use of these weapons to counter Hitler's threat highlights the influence that the V-weapons had on strategic decision making.²⁷

The imperative to counter the V-weapon threat also adversely influenced strategic planning decisions. For some time, Montgomery had been unsuccessful in securing Eisenhower's support for Operation Market Garden. As the V-2 threat became clearer, Montgomery re-submitted the plan to include the opportunity to neutralise the rocket threat. Not only did Eisenhower agree to the plan, but he allocated it the highest priority.²⁸ This was ultimately a flawed decision as the operation was a failure. D'Este describes Eisenhower's decision to agree to the Market Garden plan as one made "more from a sense of...pressure to overrun and put out of commission Hitler's V-weapon sites in Holland than from a solid military foundation."²⁹ Therefore, although the primary objective of Market Garden was not the V-weapons, it became the decisive imperative. The urgency of the requirement to neutralise the V-weapon threat therefore clouded military judgement and was the influencing factor that led to Eisenhower agreeing to the ill-fated plan.

The threat of the V-weapons also brought to the fore national imperatives and considerations within the Allies, with the inevitable potential for friction. In evaluating the most appropriate means to counter the V-weapon threat, the US proposed that a joint US/British committee should replace the British Air Ministry in having responsibility for countering the threat. This was refused by the British leadership in unambiguous terms on the grounds that it was the British people that were under threat, and therefore they would lead with the response.³⁰ The US was also seen to follow national interests with regard to the threat. For example, a key driver behind US support for the UK allocating a priority to the V-2 was that they believed that the rockets had the range to target mainland US.³¹ Intelligence sharing also became a source of friction. A report raised by a war committee established in Washington to evaluate the implications of the rocket threat highlighted discontent over a lack of intelligence sharing; it stated that the committee was "strongly impressed by the hesitancy of British leaders to reveal the true nature of the danger."³² Although these frictions were an issue, there is little evidence to suggest that they had a major impact on either the cohesion of the strategic alliance, or the overall war effort.

In any future conflict, our strategic centre of gravity is likely to be the cohesion of a coalition, with support of the people a critical requirement. Therefore, the need to act to minimise the psychological impact will be just as much of an imperative in contemporary considerations as it was during the V-weapon campaign, as shown by the coalition imperative to keep Israel out

of the Iraq war in 1991. Recent events in Syria have also highlighted that WME will continue to be exploited by potential adversaries to introduce frictions in creating and maintaining cohesion within a coalition. In 2012 a Syrian Foreign Ministry spokesman stated that although his government had no intention of using chemical weapons, it might consider doing so if “Syria faces external aggression”.³³ The intent behind this statement was to use WME to introduce uncertainty into the minds of potential coalition partners, and thus make creating coalitions more difficult, a point reinforced by Dominici in his discussion regarding the coalition in Iraq in 2003.³⁴ The discovery of a WME threat during an operation could also present strategic challenges. National imperatives would then determine how a coalition partner responded, potentially leading to a withdrawal of support or military contribution.³⁵ The implications that WME presents for a coalition could therefore be significant, with particular emphasis on the imperative to ensure that its cohesion is not undermined.

Ranger and Wiencek argue that the presence of WME will be a key factor that complicates strategic decision making,³⁶ and this will include challenges associated with deterrence and potential responses. While the Allies’ chemical and biological programme may have deterred Hitler from use of his programme, a combination of ethical considerations, and adherence to *jus in bello* principles and treaty obligations quite rightly precludes this from being an appropriate form of modern deterrence for the West. Credible messaging, therefore, could be extremely important. President Obama’s statement in 2012, aimed at deterring Syria from using WME, caused much debate and could potentially have wider strategic implications; in this instance the US did not follow through with a specific response despite the warning that, “...a red line for us is we start seeing... chemical weapons moving around or being utilized... That would change my equation.”³⁷ The decision to go to war with Iraq in 2003 also highlights the challenges that WME presents concerning intervention. The decision was taken because of the perceived need to counter the threat of Iraq’s WMD; however the belief that Saddam had this capability at his disposal was based on ambiguous intelligence linking a chemical and biological threat with ballistic missiles.³⁸ As with the experience of Market Garden, history shows that the imperative to counter this perceived threat clouded political and strategic level judgement and decision making. These examples highlight that the potential presence of WME could continue to have a significant, and sometimes detrimental, impact on strategic considerations.

Although the threat of the V-weapons did have an effect on strategic thinking for the Allied leaders in WWII, there is no evidence to suggest that this had a major impact on the overall Allied effort. Experience from more recent case studies would indicate that the imperative to counter the threat of WME could continue to lead to strategic challenges. The paper will now explore the resource implications associated with countering the V-weapon threat, and its contemporary parallels.

Impact on Resources

There is a strong argument that the greatest impact the V-1 and V-2 weapons had on the overall

war effort was in the level of resources that were diverted to counter the threat. As Collier identified, "The great question was whether a substantial part of the Allied bomber effort should be switched from the battle in Normandy or the bombing of Germany to the rather daunting task of knocking out ... sites".³⁹ The majority of these resources were allocated to Operation Crossbow, the Allied effort to coordinate pre-emptive aspects of dealing with the V-weapon threat; this included the intelligence gathering contribution and offensive strikes against the range of targets associated with the V-weapons. There was general agreement amongst the Allied leaders that air power would be the key to countering the launch of the V-1 and V-2 weapons; this was predicated on the fact that the Germans still had control of continental Europe in 1943.⁴⁰ But this could only be achieved if sorties were diverted from other missions. From 17 August 1943, when the RAF conducted the initial raid against the Peenemunde rocket development complex, in excess of 6,000 bomber missions were diverted to pre-emptively attack Crossbow targets before the V-weapon offensive started in June 1944; in January 1944 alone, 38% of all missions were assigned to meet Crossbow requirements.⁴¹ This would reinforce Joseph Angell's observation of the challenge as "a diversionary problem of the first magnitude."⁴²

With such a high percentage of missions diverted to counter the V-weapon threat, it was inevitable that such action would lead to frictions. Specifically, during the period 1943-1945, Operation Crossbow was competing with Operations Pointblank and Overlord for the same resources. Particular issues of concern were raised by both Air Chief Marshal Harris and Lieutenant General Spaatz who didn't want resources diverted from Pointblank, the offensive bombing campaign over Germany, to the defensive Crossbow campaign.⁴³ Central to this disagreement was a failure of the operational commanders to grasp the political imperative to neutralise the V-weapon threat and minimise any possible risk of losing the support of the population. Eisenhower, however, did understand the political imperative and with overall command for all bombing assets, he prioritised Crossbow missions over all other missions, except those that met, in his words, "the urgent requirements of the battle".⁴⁴ This was supported by Churchill. As the diversion of sorties to Crossbow became an enduring friction, Churchill personally intervened in July 1944 when he declared that "Subject to the overriding needs of the Battle of France, all Britain's available resources must be used to try to counter the flying bombs."⁴⁵

While the two V-weapons presented very different challenges in terms of counter-measures and the associated resources that needed to be allocated, their collective "randomness" added to the resource burden necessary to counter the threat.⁴⁶ The nature of the V-2 rocket was such that it could not be defended against once airborne; therefore, destroying the launch sites became a critical requirement. The V-1 on the other hand could be intercepted with responsibility delegated to the Air Defence of Great Britain. Again, significant resource was required for the associated three lines of defence: multiple squadrons of fighters including Tempests, Spitfires and Meteors provided the first line of defence; the second line was provided by anti-aircraft guns; and the third line by barrage balloons.⁴⁷

Despite Harris' claim in July 1944 that diverting resources to Crossbow had contributed to undermining most of Bomber Command's efforts over the preceding 3 years,⁴⁸ there is insufficient evidence to suggest that it delayed the outcome of the war, particularly considering the numbers of aircraft available to the Allies. The conclusion reached by the United States Strategic Bombing Survey is that the diversion of resources had an insignificant impact overall on the Allied war effort.⁴⁹ Kipphut reinforces this, and points to the fact that the Crossbow missions successfully delayed the use of the V-weapons by 3-6 months, which was long enough to enable the Normandy landings to take place as scheduled.⁵⁰ There is also an argument that Hitler's persistence with the V-weapons, and his obsession with the V-2 in particular, had a positive impact on the Allied war effort. In order to pursue the V-2, Hitler ordered that all available resources should be allocated to the programme. This resulted in the cancellation of projects such as the *Wasserfall* anti-aircraft programme with the resultant effect that there was no need for dedicated suppression of enemy air defence missions because allied bombers encountered significantly less German defences during their bombing raids.⁵¹ While the V-weapon campaign was successful in meeting Hitler's objective of diverting resources, this did not have a decisive effect and did not have the desired impact of altering the course of the war. In particular, it came too late to delay the Normandy offensive.

