



AIR POWER REVIEW

VOLUME 21 NUMBER 3 AUTUMN/WINTER 2018

ARTICLES

AIR POWER IN AN AGE OF ARMED HUMANITARIAN INTERVENTION

Flying Officer Luke Botting

AIR POWER AND INTERVENTION: THE ROYAL AIR FORCE EXPERIENCE IN THE FORMER YUGOSLAVIA, 1992-1995

Dr David Jordan

THE RAF'S EXPERIENCE OF COMMAND AND CONTROL IN OPERATION TELIC, THE SECOND GULF WAR, 2003

Dr Sebastian Ritchie

UK AIR POWER IN OPERATION UNIFIED PROTECTOR, LIBYA 2011

Dr Sebastian Ritchie

THE DISTANCE PARADOX: REAPER, THE HUMAN DIMENSION OF REMOTE WARFARE, AND FUTURE CHALLENGES FOR THE RAF

Dr Peter Lee

INTEGRATING CYBER WITH AIR POWER IN THE SECOND CENTURY OF THE ROYAL AIR FORCE

Wing Commander Paul Withers

VIEWPOINTS

TWENTY-FIRST CENTURY AIR POWER: FUTURE CHALLENGES AND OPPORTUNITIES

Lieutenant General David A Deptula USAF (Retired)

THE BLURRING OF THE AIR AND SPACE DOMAINS - PERSPECTIVES OF THE PHYSICAL, MORAL AND CONCEPTUAL IMPLICATIONS FOR THE ROYAL AIR FORCE IN ITS SECOND CENTURY

Air Commodore Philip Lester

BOOK REVIEWS

Wing Commander James Parker

Group Captain John Alexander

Group Captain Clare Muir

Group Captain Mark Phelps

Wing Commander Angus MacIntyre

A PEER REVIEWED JOURNAL BY
THE RAF CENTRE FOR AIR AND
SPACE POWER STUDIES



**SEE THE
ROYAL AIR FORCE
AIR POWER REVIEW
ON-LINE**

<https://www.raf.mod.uk/rafcasps>

Air Power Review

is the professional
flagship publication
of the Royal Air Force

ROYAL AIR FORCE AIR POWER REVIEW

The Royal Air Force *Air Power Review* is produced under the auspices of the Royal Air Force Centre for Air and Space Power Studies. The publication aims to provide a forum for academically credible articles on air, space and cyber power, with the objective of stimulating debate and promoting the evolution of air, space and cyber power thinking within the broader military and academic communities. Authors are therefore encouraged to challenge accepted norms and offer novel conclusions. Consequently, the views expressed in this journal are those of the individual authors and do not necessarily represent those of the UK Ministry of Defence, or any other department of Her Britannic Majesty's Government of the United Kingdom. Further, publication of those views should not be considered as constituting an official endorsement of factual accuracy, opinion, conclusion or recommendation by the UK Ministry of Defence, or any other department of Her Britannic Majesty's Government of the United Kingdom.

Contributions from both Service and civilian authors are sought provided the submission is original and unpublished. Any topic will be considered by the *Air Power Review* Editorial Board provided that it contributes to existing knowledge and understanding of air power. Articles should comply fully with the style guide published at the RAF Centre for Air and Space Power Studies website, <https://www.raf.mod.uk/rafcasps>; essentially they should be between 5,000 and 10,000 words in length, list bibliographical references as end-notes, and state a word count. Shorter articles and those which offer more of a personal opinion will also be considered for inclusion as a 'viewpoint'. A short biography and abstract should be submitted with each paper. A payment of £230 will be made for each full article published, or £100 for a published viewpoint and £50 for a book review. Additional constraints apply for payments to Service personnel for which details are available from the Editor.

Feedback from readers is encouraged and those wishing to comment on published articles or make suggestions for how *Air Power Review* can better meet the needs of the broader air power community can do so by contacting the Editor at the address below. The Editor reserves the right to publish feedback in part or in full, where it contributes meaningfully to the debate.

All material for publication should be submitted in a Microsoft Word compatible format by e-mail. Digital pictures should be saved as TIFFs or JPEGs at 300dpi or greater. Final design format for article presentation on the printed page will be at the discretion of the Editor.

PLEASE SEND ARTICLES TO:

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

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

EXECUTIVE BOARD MEMBERS

Gp Capt James Beldon (Editor) Director Defence Studies (RAF)	Dr David Jordan King's College London (JSCSC)	Mr Sebastian Cox Head Air Historical Branch (RAF)
--	---	---

EDITORIAL BOARD MEMBERS

Gp Capt (Retd) Clive Blount	Air Cdre (Retd) Dr Peter Gray University of Wolverhampton	Dr David Lonsdale University of Hull
Dr Jonathan Fennell King's College London (JSCSC)	Dr David Hall King's College London (JSCSC)	AVM (Retd) Prof Tony Mason
Dr Ian Gooderson King's College London (JSCSC)	Dr Mark Hilborne King's College London (JSCSC)	Dr Sebastian Ritchie Air Historical Branch (RAF)
Dr Christina Goulter King's College London (JSCSC)	Dr Peter Lee Portsmouth Business School	Dr Steven Paget Portsmouth Business School

EDITORIAL STAFF

Assistant Editor Wg Cdr Helen Wright Dep Director Defence Studies (RAF)	Co-ordinator Sqn Ldr Victoria McCormick SO2 Defence Studies (RAF)	Researcher Fg Off Luke Botting SO3 Defence Studies (RAF)
Researcher Sgt Paul Marr SNCO Defence Studies (RAF)	Secretary Miss Jane Curtis Admin Support, Defence Studies (RAF)	Production and Design Mr Anthony Jones Air Media Centre, Air Command

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

ISSN: 1463-6298

Those wishing to be placed on the distribution list should write direct to the Editor.

The views expressed are those of the authors concerned, not necessarily the MOD.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor. Unless by prior arrangement, articles and photographs will not normally be returned.