It is likely that one of the most significant contemporary implications raised by WME would also be associated with the allocation of resources to counter the threat. The significant level of resource diverted to counter the threat of Scuds being launched at Israel in 1991, 1,500 strike sorties, mirrored that allocated to counter the V-weapon threat.⁵² But Kipphut makes the point that future challenges will be greater because the threat is likely to comprise more technologically advanced ballistic and cruise missiles.⁵³ A mass of resource alone will no longer be sufficient (or indeed be available) to counter this threat, which will result in the need for a more sophisticated approach and a prioritisation of assets.

The threat that these weapons could carry chemical and biological (and nuclear) warheads is an additional imperative in the requirement for comprehensive defences. But countering the threat of these WME needs to go much deeper, and according to a senior Pentagon official, should comprise a layered approach, including prevention, and active defence, both of which will have implications for resource allocation.⁵⁴ While prevention will require international community enforcement of regulations and treaties, rogue states may not necessarily pay much heed to this. Iraq openly flaunted its disregard for the international community's efforts during the Iran-Iraq war, with Syria threatening to do the same in 2013. Another facet of prevention therefore, is the possibility of offensive pre-emptive strikes. But pre-emptive strikes would not be acceptable in all instances, and, as discussed above, would the appropriate resources exist for a successful campaign?⁵⁵

Amongst the range of counter-measures available, it is possible that defensive measures could be the most complex. Ballistic missile defence systems are at the forefront of these considerations. Given the challenges associated with developing a comprehensive defensive

system, it is no surprise that the US is fostering a network of close partnerships including with NATO, Japan and Israel.⁵⁶ But at a time of restraint in defence spending, prioritisation in the allocation of scarce resource will be essential and will not be without friction. For example, the US announced in March 2013 that it would divert its missile defence efforts from Europe to the US west coast to counter the developing North Korean ballistic missile threat, but this could only be achieved by cancelling its proposals to deploy a similar capability in Europe.⁵⁷ Therefore, while the contemporary threat posed by WME has also been shown to require the diversion of resources, the future challenges are likely to be more complex with the potential for greater friction internally and amongst partners in determining the most effective means of allocating appropriate resources to counter the threat.

Conclusion

The paper has shown that the V-weapons did not, as Hitler had hoped, impact on the Allied war effort sufficiently to alter the course of the war. They did, however, have a significant effect which extended beyond military considerations. As terror weapons, and underpinned by the belief that they could be used to deliver chemical and biological agents, the psychological impact they had on both the population and war leaders had a major influence on strategic considerations throughout the later stages of the war, particularly with regard to the diversion of resources. Paradoxically, and rather than limiting their effectiveness, the inaccuracy and indiscriminate nature of the V-weapons reinforced their potential categorisation as original weapons of mass effect.

Analysis has also shown that there are many parallels with contemporary implications of WME. In particular, evidence suggests that the psychological impact of these weapons could remain significant in influencing strategic considerations, especially those associated with protecting the centre of gravity. Not all historians, however, agree with the paper's thesis regarding the legacy of the V-weapons as WME. For example, Neufeld argues that "The ballistic missile wasn't an effective weapon until you put a nuclear warhead on top of it – and suddenly it became a super weapon".⁵⁸ But this misses the point regarding cognitive influence. Masters supports this view by arguing that while ballistic missiles may still not necessarily be very accurate, their greatest impact will be in the psychological domain by targeting populous regions.⁵⁹

Finally, the statement quoted from *The Times* that introduces this paper is as valid today as it was in 1937. But even if a contemporary war is not 'waged' with WME, the threat posed by missiles with the capability to carry such warheads, even if not used, will ensure strategic influence by having psychological impact. The imperative to mitigate this impact will therefore remain strong and the enduring challenge will be associated with decisions regarding how to counter a possible WME threat. This is reflected in the fact that many senior interlocutors have recently highlighted the need for the UK and NATO to give serious consideration to robust ballistic missile defence measures.⁶⁰ As the UK begins to refine its thinking on SDSR15 considerations, investment in a missile defence capability may be a key outcome that mirrors the priority placed on cyber defence considerations in SDSR10. While it is impossible to predict

whether this will be a key outcome, and at what cost, it can be predicted with a degree of certainty that prioritising such a decision will not be without its difficulties.

Notes

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¹³ David Johnson, *V1 V2: Hitler's Vengeance on London* (Chelsea: Scarborough House, 1981), 64.

¹⁴ Herbert E. Bates, *Flying Bombs Over London* (Kent: Froglets Publications Ltd, 1994), 53.

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¹⁶ Stephen L. McFarland, "Preparing for What Never Came: Chemical and Biological Warfare in World War II," *Defence Analysis* Vol. 2, No. 2 (1986): 115.

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¹⁹ Ross H. Pastel and Elspeth Cameron Ritchie, "Introduction to and Mitigation of Psychological Effects of WMD," *Psychological Responses to the New Terrorism: A NATO-Russia Dialogue* Vol. 3, Issue 1, (2005): 9.

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²⁴ See Kenneth B Payne 'On Nuclear Deterrence and Assurance' in Anthony C Cain (ed), *Deterrence in the Twenty-First Century: Proceedings* (Maxwell: Air University Press, 2010), 86 and Baker's testimony to the Senate Foreign Relations Committee, 19 May 2010, in which he offered his views on the effect the warning had: <http://www.foreign.senate.gov/imo/media/doc/BakerTestimony100519p.pdf> (accessed 4 April 2014).

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²⁶ McFarland, "Preparing for What Never Came," 110-111.

²⁷ Goldstein, "Pinpricks", 91.

²⁸ Johnson, *V1 V2*, 138.

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⁴¹ McFarland, "Preparing for What Never Came," 111.

⁴² Goldstein, "Pinpricks", 87.

⁴³ *Ibid.*

⁴⁴ Story, *Third World Traps and Pitfalls*, 10.

⁴⁵ Goldstein, "Pinpricks", 89.

⁴⁶ King and Kutta, *Impact*, 317.

⁴⁷ *Ibid.*, 190.

⁴⁸ Henry Probert, *Bomber Harris: His Life and Times* (London: Greenhill Books, 2001), 296.

⁴⁹ United States Strategic Bombing Survey, *V-Weapons (Crossbow) Campaign*, 36.

⁵⁰ Kippbut, "Theatre Missile Defense," 39.

⁵¹ Johnson, *V1 V2*, 164.

⁵² Goldstein, "Pinpricks", 101.

⁵³ Kippbut, "Theatre Missile Defense," 47.

⁵⁴ Grace V Jean, "To Counter Weapons of Mass Destruction," *National Defense* 94, Issue 679, (June 2010): 40.

⁵⁵ Ranger and Wiencek, *The Devil's Brews II*, 44.

⁵⁶ Jonathan Masters and Greg Bruno, "US Ballistic Missile Defence," *Council on Foreign Relations*, <http://www.cfr.org/missile-defense/us-ballistic-missile-defense/p30607#p8> (accessed February 25, 2014).

⁵⁷ Ibid.

⁵⁸ Neufeld Michael J. "Wernher von Braun's Pact with the Devil." *World War II* (December 2007): 21-23. <http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=8&sid=cf3eca8f-55f6-4fa9-8b24-1b8fc61019a0%40sessionmgr4004&hid=4212> (accessed February 10, 2014).

⁵⁹ Masters and Bruno, "US Ballistic Missile Defence," <http://www.cfr.org/missile-defense/us-ballistic-missile-defense/p30607#p8> (accessed February 25, 2014).

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Viewpoint

Eagles and Air Power: The Lord of the Rings as doctrine

By Dr Kenneth Payne

Introduction

JRR Tolkien had an intuitive feel for air power. Inspired by a throwaway comment from an RAF student about the reconnaissance role of the Great Eagles in Lord of the Rings (LOTR), I bought Kindle editions of the books to learn more.¹

The keen student of air power theory might at first be disappointed by events in Middle Earth. There are only thirty mentions of eagles in the entire trilogy; only three of the birds are ever named; and just one has just a few lines of stilted dialogue. Tolkien was not obviously an air power enthusiast. Indeed, as his biographer records, he thought aerial warfare both 'immoral and excessively dangerous'.² In a wartime letter to his pilot son Christopher, Tolkien gloomily observed the gap between the noble ideal of flight and its actual use, such that 'our devices not only fail of their desire, but turn to new and horrible evil. So we come inevitably from Daedalus and Icarus to the Giant Bomber. It is not an advance in wisdom!'³

He had, nonetheless, considerable military experience, having served in France with the BEF in the Great War, where as a signals officer he took part in the British offensive at the Somme in 1916. His Sam Gamgee, he recorded later, was 'a reflexion of the English soldier, of the privates and batmen I knew in the 1914 war'.⁴ Much of LOTR, moreover, was written during the Second World War, with the author sending parts of it as a serial to entertain Christopher, then training in South Africa with the RAF. During the Blitz, Tolkien served as an air raid warden in Oxford, which remained unmolested throughout the war, even later when the Germans embarked on the so-called *Baedeker* raids against targets of cultural value, like Exeter and Bath.

Both World Wars seem to have informed his writing, even though Tolkien himself insisted that LOTR was 'neither allegorical nor topical'.⁵ He certainly did not intend it as commentary on the Second World War, either writ large as the struggle of the democratic west against totalitarian dictatorship, or in its more tactical details of combat. The fighting for the most part is medieval: cinema goers will remember the huge set-piece battles between massed ranks of infantry, as with the sieges at Helms Deep and Minas Tirith, or perhaps cavalry wheeling in the open steppes of Rohan.

The eagles, however, are an exception. First, as we shall see, they are critical for the plot of LOTR, because of three key episodes where they turn the tide decisively. Air power, as these birds demonstrate, can have a critical impact on what is an essentially land campaign. But more than this, they illustrate, just as I had hoped, some hardy perennials of air power theory and practice. Allegory or not, there are striking parallels between the air war against Sauron and that against Hitler. And for those new to air power, whether theory or practice, the struggles of the Fellowship might be more familiar than the struggles of the Few. I use all of the core air power roles outlined in modern doctrine to explain more.

ISTAR⁶

My student was right: giant, mythical Eagles make an excellent aerial reconnaissance platform. And this, moreover, in a book written at a time when ISTAR itself remained somewhat primitive, being mostly confined to photo reconnaissance, notably by the unarmed Supermarine *Spitfires* and De Havilland *Mosquitoes* of the RAF's newly formed Photographic Reconnaissance Unit (Downing 2011).

Gandalf, held prisoner in Saruman's white tower by that treacherous and power hungry fellow wizard, is the key beneficiary. As he relates to Frodo, 'the Eagles of the Mountain went far and wide, and they saw many things: the gathering of wolves and the mustering of Orcs; and the Nine Riders going hither and thither in the lands; and they heard news of the escape of Gollum. And they sent a messenger to bring these tidings to me'.⁷

The eagles do the most obvious thing we expect of aerial ISTAR: picking out concentrations of enemy fielded forces. This proves comparatively easy, even in the difficult terrain of Misty Mountains and Mirkwood. They also demonstrate an impressive ability to track the movement of individual targets, and to listen in on intelligence about Gollum's escape. It helps, of course, that they can talk. There are limits, however, as we learn later of the council in Rivendell that 'even from the Eagles of the Misty Mountains they had learned no fresh news, of enemy movements or of Gollum's whereabouts'.⁸ The problem is likely one familiar from the manhunts of recent wars: that of depth versus the number of platforms available to scour for an individual target.

The eagles are a high altitude surveillance platform. Occasionally in the narrative, the eagles are seen far off in the distance, as when Aragorn sets off in pursuit of Frodo and Boromir, and

sees 'a great bird like an eagle high in the air, descending slowly in wide circles down towards the earth'.⁹ Later, Legolas, Gimli and Aragorn track the kidnapped Hobbits, Legolas spots an eagle, flying very high and with great speed towards the North, so far aloft that only the elf can see him. In their ability to scan wide areas in real time the eagles exceed the more primitive photo and signals reconnaissance abilities that would be available to air forces for many years to come. As an autonomous platform, with tremendous range, speed and endurance, the giant eagle outmatches anything else in the trilogy.

But Middle Earth is huge, and a handful of Great Eagles from the Misty Mountains cannot maintain any sort of persistent surveillance over it, no matter what their speed and endurance. In the quality versus quantity debates of today, the same dilemma plays out: exquisite capabilities are of limited utility when set against great depth, or a demanding operational tempo.

Air Mobility

As with reconnaissance, so too with air mobility - Tolkien uses air power in similar fashion to the RAF's rapidly evolving capabilities in the Second World War. The impressive feats achieved by the Eagles include spotting Gandalf from afar and rescuing him, not once, but twice. The first occasion is when Gandalf escapes from Isengard. Alone and trapped at the pinnacle with 'no descent, save by a narrow stair of many thousand steps,' Gandalf fears the worst.¹⁰ But Gwaihir, 'the Windlord, swiftest of the Great Eagles,' spots him in the late summer moonlight. Not bad. Gandalf 'spoke to him and he bore me away before Saruman was aware. I was far from Isengard, ere the wolves and orcs issued from the gate to pursue me.'¹¹ Mobility to achieve surprise is a key air power capability, ably demonstrated here.

In WW2, air power was used to transport key figures on both sides. This episode recalls the role of the Westland *Lysander* in transporting agents and irregulars to occupied Europe a few years later. Originally intended as an army co-operation aircraft, it performed poorly in that role, but was, as M R D Foot wrote in his history of the Special Operations Executive, an aircraft 'about which Voltaire's remark about God has been applied; if it had not existed it would have had to be invented.'¹² More than 100 successful sorties were made into France for the loss of only two aircraft. Modern doctrine refers to 'special air operations' - an important enabler of special forces operations.¹³ Key individuals are retrieved from under the enemy's nose, or transported about the theatre of operations quickly and without attracting attention. As with the *Lysander*, so with Gwaihir - the role of intra-theatre mobility is improvised amidst conflict.