Photographs Courtesy of: Air Historical Branch and RAF Museum

Print: CDS

AIR POWER REVIEW

VOLUME 21 NUMBER 3 AUTUMN/WINTER 2018

6

INTRODUCTION

Air Chief Marshal Sir Stuart Peach

8

FOREWORD

Group Captain James Beldon

11

THE ROYAL AIR FORCE CENTRE FOR AIR AND SPACE POWER STUDIES ACADEMIC AWARDS 2018

ARTICLES

14

AIR POWER IN AN AGE OF ARMED HUMANITARIAN INTERVENTION

Flying Officer Luke Botting

40

AIR POWER AND INTERVENTION: THE ROYAL AIR FORCE EXPERIENCE IN THE FORMER YUGOSLAVIA, 1992-1995

Dr David Jordan

60

THE RAF'S EXPERIENCE OF COMMAND AND CONTROL IN OPERATION TELIC, THE SECOND GULF WAR, 2003

Dr Sebastian Ritchie

82

UK AIR POWER IN OPERATION UNIFIED PROTECTOR, LIBYA 2011

Dr Sebastian Ritchie

106

THE DISTANCE PARADOX: REAPER, THE HUMAN DIMENSION OF REMOTE WARFARE, AND FUTURE CHALLENGES FOR THE RAF

Dr Peter Lee

132

INTEGRATING CYBER WITH AIR POWER IN THE SECOND CENTURY OF THE ROYAL AIR FORCE

Wing Commander Paul Withers

VIEWPOINTS

160

TWENTY-FIRST CENTURY AIR POWER: FUTURE CHALLENGES AND OPPORTUNITIES

Lieutenant General David A Deptula
USAF (Retired)

180

THE BLURRING OF THE AIR AND SPACE DOMAINS – PERSPECTIVES OF THE PHYSICAL, MORAL AND CONCEPTUAL IMPLICATIONS FOR THE ROYAL AIR FORCE IN ITS SECOND CENTURY

Air Commodore Philip Lester

BOOK REVIEWS

194

THE ROYAL AIR FORCE: THE FIRST ONE HUNDRED YEARS

Reviewed by Wing Commander James Parker

198

GOVERNING FROM THE SKIES: A GLOBAL HISTORY OF AERIAL BOMBING

Reviewed by Group Captain John Alexander

202

DRONES AND TERRORISM: ASYMMETRIC WARFARE AND THE THREAT TO GLOBAL SECURITY AND

ARMED DRONES AND GLOBALIZATION IN THE ASYMMETRIC WAR ON TERROR

Reviewed by Group Captain Clare Muir

208

ETHICS AND AUTONOMOUS WEAPONS

Reviewed by Group Captain Mark Phelps

212

2020: WORLD OF WAR

Reviewed by Wing Commander Angus MacIntyre

216

RAF HISTORICAL SOCIETY CALL FOR PAPERS

LETTER FROM HIS MAJESTY KING GEORGE V ON THE ARMISTICE, 1918

The King's Message to the Royal Air Force.

*To the Right Hon. Lord Weir, Secretary of State
and President of the Air Council.*



IN this supreme hour of victory I send greetings and heartfelt congratulations to all ranks of the Royal Air Force. Our aircraft have been ever in the forefront of the battle; pilots and observers have consistently maintained the offensive throughout the ever-changing fortunes of the day, and in the war zones our gallant dead have lain always beyond the enemies' lines or far out to sea.

OUR far-flung squadrons have flown over home waters and foreign seas, the Western and Italian battle lines, Rhineland, the mountains of Macedonia, Gallipoli, Palestine, the plains of Mesopotamia, the forests and swamps of East Africa, the North-West frontier of India, and the deserts of Arabia, Sinai, and Darfur.

THE birth of the Royal Air Force, with its wonderful expansion and development, will ever remain one of the most remarkable achievements of the Great War.

EVERYWHERE, by God's help, officers, men and women of the Royal Air Force have splendidly maintained our just cause, and the value of their assistance to the Navy, the Army, and to Home Defence has been incalculable. For all their magnificent work, self-sacrifice, and devotion to duty, I ask you on behalf of the Empire to thank them.

November 11th, 1918

A handwritten signature in black ink, reading 'George R. V.', with a long, horizontal flourish underneath.

LETTER FROM HIS ROYAL HIGHNESS THE DUKE OF CAMBRIDGE



KENSINGTON PALACE

Shortly after arriving as an instructor at Cranwell in early 1918, my great grandfather, His Majesty King George VI (then Prince Albert), became a founding member of the Royal Air Force, and later that year the first qualified pilot in my family. He forged a link with the Service that has remained unbroken ever since. I recall my own flying training at the Royal Air Force College Cranwell with immense happiness, and I am extremely proud to have served as a full-time member of this remarkable Service, and to have had the privilege of serving alongside its magnificent men and women.

The Royal Air Force not only serves as our country's shield and spear – defending us, our friends and allies from harm – but it also delivers salvation to those hit by humanitarian disasters at home and abroad. Last year's mission in the Caribbean after the hurricanes, and this year's support to hundreds of people in the United Kingdom hit by the winter storms, are just two examples of the RAF's compassionate professionalism.

It is a pleasure therefore to celebrate the Royal Air Force's first centenary in the certain knowledge that it will apply the same attributes of professionalism, gallantry and skill in its second, and that it will create a next-generation air force that is representative and inclusive of the best of our diverse nation.

A handwritten signature in black ink, appearing to read 'Will' followed by a stylized flourish.

INTRODUCTION

BY AIR CHIEF MARSHAL SIR STUART PEACH
CHAIRMAN OF THE NATO MILITARY COMMITTEE

Over the past year, *Air Power Review* has examined 100 years of the Royal Air Force's history. This is important not just because it allows us to reflect on a century of operational success, but because it recognises that at the heart of our story is an unbroken record of ideas and innovation. The earliest aviators set the scenes – through their bravery and commitment – of an independent air arm leading to the creation of a separate Service on 1 April 1918. From the start the Service was a forward-thinking, adaptable organisation, valuing social mobility, professional merit and rigorous study. That intellectual streak endures, and we should continue to draw on the excellence of previous great air power thinkers who innovated at all levels of warfare. There are many: the engineering genius of Frank Whittle and his fellow Halton teachers, the strategies of Marshal of the Royal Air Force Sir John Slessor, and the remarkable tactics of Air Marshal Sir Arthur Coningham, are those that stand out to me. It is a proud legacy of thinking, as well as brave and dynamic action, that today's airmen and women inherit.

The RAF's history of ideas is a deep well of wisdom and experience from which we can draw on for the future. Indeed, for history to be useful to the military professional, its lessons must be assessed for their current and future relevance, and used to test our modern doctrine and practice. In so doing, we must address the following vital questions: How will we fight? How can we unleash our people's talent to the full? For both of these we must *understand*; the threat, the geography, history, capability, and culture. We must also criticise ourselves, honestly and openly. Do we do this enough? Do we step away, or step up, enough to get the right perspective? I suggest we can do more. This *is* the conceptual element of the RAF's strategy; it is *how* we think, not *what* we think. Our future operational relevance and success depends upon it, and upon you. When our successors look back in one hundred years' time, it will be your ideas from which they will seek to divine their own wisdom.

The Centenary series of *Air Power Review* has been important in bringing that conceptual element of the RAF's past century to the fore. This edition continues that work, as well as offering some developments that will influence the next century of air and space power debate and practice. However, this journal alone cannot drive future changes; here again it is up to you. Engaging with the ideas presented within this journal and other RAF Centre for Air and Space Power Studies outputs – in the spirit of ambition which has been recounted across these pages – will be the source of the ideas of the future. You all have a role to play, whether it be through producing your own articles for *Air Power Review* or discussing the ideas of air and space power with your colleagues.

However you contribute, I hope that RAF100 has inspired you to confront present challenges and develop the intellectual edge to propel the Royal Air Force into a new innovative era in which, as the Royal Air Force's increasing role in space implies, not even the sky is the limit. *Per Ardua ad Astra*.

FOREWORD

BY GROUP CAPTAIN JAMES BELDON
DIRECTOR OF DEFENCE STUDIES

I am delighted to present to you this final edition of our special Centenary series of *Air Power Review*, in which we examine the Royal Air Force's roles in a post-Cold War period which has been characterised by two broad chronological themes. The first was the seemingly unrivalled military dominance of the West following the collapse of the USSR in 1991, producing an international environment in which Western values were to be promoted around the world through, amongst other methods, armed 'humanitarian' intervention. This edition tracks the RAF's participation in such campaigns up to Operation Ellamy (Libya in 2011), after which a normative reaction against the *Responsibility to Protect* and budgetary constraints within many Western militaries preceded increased strategic competition from a resurgent Russia and a rising China. It is in this context that the second theme of this edition unfolds: the rapid pace of technological change, to which the RAF specifically (and air and space power more broadly) must adapt. As we look to further developments, especially into space (which will be the subject of a special edition of APR in summer 2019), the need to explore the future direction of air and space power becomes ever more pressing. RAF100 has been a tremendous opportunity to celebrate our past; we must now draw on the lessons of that history to inspire the future, as Air Chief Marshal Sir Stuart Peach implores us to do in his introduction to this edition.

To that end, the opening article provides an overview of air power's role in armed humanitarian intervention, tracing the post-Cold War operations which have characterised the RAF's endeavours in recent times. Flying Officer Luke Botting examines the period spanned by this edition, one which has witnessed conflicts which have had far-reaching effects in the realms of military strategy and international relations. Humanitarian interventions were conducted in Iraq (in the aftermath of the First Gulf War), Bosnia, Somalia, Kosovo and East Timor, amongst others. In his article examining the RAF's operations in the former Yugoslavia between 1992 and 1995, Dr David Jordan highlights the Service's operations in an era when simultaneous global commitments and the budgetary impact of the 'Peace Dividend' conspired to stretch the RAF's ability to meet the demands made of it. Dr Jordan's emphasis on the RAF's air mobility operations in particular reminds us of the strategic importance of such capabilities, even on operations where combat operations receive the majority of popular attention. It therefore complements the subsequent article, by Dr Sebastian Ritchie of the Air Historical Branch, which delves into the details of air command and control during Operation Telic, the RAF's largest scale combat operation since the end of the First Gulf War, revealing previously unpublished official sources to produce compelling insights into the wider Iraq conflict.

Of the spate of interventions conducted in the two decades after the end of the Cold War, most were *ad hoc* reactions to discrete instances of failed states or human rights failings around the world. The British- and French-led air campaign over Libya in 2011, however, is particularly noteworthy. It was the first instance of the international community invoking the newly-established doctrine of *Responsibility to Protect*, an international legal precedent born from the earlier NATO intervention in Kosovo and the subsequent International Commission on Intervention and State Sovereignty. It also shared with the Kosovo intervention an air-led strategy. Dr Sebastian Ritchie's second essay in this edition offers a shrewd insight into the history of the RAF's role in Operation Ellamy (named Operation Unified Protector by NATO), not only providing an official account of the campaign, but also correcting some common misconceptions seen in earlier accounts. As Ritchie rightly notes, the RAF made a substantial contribution to the operational-level success of the campaign.

Of course, the RAF's role in the recent history of air and space power has not been confined to the physical component alone. Conceptually and morally, it has adapted to changing times, most notably with the introduction of Remotely Piloted Air Systems (RPAS). Dr Peter Lee uses unprecedented access to Reaper crews to explore the psychological effects of the 'distance paradox' on RPAS operators, reflecting that, while the physical distance between those operators and their targets has increased to span continents, the emotional and psychological distance has regressed to those experienced by aircrew of the First World War. His essay draws on the conclusions of his new book, *Reaper Force: Inside Britain's Drone Wars*, which addresses the human effect of changing technologies and the RAF's adoption of new systems into its force structure. It adds to a growing literature on this and related topics, examples of which are included in this edition's book review section.

In a similar vein, Wing Commander Paul Withers highlights some of the contemporary challenges of integrating cyber into the air domain, and reflects on how the RAF is stepping up to such challenges. He does so by relating offensive and defensive cyber to air power and proposing technological, procedural and personnel-related means of integrating the two in an effective future doctrine. It is an inspiring article on which to conclude this edition's examination of the post-Cold War period, by focusing our minds on the next century of RAF air, space and, indeed, cyber power.

Our concluding section takes a glimpse into the future. In their viewpoints, Lieutenant General David Deptula USAF (Retired) and Air Commodore Philip Lester pose some challenges to air power and military professionals. Both authors identify the blurring of boundaries between the air, land, maritime and space domains and the scope for greater inter-domain integration. But both authors also incorporate different perspectives based around national capabilities and priorities, and tease the reader with some intellectually provocative thoughts.

In spanning the period from 1992 into the future, this final edition in the Centenary series of *Air Power Review* special editions looks, Janus-like, both backwards and forwards, and cements the Royal Air Force's reputation for being future focused, but nevertheless ever receptive to the lessons of history.

Erratum: In *Air Power Review* Volume 21 Number 1 (Spring 2018), the articles 'Fighting In The Air' by Squadron Leader (later Marshal of the Royal Air Force) William Sholto Douglas and 'Experiences With A Day Bombing Squadron In The Independent Force In 1918' by Squadron Leader (later Air Commodore) John C Quinnell were incorrectly identified as essays written by them as students at the RAF Staff College in the 1920s. It has been brought to the Editor's attention that these papers were in fact based on lectures delivered to the Staff College. We apologise for the error and are grateful to Dr Katharine Campbell (daughter of the late MRAF Lord Douglas) for bringing it to our attention.