Later in the story, the Eagle reprises his role as a vehicle for rapid intra-theatre mobility. 'We have need of speed greater than any wind', declares Gandalf, preempting Maverick and Goose. 'The North Wind blows, but we shall outfly it,' Gwaihir declares immodestly.¹⁴ The two then set off to the south, overflying Mordor and approaching Mount Doom itself, raising serious questions about the Integrated Air Defence System available to the Dark Lord, apparently possessed of an 'all seeing eye'. The same thought occurred to a later cartoonist,

who depicts the Eagles overflying Mount Doom and dropping in the Ring at the outset, saving the Fellowship much hardship, and readers considerable time. Guilio Douhet and John Warden one suspects, would have approved.¹⁵

Gwaihir rescues Gandalf a second time, after the wizard has defeated the Balrog, throwing him from the summit of Moria. The eagle spots the grievously wounded Gandalf lying alone on the mountain, apparently more dead than alive.¹⁶ Eagles, it seems, have great utility in combat Search and Rescue, an important facet of air mobility, especially in casualty averse times. The real value of the Eagles comes from the combination of two air power roles - reconnaissance and mobility. Search and Rescue often involves more than one platform: the Great Eagles, by contrast, are versatile and multirole. In the Second World War, as Tolkien was writing about Gandalf's rescue, the Supermarine *Walrus* flying boat was being used in the Gwaihir role as the RAF's first effective combat Search and Rescue aircraft, retrieving airmen downed over the channel in the Battle of Britain (Franks 1994; Galdorisi and Phillips 2008). Unlike the Eagle, however, the *Walrus* operated in conjunction with other aircraft and with shipping to locate and rescue aircrew, notably the versatile *Lysander*.

Attack

The Eagles are not the only air power in Middle Earth - the enemy also uses the skies. In *The Hobbit*, the dragon Smaug memorably strikes fear into dwarf and man alike. This is straightforwardly air power for strategic effect - attacking the enemy centre of gravity with immense firepower, in the hope of shattering his will and capacity to resist. This notion of terror bombing was part of public discourse in the pre-war years, when Tolkien penned *The Hobbit*, with many lurid accounts of the sort of mass societal destruction that might result from aerial attack on undefended cities.¹⁷ Just months before it was published, the German Condor Legion had bombed the Spanish town of Guernica, causing extensive damage and mass casualties and earning international opprobrium as a consequence.

'Fire leaped from thatched roofs and wooden beam-ends as he hurtled down and past and round again, though all had been drenched with water before he came [...] Another swoop and another and another house and then another sprang afire and fell; and still no arrow hindered Smaug.'¹⁸ Though of course, a little while later, some effective air defence from one archer does exactly that. In the meantime, though, there is mass panic among the terrified locals.

In LOTR, the Black Riders, having been swept away in a flood, later reappear mounted on appropriately dastardly looking beasts: 'birdlike forms, horrible as carrion-fowl, yet greater than eagles, cruel as death'. These creatures seem designed to strike terror into onlookers, their riders emitting a piercing shriek that reduces one Hobbit to throw himself against a wall in terror, 'panting like a hunted animal'.¹⁹ The psychological effect of this screaming seems even more potent than the actual violence meted out by the riders. Beneath the five 'foul hell-hawks' of the Nazgûl, Lord Faramir and a small patrol are fleeing for the safety of the Pelennor Gate

and the lands of Gondor. This is air power used for precision strike - and in the ground attack role against enemy fielded forces, prosecuting a target of opportunity caught undefended and in open terrain. It looks as if they will not make it and be cut down from the air, but Gandalf arrives on horseback at the last moment, driving the enemy away. Here we need squint only a little to see the flight to Dunkirk by the British Expeditionary Force; the wheeling Ju-87 *Stukas* driven off by air superiority fighters operating from the UK and hastily assembled anti-aircraft artillery operating around the perimeter. A British officer at Dunkirk described the *Stukas* 'diving, zooming, screeching, and wheeling over our heads like a flock of huge infernal seagulls.'²⁰

Later, the Nazgûl are merciless in their later attacks on Minas Tirith itself, their voices

filled with evil and horror. Ever they circled above the City like vultures that expect their fill of doomed men's flesh. Out of sight and shot they flew, and yet were ever present [...] At length even the stout-hearted would fling themselves to the ground as the hidden menace passed over them [...] and they thought no more of war; but only of hiding and of crawling and of death.²¹

This in a book begun, remember in 1938, written in part during the Second World War, and completed soon thereafter. This could easily describe the scene at Rotterdam, Warsaw or Guernica, or on the retreat southwards through Crete, beneath lines of sinister gull-winged dive bombers, their sirens howling to terrify those below. Being attacked by *Stukas* was, Air Marshal Victor Goddard wrote, 'to experience 'a crescendo of diving fury,' and 'to know the denigration that comes to a man unmanned.'²² 'It was the most hellish, terrific noise you could encounter,' said Private Earnest Leggett, of being attacked by diving *Stukas* outside Dunkirk, 'I threw myself down on the bank, spreadeagled, and I shook just like a jellyfish. The noise was so penetrating and so ominous: it was devilish.'²³

Control of the Air

At the height of the battle for Gondor, the eagles play their second, equally pivotal part in LOTR. Sweeping down in 'long swift lines' behind their leader Gwaihir onto the Nazgûl below, 'the rush of their wide wings as they passed over was like a gale.'²⁴ Capable of operating alone in long range reconnaissance mode, the Eagles here demonstrate remarkable tactical flexibility, adopting a 'big wing' formation and vectoring onto their enemy in line astern. At this, the hitherto dominant Nazgûl, the elite air forces of the enemy, turn and flee. Seeing this, the vast hosts of the enemy waver, as 'doubt clutched their hearts'.²⁵

This is the key moment in the whole battle. The Nazgûl are dismounted when surprised by the diving Eagles, and there is no aerial combat. Nonetheless, here is a clear example of Offensive Counter Air (OCA) - attacking the enemy air forces before they can get aloft. The Israeli Air Force achieved this decisively at the onset of the Six Day War in 1967, thereafter exposing the opposing Arab land forces to overwhelming air superiority (Oren 2002). The Coalition achieved likewise in the first weeks of the 1990/1 Gulf War, with Iraqi fighter aircraft staging an

ignominious retreat to neighboring Iran, rather than being destroyed in place. The struggle for control of the air is broader than dogfighting, or even, perhaps, eaglefighting.

This episode is also a classic illustration of the effects of shock action over the destruction of capability. The Nazgûl are not killed by the onslaught from the eagles, merely driven off, but that is sufficient to instantly shatter the resolve of the hitherto dominant armies of Sauron. The loser in battle, as Clausewitz noted, need not always be the side with the most dead, or the greatest loss of materiel, merely the one who has experienced a collapse of will. Air power has long aimed at shattering will, as much as capability, even if it is harder to know *ex ante* how much force it will take to 'influence' - the key term of art nowadays - one's adversary.

The Nazgûl are the vital 'Centre of Gravity' in the enemy's order of battle, and are identified and prosecuted as such by the Eagles. The struggle for control of the air can depend on effective aerial attack, destroying fielded air forces, but also on ground attack pushing supporting air power away from contested territories and ground forces. For example, one effect of the Allied strategic air campaign against Germany, underway as Tolkien wrote, was to channel the *Luftwaffe's* resources into the defence of German cities, thereby depriving the *Wehrmacht* of close air support, and effectively undermining its capacity as an independent strategic bombing force. There are echoes here too in the *Black Buck* raids of the Falklands conflict - pushing Argentinian *Mirage III* fighter aircraft back to the mainland, and reducing thereby their participation in attacks against the British Task Force (Freedman 2005).

Coalition and Joint Action

Beyond the air power roles, LOTR touches on other aspects of air power doctrine salient to the real world operating environment, then and now. Two in particular stand out - the role of cooperation with other forces, and that of technology and innovation.

On the move in open country, the Fellowship sees 'a great bird high and far off, now wheeling, now flying on slowly southwards.' It is 'A hunting eagle,' Legolas declares, 'I wonder what that forebodes. It is far from the mountains.'²⁶ The independent nature of the Eagles is a feature throughout LOTR - they share information with the coalition allied against Sauron, and they help out. But their intentions are opaque, both to us the reader, and to the allies themselves. In an earlier episode, Sam fearfully imagines seeing hawks or eagles hovering overhead with 'bright unfriendly eyes' - an intimation that not all eagles might be straightforwardly on the side of the Fellowship.²⁷

European war of Tolkien's day featured limited air-ground communication. Identification of aircraft types could be tricky in poor weather, and the possibility of the wrong targets being identified and prosecuted was ever present. While other air forces, notably the *Luftwaffe*, developed with close air support of ground forces as a primary objective, the RAF prioritized strategic air power, targeted beyond the battlefield. Air-land integration was as much a problem for the British as for the Fellowship. As for the shifting balance of allies and

uncertainty about who was an enemy, the role of the Vichy French Air Force attacking the British base at Gibraltar provides a useful Second World War example.

Innovation

Sauron seems capable of rapid technological innovation - the stealth attributes of the rings themselves, the sudden appearance of the Nazgûl's terrifying flying creatures, or the siege engines that breach the defences of Gondor. But the coalition of Elves, Dwarves and Men remains resolutely stuck in the Middle Ages. Magic is departing Middle Earth, and the best the defenders of Gondor can muster is some capable, if vintage, armour and close quarters weaponry, all of which they have forgotten how to manufacture.

There is, as Smaug demonstrates, considerable risk in relying so much on a single type, no matter that it has been hitherto dominant in a number of roles. With his heavy weight of firepower, speed and stealth Smaug is undoubtedly the premier ground attack platform in Middle Earth. But dragons seem a colourful anachronism in the books, sliding into obsolescence with the development of effective active and passive DCA. Slow and unmanoeuvrable, the dragon is evidently vulnerable to disciplined and concentrated ground fire. In any event, as Bomber Command discovered in the Second World War, the capacity of civilian populations to endure tremendous punishment via aerial bombardment was remarkable (Pape 1996; Payne 2014).

The lesson here is that technology can bring a decisive edge to the struggle for mastery of the air, but that over-concentration on one type, or attempting too great a technological leap brings risks.

Conclusion

When it comes to air power roles, then, Tolkien and his eagles do a magnificent job of anticipating our modern RAF doctrine and of tracking real developments in aerial warfare then underway in Europe. There are time tested precepts of air power aplenty in Lord of the Rings - the importance of persistence, speed, reach and height should be readily apparent to readers. There is emphasis on precision, and shock; on improvisation and multirole capabilities; on centres of gravity and the constraints of terrain and climate. There is Defensive Counter Air (DCA), via ground based air defences (GBAD) on the ramparts of Gondor. There is passive DCA in the elvish cloaks adopted by Frodo and Sam to foil overflying Ring Wraiths.

There are, of course, many air power features that Tolkien overlooks, in part because he is as much a creature of his times as we all are, in part because of the nature of the wars of the Rings. There is, for example, not much inter-theatre mobility on offer, with air forces in Middle Earth and mid-twentieth century Europe alike having only a limited capacity to transport materiel. And with all the sustained land warfare going on in Middle Earth, air maritime integration doesn't get much of a look in in LOTR - plus ça change, you might think. Stand off weapons too are in short supply too: Smaug excepted, the aerial creatures of Middle Earth cannot bring much weight of firepower to bear from the air. Accordingly, the attack role

of Eagle and Nazgûl alike is limited to precision strike and the psychological effect of shock action.

But in his writings on autonomous ISTAR, long-range networked sensors (via the Palantir), and stealth, Tolkien was not just describing air power, he and the eagles were truly at the cutting edge. The fundamentals of air power, it seems, apply equally to this earth as to others.

Notes

¹ In the interest of authenticity, I finished drafting this paper over a pint at Tolkien's local, the appropriately named *Eagle and Child*.

² Tolkien, J. R. R. (2005). "The Lord of the Rings" (ebook edition). London, Harper Collins., loc 3347

³ Tolkien, J. R. R., H. Carpenter, et al. (2012). The letters of J.R.R. Tolkien: a selection (ebook edition). London, HarperCollins., loc 1878

⁴ Quoted in Carpenter, H. (1995). J.R.R. Tolkien: a biography (Kindle edition). London, HarperCollins.loc 1399

⁵ Tolkien, J. R. R. (2005). The Lord of the Rings (ebook edition). London, Harper Collins., loc 319

⁶ Intelligence, Surveillance, Target Acquisition and Reconnaissance - defined in UK Air power doctrine as one of the core roles of air power. MOD (2009). British Air and Space Power Doctrine: AP 3000 (4th edition), Great Britain, MOD Air Staff.

⁷ Tolkien, J. R. R. (2005). "The Lord of the Rings" (ebook edition). London, Harper Collins., loc 5542

⁸ Ibid., loc 24692

⁹ Ibid., loc 8461

¹⁰ Ibid., loc 5520

¹¹ Ibid., loc 5546

¹² Foot, M. R. D. (2004). "SOE in France : an account of the work of the British Special Operations Executive in France, 1940-1944". London, Whitehall History Publishing in association with Frank Cass., p. 83

¹³ MOD (2009). British Air and Space Power Doctrine: AP 3000 (4th edition), Great Britain, MOD Air Staff., p. 45, See also, Foot, M. R. D. (2008). "SOE : an outline history of the Special Operations Executive 1940-1946". London, Folio Society.

¹⁴ Tolkien, J. R. R. (2005). "The Lord of the Rings" (ebook edition). London, Harper Collins., loc 18961

¹⁵ See, 'How Lord of the Rings should have ended', Youtube, 9 March 2007, <http://www.youtube.com/watch?v=1yqVD0swvWU> (Accessed 4 January 2014). Douhet, for unfamiliar readers, emphasised the strategic use of air power against key enemy weaknesses, so as to avoid protracted and bloody ground warfare. Warden, a later theorist, also favoured strategic air power used against key parts of the enemy society's 'system'. See Douhet, G. and D. Ferrari (1943). "The Command of the Air ... Translated by Dino Ferrari". London, Faber & Faber and Olsen, J. A. (2007). "John Warden and the renaissance of American air power". Washington, D.C., Potomac Books.

¹⁶ Tolkien, J. R. R. (2005). "The Lord of the Rings" (ebook edition). London, Harper Collins., loc 10261

¹⁷ Richard Overy provides an excellent review of the popular perception of strategic air power

in the inter-war period: Overy, R. J. "The bombing war : Europe 1939-1945", pp. 19-55.

¹⁸ Tolkien, J. R. R., C. Dixon, et al. (2009). "The Hobbit: Or there and back again" (ebook edition). London, Harper Collins., loc 3437

¹⁹ Tolkien, J. R. R. (2005). "The Lord of the Rings" (ebook edition). London, Harper Collins., loc 16223

²⁰ This is Gunner Lieutenant Elliman, quoted in Sebag-Montefiore, H. (2006). "Dunkirk : fight to the last man". London, Viking. p. 387

²¹ Tolkien, J. R. R. (2005). "The Lord of the Rings" (ebook edition). London, Harper Collins., loc 16510

²² Goddard, V. (1982). "Skies to Dunkirk : a personal memoir". London, W. Kimber., p. 142

²³ Levine, J. and Imperial War Museum (Great Britain) (2011). "Forgotten voices, Dunkirk". London, Ebury., p. 74

²⁴ Tolkien, J. R. R. (2005). "The Lord of the Rings" (ebook edition). London, Harper Collins., loc 18934

²⁵ Ibid., loc 18941

²⁶ Ibid., loc 8010

²⁷ Ibid., loc 3973

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Book Reviews

Air Commanders

By John Andreas Olsen

Reviewed by Air Vice-Marshal (Ret'd) Tony Mason

Introduction

Air Commanders is a study by different authors of twelve United States air commanders, spanning World War 2, the Cold and post-Cold War periods. The short biographies, introduced by a thought provoking introduction by Colonel Olsen, place the individuals in their strategic, operational or tactical contexts, examining their background, education, training, experience, character and leadership styles with which they faced the challenges of high command.