THE ROYAL AIR FORCE CENTRE FOR AIR AND SPACE POWER STUDIES ACADEMIC AWARDS 2018

The Royal Air Force Centre for Air and Space Power Studies (RAF CASPS) Academic Awards for 2018 were presented on 11 July during the Chief of the Air Staff's Air Power Conference held at the IET Savoy, London. The presentations were made by Air Chief Marshal Sir Stephen Hillier in front of over 400 delegates comprising visiting air chiefs, academics, members of the civil service, and service personnel, both regular and reserves.

THE GORDON SHEPARD MEMORIAL PRIZE

The Gordon Shephard Memorial Prize is awarded in memory of Brigadier General G F Shephard DSO MC RAF. Awarded annually since 1919, previous winners include Flight Lieutenant Slessor MC (1923), Wing Commander Leigh-Mallory DSO (1930) and Squadron Leader Graydon (1974). The prize is awarded to an RAF airman or woman for the best Service paper or essay published through RAF CASPS.

The recipient for 2018 was Wing Commander Stuart Patton, a tactical air transport pilot, who is currently serving as Deputy Chief, Strategy Division, CAOC Al Udeid. His paper 'Deterrence at Distance: Air Power and Conventional Deterrence in the Emerging Global Environment' was published in *Air Power Review* Volume 20 Number 2, the Deterrence Special Edition. The paper explores deterrence theory, identifies the role of air power in the evolution of deterrence concepts and considers the influence of air power on modern actors, including the challenges presented by hybrid warfare and anti-access strategies. Successful deterrence offers the compelling promise of strategic effect with minimal recourse to the application of hard force. With Western actors eager to retain global influence despite resource constraints and a diversifying threat, this article seeks to examine the role of air power in achieving strategic deterrence through conventional means.



THE SALMOND PRIZE

The Salmond Prize is awarded in memory of Sir John Salmond who, as an Air Chief Marshal, was appointed CAS in succession to Marshal of the Royal Air Force Sir Hugh

Trenchard in 1930. The Prize is awarded annually for the best essay on an air power topic submitted to RAF CASPS by a civilian or non-RAF serviceman or woman of any nationality.

The recipient for 2018 was Warrant Officer Class 2 Paul Barnes, who is currently the British Army's Visiting Fellow at the Royal United Services Institute for Defence and Security Studies. He holds an MA in Military History with Distinction from the University of Birmingham and was the Royal Air Force Historical Society's Henry Probert Bursar 2014-16. His paper, "Complete Failure": The British and Dominion Aerial Re-supply 1915-16' was published in *Air Power Review* Volume



20 Number 1. The article examines the role of the air services in the Mesopotamian Campaign from 1915 to April 1916 in general, and specifically the attempted aerial re-supply of British and Empire forces besieged in the town of Kut Al-Amara in 1915-16. The surrender of Kut Al-Amara to the Ottomans in April 1916 was, until the surrender of Singapore to the Japanese in 1942, arguably the single worst shock to the prestige of the British armed forces since surrender at Yorktown in 1781. The article goes on to critically analyse the historiography of the Mesopotamian Campaign and suggests that the shock of defeat has imposed a meme of complete failure on the Campaign which is, in fact, far more nuanced.

THE AIR POWER DEFENCE RESEARCH PAPER PRIZE

The Air Power Defence Research Paper (DRP) Prize is awarded annually to the Advanced Command and Staff Course graduate who produces the best air power related DRP.

The recipient for 2018 was Wing Commander Leonie Boyd who is currently serving on the Advanced Command and Staff Course Directing Staff at the Defence Academy of the United Kingdom. Her DRP, 'The Influence of Gender on Careers in Science, Technology, Engineering and Mathematics (STEM) Subjects – The Experience of Engineers in the Royal Air Force', is an excellent examination of recruitment and retention in the RAF engineer branch with specific emphasis



on female commissioned officers. The analysis of the specific case of the RAF is embedded in the wider perspective of the difficulties in educating and recruiting engineers in the civilian sector. The thorough analysis of the civilian sector as well as the attractiveness of STEM subjects to girls compared to boys provides important context against which to assess the RAF's specific problems. Grounded in an understanding of theories and concepts it provides an insightful and original contribution on this subject.

THE CHIEF OF THE AIR STAFF'S FELLOWS' PRIZE

Awarded annually, the Chief of the Air Staff's Fellows' Prize recognises the Fellow who has made the greatest contribution to the study and promotion of air power.

The recipient for 2018 was Wing Commander Dr Andrew Walters. The prize was awarded to Wing Commander Walters in recognition of his superb endeavours as a Chief of the Air Staff's Fellow in 2017-18, during which period he completed his PhD examining inter-Service friction in India in the inter-war period and its impact on doctrine, played a major role in promoting the history and re-formation of 617 Squadron, and served on the Joint Services Command and Staff College staff. An ex-Tornado pilot and Gulf War veteran, Wing Commander Walters is now an airline pilot, but continues to serve as a Volunteer Ex-Regular Reservist, acting as directing staff on the Advanced Command and Staff Course (Reserves). Although Wing Commander Walters was unable to attend the awards ceremony at the Air Power Conference in person, he received his award from the Director of Defence Studies, Group Captain James Beldon, at an informal presentation at Shrivenham a few weeks later.



AIR POWER IN AN AGE OF ARMED HUMANITARIAN INTERVENTION

By Flying Officer Luke Botting

Biography: Flying Officer Luke Botting commissioned into the Royal Air Force as an Aerospace Battle Manager in October 2017, after having gained an MA (Hons) in International Relations from the University of St Andrews in 2016. He is currently working at the Centre for Air and Space Power Studies, from where he intends to return to post-graduate education.

Abstract: Conflicts in the immediate post-Cold War period – from the First Gulf War in 1991 to the NATO air campaign over Libya in 2011 – occurred within a fast-changing international order which prompted a reassessment by the West of their use of force. This article examines two themes which developed concurrently during the twenty years following the end of the Cold War. The first is the incorporation of humanitarian motives by Western leaders and the wider international society in their justifications for resorting to force – a development which has been conceptualised as armed humanitarian intervention. The second theme is the degree to which air power played either a supporting or supported role in such interventions. In charting the course of these themes, this article uses case studies from throughout the period and provides one possible theoretical lens of many through which to view them.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor.

INTRODUCTION

All force – air power included – is directed towards a purpose. In Clausewitzian terms, it is the continuation of political intercourse, carried on by other means.¹ The previous two Centenary series of *Air Power Review* special editions have demonstrated that trend neatly, with specific reference to the Royal Air Force (RAF). The world's first independent air force was born of a need to secure victory in a general continental war over Europe, but the nascent RAF adapted quickly to the Inter-War years by taking up the role of Imperial Policing. In the lead-up to the Second World War, the air defence of the United Kingdom took priority, while success in the Battle of Britain and the entry of the United States into the War preceded the shift of focus to strategic bombing operations. Finally, the RAF of the Cold War period was dominated by broader nuclear strategy, a series of small interventions that accompanied the UK's withdrawal from Empire, and a notable but brief expeditionary operation in the Falklands War in 1982. This is, of course, a simplified summary of the application of air power in the RAF's first century; strategic imperatives cannot be so neatly delineated nor do they exist in isolation from one another. While the RAF was developing its nuclear capabilities, for example, it was also gaining experience in low-intensity operations across the rapidly-decolonising Empire. Similarly, a focus on Fighter and Bomber Commands can detract from the vital role of Coastal Command in securing the Atlantic convoys and, by extension, the survival of the British people. Nevertheless, viewing the development of the RAF as a history of 'phases' aids the understanding of air power. It identifies *generalisable patterns* in actors' thoughts and behaviour, and then frames specific events within those patterns.² It sacrifices detailed analyses of highly-particular events, but achieves a broader understanding of systemic factors affecting the direction of thought and deed. In essence, it is a method which treats the historical process as a social science rather than an art.³

This paper will attempt to continue that pattern of analysis, examining the period of air power's development in the roughly two decades immediately following the end of the Cold War, spanning the years 1990 (and the outbreak of the First Gulf War) to 2011 (and NATO's intervention in Libya). It argues that the theme which broadly unites the various conflicts of this period is 'armed humanitarian intervention' – the threat or use of armed force against a state, its government or its *de facto* authorities in order to prevent or end egregious abuse of human rights.⁴ That this theme is used as an analytical framework does not suggest that every Western intervention was explicitly conducted in the name of humanitarianism; instead it contends that such conflicts contributed to the development of a more general strategy of armed humanitarian intervention which shaped decision-makers' action (or inaction). This paper will also explore how air power's role – and its dominance as a state's tool of first resort in the application of force – changed alongside the formation of that strategy. It will do so by examining a series of notable campaigns engaged in by Western states spanning the immediate post-Cold War period, specifically focusing on the political perception of

the concepts of humanitarianism and intervention, and on the operational application of air power.

The paper is structured chronologically, charting the life-cycle of the Western strategy of armed humanitarian intervention. Influencing this cycle is the idea of ‘permissive space’, the normative capacity of the international society⁵ to incorporate that strategy into its institutional organisation. The permissiveness of the international society to Western intervention (though not necessarily humanitarian in character) was initially realised in the First Gulf War, just as the full effects of technologically-advanced massed air power were seen for the first time. Almost immediately afterwards, in failed UN operations in Somalia and inaction over Rwanda, a humanitarian justification was engendered in Western strategic thought, and the question of how air power could be integrated with that motive was raised. The subsequent interventions in Bosnia and Kosovo represented to a large degree the maturation of a cohesive and air-centric strategy of armed humanitarian intervention, divorced from the legitimisation of UN authority. It is here in the chronology that this paper notes a shift in the international approach to Western strategy; the permissive space for intervention begins to close, hastened by US-led wars in Afghanistan and Iraq following the terror attacks of 11 September 2001. This change in the character of conflict also necessitated a change in the operational use of air power. By the time of the 2011 intervention in Libya (the first invocation of the military pillar of *Responsibility to Protect*) and a return to air-led campaigning, a normative gap had emerged which marked the end of this period of air power.

This paper attempts to cover the principle trends in the development of armed humanitarian intervention, though it does not address all major conflicts in the 20 years following the end of the Cold War. Its discussions of the conflicts in Bosnia and the 2003 invasion of Iraq are deliberately brief, so as not to detract from dedicated articles on those subjects elsewhere in this edition of *Air Power Review*; it only cursorily references No-Fly Zones over Iraq and the NATO intervention into Libya in 2011. Equally, though the UK military – especially the RAF – contributed to all of the interventions examined in this paper, it takes a more general approach which considers air power broadly; American operations and strategy are referenced frequently, to some extent recognising the US’ hegemony in shaping the post-Cold War international order. However, this does not mean that the analysis offered is irrelevant to the RAF. It is precisely *because* the UK and the RAF were involved in actioning the strategy outlined hereafter that it is vital to understand the Service’s role in this period of strategic history. Moreover, it provides the context alongside which later articles can be interpreted, as they delve into future developments in air power which will shape the next age of RAF operations.

THE FIRST GULF WAR: AIR POWER AND INTERVENTION

On 2 August 1990, Iraq’s Republican Guard crossed the border into Kuwait on the orders of Saddam Hussein.⁶ The Iraqi invasion precipitated the first major conflict of

the post-Cold War world – the First Gulf War – a war which established the supremacy⁷ of the West in general and of the US in particular. In doing so, it also demonstrated the unparalleled strength of Western air power. This example does not lend itself to the notion of armed humanitarian intervention. But, as this section will suggest, the success of the First Gulf War created the foundations for such a strategy in the period that immediately followed.⁸ It did so in two ways: firstly, it made clear the permissiveness of the international society to Western-led intervention under UN authority. Even traditional opponents on the Security Council – the Soviet Union (as it still was at the time) and China – supported or acquiesced to a coalition counter-invasion. Secondly, the campaign showed for the first time the *realistic* possibility that air power could act as *the* decisive force component in an operation. Certainly, the First Gulf War lacked a humanitarian motive; the coalition's mandate was to restore international order rather than alleviate any human rights abuses. And the air campaign was followed by a significant ground invasion of Kuwait and Iraq against a fielded force. However, in Operation Desert Storm it is possible to see the outline of a future air-centric intervention in, for example, Kosovo. Therein lies the importance of the First Gulf War to a Western strategy of armed humanitarian intervention.

The moral authority to intervene in the Gulf set a precedent for Western states. That authority was granted by the UN Security Council, which first reacted to Iraq's invasion of Kuwait by issuing Resolution (UNSCR) 660. Within, the Council condemned Iraq's actions as a 'breach of international peace and security' and demanded its withdrawal from Kuwait.⁹ Saddam ignored it, prompting a series of further resolutions designed to compel him to comply with UNSCR 660. UNSCR 661, for example, imposed international sanctions on Iraq,¹⁰ while UNSCR 665 enacted a naval blockade to enforce them.¹¹ The culmination of the Security Council's efforts was UNSCR 678, which invoked Chapter VII of the UN Charter,¹² authorising 'all necessary means' (in other words, the use of force) to 'restore international peace and security'.¹³ Importantly, this did not provide a humanitarian basis for the coming counter-invasion. The reference to 'international peace and security' was rooted within the UN Charter itself which, other than a brief mention in the preamble, does not base its purposes and principles on human rights. It explicitly defines its role as defending the sovereign equality and territorial inviolability of *states* rather than persons.¹⁴ In the tradition of UN missions up to this point (none of which had invoked Chapter VII's authority to use force, but which were loosely termed 'chapter six-and-a-half' operations), the restoration of Kuwait's sovereignty would be undertaken in the name of the stability of the international society rather than for concerns over human security.¹⁵ Furthermore, neither of the main Western architects of the response – the UK and the US – were motivated by humanitarian impulses. The UK Prime Minister, Margaret Thatcher, sought to secure the global oil supply from Iraqi dominance.¹⁶ President Bush, also cognisant of the resource dimension, did not want Iraqi expansion to accelerate the development of military capabilities, especially of nuclear weapons.¹⁷ Neither the international