Collectively, the studies raise important questions for all airmen. Is there an ideal career progression to prepare for high command? What personal qualities are best suited? What are the implications for modern high air command of the very different environments of World War 2, the Cold-War and the wars of a new, post-cold war era? The success or failure of a commander may be assessed by a comparison of objectives and outcome, but how far is that success attributable to personal qualities and how far to circumstances beyond his control? Do the demands of high command in air warfare differ from those facing army generals?

Clausewitz heavily emphasized the prime importance of "chance" in warfare. Consequently, a commander needed above all to have a powerful intellect to identify and react to the unexpected, and the determination to act on the basis of his judgment. That fundamental requirement was recently placed in the context of RAF high command in the first Gulf War by the then Director of Operations to the UK Joint Force Commander at RAF High Wycombe:

"During Operation Granby I observed at first hand that at the very highest level of command there is a step change in pressure which places greater emphasis on certain personal characteristics. While total commitment to the cause and the determination to see it through are self evident, as is military professionalism of the very highest order, the unremitting pressure of Granby over eight months stressed the importance of stamina and resilience. A considerable reserve of mental stamina was essential to be able to master both concept and detail and to maintain concentration over long periods, no matter how many diversions there were. And one needed a similar degree of resilience to cope with these diversions, which modern communications guaranteed came thick and fast- and principally from unwelcome quarters."

(Air Chief Marshal Sir Richard Johns, addressing the RAF Historical Society, 13th March 2013. RAF Historical Society Journal No.57, pp21-22)

That unique insight into the challenges to high air command in 1991, in a relatively short campaign fought from a headquarters 2500 miles away, with resources but a fraction of those at the disposal of any of the commanders in this book, illuminates the enormous scale and complexity of the tasks facing the latter. It also, by implication suggests that the historical "fog of war" caused by uncertain or lack of information has been replaced by a surfeit which could prove equally impenetrable.

Clausewitz confined his comments on "chance" to a commander's ability to react to the unforeseen after war had begun. Indeed, air operations are still more vulnerable to vagaries of weather than those on land. The opponent may be superior or inferior in numbers, quality, or equipment; he may make mistakes or display unexpected brilliance. But in fact, chance affects the performance of a commander, and especially an air commander, far more widely than that. He is likely to have little or no opportunity to determine the resources made available to him. General Spaatz for example was fortunate to take over a bomber force which was well equipped for the task. General Tunner on the other hand, personally drove the Berlin Airlift to literally a history defining success from an inheritance of inadequate aircraft, low morale and poor organization.

In a coalition, other factors beyond the commander's control demand more than just stamina and resilience. Generals Ryan and Horner were well resourced but fully understood the constraints of NATO allies in one case and of the Saudi hosts and Israeli concerns on the other. They brought a wealth of experience, powerful intellect and overwhelming superiority to their tasks but in addition, both realized that air power, like any other kind of armed force, must be subordinate to and in harmony with political sensitivities. A truly great air commander is one who in his decision making can transcend the limits of his own experience, not just benefit from it.

Air commanders in World War 2 possessed advantages denied to their post war successors. They drew upon virtually unlimited resources to sustain thousands of aircraft. Political constraints

were minimal; disagreements were only over strategy; the general public and the media were supportive. Heavy civilian and military casualties and extensive civilian destruction were accepted, with one or two exceptions, as inevitable features of total war fought in a just cause.

General Spaatz had been decorated in France in World War 1, and was close to the inter war USAAC leaders. He was not a good speaker, was taciturn, disliked military education and according to General Eisenhower “couldn’t write what he wanted”. Author Richard Davis quotes General Lemay saying that “he never got any direct orders from General Spaatz on anything”. But he successfully commanded the US Army Air Forces from 1943 to 1945 although General Ira Eaker commanded 8th Bomber Command, known as 8th Air Force, from January 1942 until December 1943, when replaced by General Doolittle. In that period Eaker, not Spaatz, was responsible for implementing operations against targets in occupied countries and in Germany from August 1943 onwards. Spaatz’ leadership was marked by determination, flexibility, mutual trust and confidence at all levels but he had the good fortune to inherit overwhelming superiority over the Luftwaffe.

General George Kenney on the other hand inherited poorly performing USAAF units in the Pacific theatre in 1942 and over three years transformed them into a theatre- dominating force. He had a powerful intellect, strong will and was a good selector of subordinates to whom he competently delegated. He brought operational and planning experience, doctrinal awareness, understanding of personnel issues and maintenance awareness to his professional mastery. One suspects that Clausewitz would have approved of George Kenney. Yet even his competence did not survive his transfer to Commander of the infant Strategic Air Command. Alan Stephens’ comprehensive, well balanced study also illustrates the risks when a commander’s confidence spills over into overconfidence, generating errors of judgment when he strays into unfamiliar territory.

Major General Weyland was included in the collection as an example of a commander at tactical level: leading the Ninth Tactical Air Command for the last ten months of WW2. He inherited the very effective air-land allied doctrine and practice originated by Air Marshal Coningham and enjoyed considerable air superiority. Richard Muller describes his success, but concentrates on his strong personal relationships with army commanders. His questionable priorities in allocating fighter bombers to the siege of Brest at a cost of reducing support of the advancing ground forces are passed over. Muller emphasizes the attention paid by Weyland to reconnaissance and signals intelligence, but fails to explain why then he was taken completely by surprise by the Luftwaffe’s January 1945 offensive, which would have had much more serious consequences had the overall strategic environment not been so favourable. Such contradictions suggest that Weyland might not have made Air Marshal Johns’ “step change” in pressure to high command.

General Curtis Le May was perhaps the best known air commander who established his reputation in World War 2 and enhanced it in the early years of the Cold War, as Commander

of Strategic Air Command (SAC). Williamson Murray ascribes to him a dark and forbidding personality not inclined to “doctrine stuff”. He was respected however, as determined, clear sighted with a well-deserved reputation as a brave and effective combat commander. He was prepared to challenge accepted wisdom and respond flexibly to changing operational circumstances. He forcefully transformed an inefficient SAC into the primary instrument of western nuclear deterrence, albeit with vastly increased resources. But just as Kenney was given a job too far, Le May’s elevation to USAF Chief of Staff revealed an inability to adapt to an environment requiring compromise and political astuteness. Indeed, his career prompts the question whether an air commander at the highest level needs the flexibility to be, in UK terms, both a combat leader and a Whitehall Warrior.

General William Tunner, the master mind of the Berlin Airlift is an exception in this collection in that he had not been a combat leader and indeed was an unimpressive pilot. But James Corum convincingly portrays an airman who, from inauspicious beginnings became an outstanding organizer, manager of resources and innovator in maintenance and logistics. He was not in the mainstream of the Air Corps, nor, unlike Spaatz or Kenney was he ever a protégé of influential inter-war Air Corps figures. During World War II however, he was rapidly promoted through a series of ferry and transport appointments before commanding air supply operations in the China Burma India theatre.