society nor the West treated Iraq's invasion of Kuwait as much more than a matter of violated sovereignty; humanitarianism was not a motivating factor. And yet the relative diplomatic ease with which the West had gained the authority to intervene in an area once denied to them by Cold War politics allowed them to believe that intervention was now a readily-available tool of foreign policy.

That the First Gulf War represented a new political precedent for the West was best summed up by US Deputy Secretary of State Lawrence Eagleburger, who noted that it was 'the first test of the [post-Cold War] system'.¹⁸ That test yielded one result above all others: the new international environment – characterised by universal American hegemony – was now permissive of intervention. The diplomatic capability of the West to deploy force was no longer constrained by the geopolitical considerations of a bipolar international society calibrated by the existential threat of a nuclear conflict.¹⁹ The Soviet Union had instead, for the first time, publicly supported Western military action by condemning Iraq and backing every relevant Security Council resolution (although there was significant debate in Moscow over so sharp a change in foreign policy).²⁰ China too, weakened by the politically-embarrassing Tiananmen Square protests,²¹ tacitly consented to the intervention by abstaining on (rather than vetoing) key resolutions and enforcing the sanctions regime against Iraq.²² As much as this approval was welcome amongst Western leadership, it must be remembered that it was given under the specific context of UNSCR 660. The Soviet Union and China were both supporting an enforcement operation intended to uphold the peace and security of the international society – nothing more. This caveat constituted the limit to the permissive space for intervention, but it was a limit which Western leaders appeared not to recognise. In a period of liberal-democratic ascendancy, it would be easy for them to conflate legitimisation of a particular intervention for wider authority in deploying force globally.

In the immediate response to Iraq's invasion of Kuwait, though, Western leaders were engrossing themselves as much in *how* their counter-invasion would proceed as they were questioning *whether* it ought to. The decisions made now would develop alongside ideas of armed humanitarian intervention, providing the ways of achieving that strategy's ends. Specifically, they would establish air power as a dominant force component in future operations. Although primarily a US affair, other coalition states, including the UK, were fully integrated in the military planning process by mid-September (they had waited for UNSCR 678 to be passed by the Security Council before preparing for offensive operations, though the RAF had already deployed Tornado F2s to Saudi Arabia within nine days of the Iraqi invasion of Kuwait).²³ Because of that late entry (US Central Command's Air Force Component had begun planning on 3 August 1990),²⁴ UK efforts were largely incorporated within the approach already underway in the US Air Force's Checkmate Office in Washington and the Black Hole planning cell in Riyadh. Checkmate produced a concept of operations which they named *Instant Thunder* in deliberate rebuke to the gradualism inherent in the Vietnam War's *Rolling*

Thunder.²⁵ *Instant Thunder* had two core elements. The first derived from Checkmate's then-chief, Colonel John Warden, whose 'concentric rings' theory suggested that by targeting an enemy's leadership, key resource-production sites, infrastructure and population (what would be called 'strategic targets'), an air campaign could leave fielded forces isolated and deprive them of the capability and will to effectively employ force.²⁶ The second element stated that these strategic targets should be attacked with rapid application of overwhelming force.²⁷ Western air forces were well-placed to pursue this approach, possessing well-trained crews and technological superiority over their rivals (specifically, low observability aircraft, precision guided munitions, night-fighting capabilities and effective command and control).²⁸ Moreover, *Instant Thunder* would attempt to exploit Iraq's weaknesses, in particular its centralised air defence system and command, control and communications (C3) network, both of which provided ample strategic targets for any air campaign.²⁹

Instant Thunder developed towards the end of 1990, eventually becoming the air campaign plan for the overall US Operation Desert Storm, though the original plan's basic elements were left intact. It was immediately successful. By the end of the first day of the air campaign, on 17 January 1991, Iraqi C3 was crippled and the air defence system was breached in multiple places. RAF Tornados had targeted Iraqi radar equipment with air-launched anti-radiation missiles (ALARM) and had flown low-level attack runs, deploying JP233 cluster munitions to deny runways to enemy interceptors.³⁰ By the close of the war, the UK would have conducted around 5% of the coalition's combat sorties³¹ and, alongside their partners, enjoyed total air superiority in medium and high altitudes, a greater success than even the air planners had anticipated.³² Around a month later, on 24 February 1991, when the ground offensive was launched, significant numbers of Iraqi troops in Kuwait – up to half, by some counts – had either deserted or chose to surrender to coalition forces as a direct result of the air bombardment.³³

Nor was air power's role limited to combat strikes. Its utility was immediately recognised by coalition planners as it permitted rapid worldwide troop deployment in response to the outbreak of the crisis in the Gulf. Western leaders had been concerned that Saddam's invasion of Kuwait would be followed by further advances towards Saudi Arabia's oil fields, a possibility which could only be prevented through the deterrent effect of ground troops (who could also defend forward airfields).³⁴ An airlift of two US brigades into Saudi Arabia within eight days of one another in August 1990 averted more potential Iraqi aggression, as did the prompt arrival of F-15s to establish continuous combat air patrols along the Saudi-Kuwaiti-Iraqi border.³⁵ That speed of deployment was recognised in the official post-war report to Congress, which stated that the 'rapid buildup of crucial forces during these initial days would have been impossible without strategic airlift'.³⁶ The early use of air power extended to other roles, too, particularly intelligence, surveillance and reconnaissance. Maritime patrol aircraft –

including three RAF Nimrod MR2s – provided support to coalition naval forces enforcing the UN-mandated naval blockade of Iraq, and over the course of the conflict expanded their role to include search and rescue operations and anti-surface warfare as well.³⁷ And combat sorties themselves were supported by rear echelon aircraft – mainly UK and US E-3 AWACS (Airborne Warning and Control Systems) – providing airborne command and control services from Saudi airspace.³⁸

Air power contributed to a plethora of tasks in the First Gulf War. Much of this was by design, but its effectiveness exceeded the expectations of coalition planners. It was expected that the ground offensive would be the decisive phase of Operation Desert Storm and that the air campaign, though it might degrade Iraqi fighting capability, would not prevent the need for large land battles.³⁹ In other words, air power was to be the *supporting* element of a ground-centric campaign. However, when coalition armies entered Iraq and Kuwait, they were faced with an enemy that had been shattered by more than a month of aerial bombardment.⁴⁰ The coalition consequently suffered far fewer casualties than had been planned for; the US, the largest single force contributor, had expected to lose thousands of troops, but ultimately lost only 63.⁴¹ Nor did air power need to support ground forces to the extent anticipated. Many planned close air support sorties were diverted to conduct deep interdiction strikes, based on the assessment that front-line Iraqi forces had already been degraded to a great extent.⁴² It seemed that air power had defeated Iraq; the ground offensive, though it encountered some resistance from the remnants of Saddam's elite Republican Guard, served mainly to push the defeated enemy out of Kuwait in accordance with the mandate enshrined in UNSCRs 660 and 678. That is not to say that the ground element's role in Operation Desert Storm was negligible. Indeed, by engaging directly with Iraqi troops it was able to enforce the political solution which air power could not.⁴³ Nevertheless, air power demonstrated a level of decisiveness which had been denied to it in the past by the limitations of technology. This conclusion – and its implication for less costly future interventions – was not lost on Western leaders.⁴⁴ Before the operational potential of air power could be fully integrated into a broader international strategy, though, it would have to be developed through experience.

SOMALIA AND RWANDA: AIR POWER AND ITS LIMITATIONS

The First Gulf War was followed almost immediately by a succession of crises, broadly characterised by their internecine nature and egregious human suffering. Two in particular are explored in this section, being used to chart the initial difficulties of aligning the West's emerging interventionist strategy with humanitarian motives. They also exhibit the difficulties of integrating air power into what would become known as armed humanitarian intervention. The first of these crises mixed food insecurity in Somalia with political collapse and civil war. The Western response to Somalia's disintegration was couched within the UN system – one which had been designed to contend with inter-state conflicts rather than civil upheaval – and led to three poorly-

executed operations between 1992 and 1995. The failure of these operations exposed the limits to the nascent strategy of armed humanitarian intervention⁴⁵ and how force was mis-employed in support of that strategy. Western involvement also demonstrated the interaction between air power, humanitarian catastrophe and modern media in what was known as the 'CNN Effect' (wherein public reaction to images of suffering could influence official policy), a vital determinant of action which would exacerbate a rift between operational methods and strategic goals.⁴⁶ The second crisis explored in this section is the Rwandan Genocide of 1994. Like Somalia, the atrocities in Rwanda would inspire a desire to incorporate humanitarian goals into a strategy of armed intervention. That no significant action was taken by the West (with the exception of minor contributions to the weak UN mission there, and a small French force towards the end of the genocide) could be interpreted as a negative reaction to events in Somalia. But even the proposed responses suggested that air power alone would be inadequate in effecting a successful armed humanitarian intervention into a situation which relied on the speedy application of force. These tragedies of the early-1990s have become infamous as failures of a humanitarian international strategy, but they are better examined as the first steps towards that ultimate goal.

The political implications of the failure of armed humanitarian intervention in Somalia to Western strategy were twofold. It suggested, firstly, that a robust response to a crisis was needed from the start, and, secondly, that a permissive international society did not translate into public support. But it also officially incorporated humanitarian concerns into the post-Cold War institutions of international society. The UN had first entered Somalia with UNOSOM-I (the United Nations Operation in Somalia), responding to UNSCR 733 which had not only noted Somalia's disintegration as a threat to international peace and security in the region, but also explicitly called for 'all parties...to facilitate the delivery [and] contribute to the efforts of humanitarian assistance' there.⁴⁷ UNOSOM-I's objectives were therefore to monitor a tentative ceasefire between warring militias in the capital, Mogadishu, as well as to facilitate the distribution of humanitarian aid in order to combat a worsening famine.⁴⁸ The force's objectives and its mandate show that the motives for the operation were at least partly rooted in a concern for human security, though the stability of the region remained an important determinant. However, UNOSOM-I was under-resourced and granted too little power from the start – its small number of peacekeepers were not able to enforce the ceasefire or to move freely around Mogadishu.⁴⁹ Their mandate was too restrictive for the reality of the situation which confronted them. Facing the aggravation of Somalia's humanitarian crisis, the UN replaced UNOSOM-I with UNITAF (Unified Task Force), a UN-authorized but US-led multinational force with troop contributions from mainly Western countries, including the UK. UNITAF, unlike its predecessor, was granted enforcement powers under Chapter VII of the UN Charter, with the right to employ 'all necessary means [i.e. force] to establish as soon as possible a secure environment for humanitarian relief operations in Somalia'.⁵⁰ As much as the First Gulf War had demonstrated to Western

leaders the permissive space for intervention in general, UNITAF's mandate revealed to them the permissive space for armed *humanitarian* intervention more specifically – parts of Africa which had only recently been closed to any such action by the power politics of the Cold War were now able to host military forces with the consent of the Security Council.⁵¹ It was a significant step in legitimising a Western strategy of armed humanitarian intervention.

If UNITAF represented a strategic step-change in Western post-Cold War foreign policy, it exposed the operational difficulties in its development. The UN Secretary General, Boutros Boutros-Ghali, had deliberately granted UNITAF enforcement powers to counteract the weaknesses of UNOSOM-I. Specifically, he intended those powers to be used to: disarm the Somali militias, and to extend the UN's authority over the whole of Somalia (not just Mogadishu and its environs).⁵² The overarching plan would be to then transfer control for UN operations in Somalia to a strengthened UNOSOM-II,⁵³ which would also be granted enforcement powers in support of a wide-ranging state-building mandate.⁵⁴ However, the US commanders of UNITAF interpreted their objectives more narrowly than did Boutros-Ghali. They reasoned that to alleviate food shortages in Mogadishu presupposed an improved security environment. They therefore determined to withdraw as soon as famine had been quelled, without disarming local militia.⁵⁵ Consequently, when UNITAF exited Somalia in May 1993, it left behind a more secure but still highly unstable situation in Mogadishu. UNOSOM-II (which also included US, UK and other Western troop contingents) now worked to implement Boutros-Ghali's desired outcome. They engaged in heavy ground fighting from 12 June 1993 (a departure from UNITAF's approach), culminating with the infamous Battle of Mogadishu on 3 October 1993 (immortalised in the film *Black Hawk Down*), in which US forces not under UN authority were evacuated from the Somali capital with the help of Malaysian and Somali UN peacekeepers after suffering numerous casualties.⁵⁶