After the Berlin Airlift, he organized air transport for US and UN forces in Korea, successfully commanded USAFE in Germany and finally commanded the USAF Military Transport Service. He had a cold personality, was not especially sociable, was a hard task master and did not inspire affection. He was however always aware of the need to maintain morale among aircrew and ground crew alike. He earned respect, and was loyally followed because of his manifest professionalism and efficiency. In these circumstances, his known shortage of combat experience was not relevant, but at the time it was exceptional.

For three other Cold War generals, air command was not so straightforward. The Soviet conventional threat to Europe, the risk of a Soviet-Chinese alliance and the shadow of nuclear escalation influenced operational decisions in Korea and Vietnam. A successful air campaign could no longer be pursued to unconditional victory, but failure and defeat could still be a risk.

Tom Keaney clearly and comprehensively portrays General George Stratemeyer in his operational context. He recovered the poor condition of the Far East Air Forces at the outbreak of the Korean War, overcame friction with General Mac Arthur’s staff, responded quickly to unexpected circumstances, encouraged precision technology and operated effectively within US government political constraints. He had a very wide career path, including spells with the US army, in training and doctrine and commanding USAAF forces in south east Asia. He was not a charismatic leader, but affable, low key and an “organizer” of air power rather than a “hands on” commander. His leadership style in many ways resembled that of Eisenhower, with in his case the need to manage relations not just with allies but US forces –Marine Corps and Navy -

competing for resources and publicity. Perhaps his most powerful attributes in high command were his confidence and judgment to delegate wisely to trusted subordinates. They call to mind the advice once given to a relatively senior RAF officer by the highly decorated and formidable General Sir John Hackett, "Identify what you alone need to do, my boy, and delegate everything else".

General William Momyer would have disdained such advice, at best. He was not by inclination a delegator. In theory, the commander of the USAF 7th Air Force in Vietnam from 1966 to 1968 could not have been better qualified for his appointment. He was a successful and brave tactical Group commander in World War 2; supervised the writing of the post war USAF doctrine manuals, including air-land theatre operations; he was Director of Operational Requirements and prior to his Vietnam appointment C-in-C of Training Command. He had a very incisive and flexible mind which could retain significant detail as well as swiftly master issues of policy and strategy. He was highly respected by subordinates, superiors and contemporaries. Case Cunningham describes both the difficulties of the Vietnam environment and Momyer's frustrated reaction to them. He struggled to overcome the impact of uncertain political objectives, political micro management, uncoordinated inter-Service air operations, target constraints and the difficulties of interdicting ground forces when they could dictate the tempo of operations. His association with the politically directed, much maligned, staccato Rolling Thunder campaign of 1968 produced conflicting assessments of his achievements. General Momyer's experience demonstrates that even the most accomplished commander can be thwarted by circumstances beyond his control. Case Cunningham's study is particularly noteworthy because more than all the other contributors, he draws heavily on contemporary records to complement subsequent interviews with colleagues and friends.

Four years later, General John Vogt was appointed in April 1972 by President Nixon to command the 7th Air Force with a mandate to rejuvenate a tired USAF effort in Vietnam. He had completed two combat tours in Europe in 1944 before spending the next twenty six years in increasingly senior military/political staff appointments interspersed with attendance at Yale, Columbia and Harvard Universities, but no higher military education. He was very self-confident, well connected politically, had a powerful intellect, an easy smile and was media savvy. Prior to his appointment he had been overtly critical of USAF performance in Vietnam. Unfortunately he quickly demonstrated his lack of recent operational experience and lack of trusted subordinates; on arrival he actually abandoned the existing daily staff briefings. His failure to remedy weaknesses in the Command prompted interventions by USAF Chief of Staff Ryan and C-in-C Pacific Air Forces General Clay. A tactical revision which ultimately led to the success of Linebacker II was initiated not by Vogt, but by Major General James Hollingsworth, air advisor to an Army Corps. Stephen Randolph concludes that Vogt's remarkable achievement was to sustain President Nixon's trust, despite the failure of the first Linebacker air offensive. It may well have been, but this study provides an object lesson in why there is no substitute for relevant experience in an air commander,

especially when compounded by an absence of higher military education and a perception of political patronage.

When the USAF next saw combat, eighteen years later, the Cold War had ended. The new era would place novel and complex demands on air commanders. A coalition led by the USA would defeat Iraq in a six week campaign which the present writer named “the apotheosis of air power”.

Dick Hallion’s enthusiastic paean to General Charles Horner, commander of allied air forces in Desert Storm, is well founded. He generated both respect and affection. From his combat experience in Vietnam he learned how not to employ air power. Instead, he led a unified command and delegated responsibility to the lowest possible level. He had the self-confidence and judgment to inspire confidence in others and worked well with coalition partners. He had the flexibility of mind to adapt the rigid bombing dogma of John Warden to the situation on the ground in the Kuwait theatre. He placed confidence in the potential of stealth and precision weapons for concentrated strategic effect while at the same time taking care to protect Saudi Arabia from a possible Iraqi offensive. In the campaign he quickly responded to the need to divert resources to hunt the SCUD missiles which threatened to draw Israel into the conflict, even though the hunt proved fruitless. Perhaps the most important base of Chuck Horner’s success as an air commander, not mentioned by Hallion, was that he never studied leadership or command, but from his earliest days as a very competent fighter pilot, he consciously observed leadership around him: good, bad and indifferent, and remembered. Arguably, with the good fortune to enjoy vast superiority in resources, manpower and overall quality, Horner could not fail. But without his leadership, success could have been more protracted and much more costly.

Desert Storm was the last of the 20th Century wars. Media exposure had heavily influenced US public opinion over Vietnam, but Saddam Hussein sought to use the media as a strategic instrument by giving the international press instant access to civilian destruction or casualties, real or imaginary. Military assets were deployed among civilian communities. The casualties in the Al Ameriyah bunker tightened targeting control, while images of destruction on the Basra road brought air operations to an unexpected halt. Western public opinion, released from the mind set of “total war”, became increasingly sensitive not just to “friendly” casualties but to the infliction of “enemy” civilian casualties and “collateral damage”. The days of national exultation, for example over the devastation caused by the Dambuster raid of 1943, were long gone. Air commanders in the next generation would be faced by constraints unknown by their predecessors.

Four years later, General Michael Ryan was commander of the NATO air forces which in a brief campaign brought an end to the first conflict in the Balkans arising from the breakup of the state of Yugoslavia. Over Iraq, conditions had been ideal for the successful use of air power: overwhelming air superiority, clearly defined political objectives, popular support, an incompetent opponent, terrain offering little cover, identifiable and accessible targets.

Chuck Horner had no need to micro-manage. General Mike Ryan on the other hand was applying air power for limited humanitarian objectives in poor weather, among mountains, forests and attacking hostile ground forces frequently deployed among civilians with constant uncontrolled media exposure. His career had included combat in Vietnam, military education at all levels, an exchange tour with the Royal Australian Air Force, maintenance, weapons instruction, planning and personal staff officer to the USAF Chief of Staff. Experience is not in itself a guarantee of successful high command, but Mike Ryan had the intelligence to learn from it and the ability and character to apply it. He had to devise his own strategy, prepare his own plans and have the flexibility to adapt to unforeseen circumstances.

Mark Bucknam's perceptive examination of his leadership is particularly relevant to air commanders in the 21st Century. The General was acutely sensitive to the need to minimize casualties on both sides and avoid collateral damage, especially when the effects of all operations were revealed almost immediately by the international media. The operation was small enough for him to exercise close personal control over almost every aspect: target selection, axis of attack, target sequence, weapon selection and bomb damage assessment.

He recognized the political constraints associated with the tortuous UN and NATO command chain. While well versed in air power doctrine, and instinctively seeking to attack quickly and forcefully, he did not make the mistake of trying to repeat Desert Storm or complain because his environment was so different. Instead he worked smoothly with British Army General Rupert Smith to bring a successful conclusion to the campaign.

Subsequently in Kosovo in 1999, General Michael Short faced very similar problems, aggravated by uncertain Alliance objectives, strategic disputes and a poor working relationship with his superior in theatre. He was a charismatic, widely experienced commander, but with no higher military education. With a deep sense of responsibility he led, ultimately, a successful campaign. Rebecca Grant's assessment would however have been more persuasive had she observed that Short was frustrated because he did not appear to understand that the application of contemporary USAF doctrine, of overwhelming strategic attack in the manner of Desert Storm, would in the political circumstances of Kosovo have been disastrously counter-productive, threatening to wreck alliance cohesion and let Milosovic off the hook. The contrast with the formidable Ryan is stark. To the latter, doctrine had to be adapted to circumstances. With Short, doctrine had calcified into dogma, apparently revealing an inflexibility of mind which was incompatible with the fundamental flexibility of air power.

The studies conclude with the command of General Michael Moseley in Afghanistan and Iraq from 2001 to 2003. James Kiras describes a forceful, highly professional and inspirational airman who in environments more akin to Desert Storm than Deliberate Force forged strong relationships with his Army superior in theatre, delegated wisely to trusted subordinates and applied lessons learned from Afghanistan to the successful combined operations in Iraq in 2003. He succeeded in being a powerful advocate of air power and of the need to integrate it

fully into the joint force, while fully understanding the implications of unfettered international media. That has to be a model for any 21st Century air commander.

No single model for the ideal air commander emerges from these studies nor can any amalgam of qualities construct one. Factors beyond their control often influenced their paths to greatness. But in preparation to meet the challenges identified by Clausewitz and Air Marshal Johns some common factors are apparent: affability is no substitute for respect; relevant experience is essential, not least for credibility, but even more so the ability to think and act beyond it, including learning from other people's experience; confidence and judgment to delegate; the ability to work harmoniously with Joint Service colleagues; self-awareness to know when to be determined and when to be flexible; the need to adhere firmly to fundamental air power principles, but adapting doctrine to changing political and operational circumstances. One quality which is implicit but not expressed in the studies is that evidence of spare capacity may well be an indication of the ability to make the "step change" to high command. Finally, the air commander is distinguished from his or her army or navy counterpart by his air mindedness: his mastery of the air power profession.

There is much here for the ambitious junior officer to learn and for more senior colleagues to reflect upon, including those already holding air rank. Nor would the book go amiss on the shelves of those who are responsible for identifying promising young officers and preparing them for high command. In military education, it will provide rich material for discussion of light blue leadership, as the wealth of detail is sufficient for readers to make their own assessment of the subjects. They may wish to explore the characters and campaigns in greater depth through the comprehensive foot notes and bibliography.

In sum, *Air Commanders* is a highly recommended, unique addition to the air power library.

Book Reviews

The Generals: American Military Command from World War II to Today

By Thomas Ricks

Reviewed by Group Captain Clive Blount

Introduction

Thomas E. Ricks is a Senior Fellow at the Washington think-tank *The Center for a New American Security* and has written widely on military issues; his Iraq books "*Fiasco*" and "*The Gamble*" were particularly well received. He is an extremely experienced journalist, with some 17 years on *The Wall Street Journal* and 9 years with *The Washington Post*, and has been part of two Pulitzer prize-winning teams. Currently, Ricks writes an often controversial online blog for *ForeignPolicy.com* called, '*The Best Defense*', and serves as a contributing editor for *Foreign Policy*. Ricks' latest controversy involved getting cut off during a *Fox News* interview about the Benghazi incident after accusing the channel of right-wing bias.*

The Generals is the result of four years of detailed study of American generalship since the Second World War, with chapters being devoted to the key figures in US Army leadership since George C Marshall. Ricks' particular focus is on army generals whom he considers were failures in combat. In essence, his central argument is that the combat performance of the U.S. Army has been less than exceptional because strategic army leaders have refused to sack failing subordinate generals. Ricks makes the assertion that fear of being sacked from wartime command would encourage innovation, daring, and professional competence and suggests that George Marshall's strict policy of 'hire and fire' meant that good officers were given the opportunity to become great and that bad or weak officers

* For those familiar with Fox News this will come as no surprise!

would be purged. He also suggests that when fear of dismissal is not present, and with it the encouragement to stand out and innovate, a cult of mediocrity takes over. Ricks believes that this has been increasingly the case in the US Army since Korea and has led both to organizational quagmire within the army and failure for the United States on the battlefield.

The Generals is an ambitious project that attempts to answer some highly pertinent strategic questions for the American military. In doing so, it provides some insightful ideas, contains some very thought-provoking leadership case studies and concludes with an attempt to provide some suggestions as to how the modern US military may improve its generalship. However, it is a far from convincing book, with Ricks taking an extremely partisan approach to history with little consideration of anything other than the facts that support his assertions. He exhibits a fair amount of service bias with an obvious affection for the US Marine Corps, for instance dwelling in detail on atrocities committed by the US Army, such as Mai Lai and its subsequent cover-up, which he attributes to poor leadership, whilst skimming over such Marines' black history as the murders at Haditha. He also seems to be unsure of what his key message actually is... whilst advocating the public firing of generals as a mark of leadership that raises morale and fighting efficiency, he then suggests that individuals should be given a second chance... in essence the opportunity to fail without consequence. As failure on the battlefield is measured in the deaths of American soldiers and large amounts of the nation's treasure, it is difficult to find sympathy with this view. However, as Ricks clearly demonstrates, 'time-serving', automatic promotion and an assured career for generals are also reprehensible, so this is a difficult area which requires a depth of thought to resolve; analysis that is lacking in this book. The book also sidetracks the reader with Ricks' attempt to entertain with historical anecdotes – thus detracting significantly from any serious analysis of his thesis. Perseverance, with careful thought, by the reader, identifies a serious challenge for today's military, but firing generals is not the solution to this problem, nor was it in the past described by Ricks. The challenge for today is to recruit, retain, educate and nurture talent to fill the strategic roles of tomorrow. Generals are to a certain extent made; they are a product of their education and experience. Wartime command is too late to realize that selection was a mistake.

Notwithstanding the above criticism of Ricks' central thesis, *The Generals* provides much food for thought on many aspects of strategic military leadership: Marshall's problem of turning an army of just 197,000 personnel into a world class force that peaked at 8.3 million in 1945 was unprecedented, and identifying leaders for that force was particularly acute - requiring firm leadership and moral courage. Human factors are a recurring theme, as evinced by the eternal battle between charismatic personality and hubris - in such individuals as Patton and MacArthur - and the tension between the good, solid, administrators required for such a massive army, and the inspirational flair and courage needed in modern, mobile warfare. Throughout the book we see in the background the eternal tension in the United States between professional military leadership and their civilian masters... civil-military relations remain problematic and controversial today.

The Generals provides much food for thought for professional military officers, regardless of service. It is an enjoyable read with an easy, journalistic style ; the leadership dilemmas faced by the subjects of the book are varied and complex, and clearly have parallels with today. A critical reading of the book is well worthwhile. With so much to offer, it is a little disappointing that the book's central message is less than convincing and, given the current emphasis on strategic realignment with the draw down from Afghanistan, it would be a shame if it was to influence the current strategic leadership of Western armies with flawed ideas. That said, Ricks' assertion that there is a lack of strategic leadership in the US military is borne out by experience; if *The Generals* forces the debate into the open it will have done great service.

<http://www.airpowerstudies.co.uk>

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