The Battle of Mogadishu, and the fighting which had preceded it, led to the negative implementation of the 'CNN Effect'. Already, public reaction to media coverage of Somalia's crisis had guided the international response to intervention. Images of victims of the famine had prompted the deployment of UNOSOM-I in the first place, arguably over the needs of increasingly dire situations in Liberia and the former Yugoslavia.⁵⁷ The ineffectiveness of that operation was visible to Western publics, whose domestic pressure on their own governments was eventually felt by Boutros-Ghali, necessitating UNITAF's robust mandate.⁵⁸ Now, UNOSOM-II's use of force was being broadcast around the world. The descent of an allegedly humanitarian operation into an urban campaign and the sight of the mutilated bodies of US servicemen being dragged through the streets of Mogadishu turned the pressure onto the US President, Bill Clinton.⁵⁹ He unilaterally ordered the withdrawal of all US troops from UNOSOM-II by March 1994,⁶⁰ fatally undermining the operation. European governments followed the US policy and extricated themselves from the disintegrating situation in Somalia.⁶¹

Lacking the necessary resources to continue, the Security Council terminated UNOSOM-II's mandate on 31 March 1995.⁶² The operational approach to the various missions in Somalia had proved detrimental to a strategy of armed humanitarian intervention there. It was evident that weak mandates, tentative action and the deaths of troops had sapped domestic support for the intervention, in spite of an international desire to resolve the crisis. For the West, the failures of Somalia negated the negligible losses of the ground campaign of the First Gulf War. The notion of placing 'boots on the ground' was discredited; operational means would have to be better aligned with strategic ends if armed humanitarian intervention were to form the basis of future Western foreign policy.

This revelation was to an extent supported by the operational employment of air power during the intervention in Somalia. Its role was limited, as were its effects. Other than for logistics, neither UNOSOM-I nor UNITAF made much use of air power, being as they were ceasefire monitors and food distributors. It was with the transfer of authority from UNITAF to UNOSOM-II that aircraft were utilised offensively against Somali militia in Mogadishu. In a scaled-down application of the principles employed in *Instant Thunder*, planners intended to attack strategic leadership and key production targets in the capital.⁶³ Combat sorties, mostly comprising fixed-wing or helicopter gunships – especially the US AH-1 Cobra – did prove effective in striking weapons caches and command centres,⁶⁴ although they notably failed to achieve the strategic effect of killing the most influential Somali warlord, Mohamed Farah Aidid,⁶⁵ due to incorrect intelligence on his whereabouts.⁶⁶ Aircraft were also employed in support of special operations directed against militia leadership. The infamous Battle of Mogadishu was a heliborne assault of US Rangers against Aidid, but unanticipated low-level anti-air fire resulted in the loss of two UH-60 Blackhawks. Somali opposition also prevented aerial evacuation, leading to the envelopment of US ground troops and the subsequent death of 18 soldiers (as well as 78 wounded).⁶⁷ Were it not for the intervention of MH-6 Little Bird attack helicopters providing close air support, it is almost certain that US ground troops would have been overrun entirely before a column of UNOSOM-II armoured vehicles could relieve them.⁶⁸ Air power, then, achieved mixed results. Its attack capabilities were effectively employed to disorientate the country's largest militia – a success which could have been exploited to positive effect by more proactive efforts by UNOSOM-II.⁶⁹ But its vulnerabilities were displayed very visibly in the assault into Mogadishu, denting Western public support for the wider concept of an armed humanitarian intervention in Somalia.⁷⁰

That legacy of Somalia – one of failure – had an almost immediate impact on another humanitarian catastrophe which was unfolding elsewhere in Africa. On 6 April 1994, just one month after the withdrawal of Western troops from UNOSOM-II, the Rwandan Genocide began. Despite notable inaction by Western leaders during the atrocities, the crisis did rekindle support for a strategy of armed humanitarian intervention and suggested two characteristics of air power which could prove decisive in operationalising

such a policy: speed and reach. Ultimately, no intervention was mounted into Rwanda. The two major actors on the Security Council during the genocide – the UK and the US – feared that involvement would lead to a repeat of the problems experienced in Somalia.⁷¹ They also refused to launch an aerial re-supply of the under-resourced UN peacekeeping force in Rwanda, out of concern for the threat to their aircraft⁷² – another ‘lesson’ of UNOSOM-II. However, this approach did to some extent wipe the memory of Somalia’s failures from the collective Western mindset. The genocide was allowed to reach its conclusion with relative impunity; the UN mission was powerless to intervene, while Belgian and French operations were minimal.⁷³ In light of so tragic an outcome, the desire in the West to pursue a strategy of armed humanitarian intervention was revived.⁷⁴ In a reversal of the previous year’s events, the ‘CNN Effect’ (despite being unable to incite a positive intervention into Rwanda) revealed in graphic detail the results of non-intervention.⁷⁵ To the extent that the UK and the US did involve themselves with Rwanda, it was in reconnaissance and airlifting of humanitarian supplies to the country after the genocide. The RAF deployed a single Canberra PR9 under Operation Purposeful, providing accurate intelligence of the refugee flows within Rwanda. Similarly, Operation Support Hope made widescale use of air transport capabilities to quickly bring humanitarian relief to a post-crisis landlocked country with little developed infrastructure. It was an impressive display of air power, involving American transport aircraft flying from the continental US and being refuelled by UK-based USAF tankers.⁷⁶ That the Rwandan Genocide had been allowed to happen prompted a rebuke to Western non-intervention. However, the fact that minor support operations were made possible only through air power’s speed and reach reinforced its role in facilitating a strategy of armed humanitarian intervention.

Despite the clarity with which these developments can be assessed after the events, the humanitarian disasters of the early 1990s indicated that the West did not yet operate a coherent strategy of armed humanitarian intervention. Certainly, the permissive space for intervention had been identified, and the moral desire to act in support of human security was now kindled. Moreover, air power had variously demonstrated its speed of deployment, global reach and accurate firepower. But these factors were yet to be integrated. The result was a display of serious limitations to the still-burgeoning strategy – limitations which were acutely visible to Western publics. It was ironic, then, that Lawrence Eagleburger, who had been briefly promoted to US Secretary of State at the end of President Bush’s term of office, viewed the intervention in Somalia as a distraction from the UN’s failings in Bosnia.⁷⁷ For it was the failures in Bosnia which would provide the impetus for a cohesive, Western, air-centric strategy of armed humanitarian intervention.

BOSNIA AND KOSOVO: AIR POWER AND HUMANITARIANISM

The UN’s intervention in Bosnia, UNPROFOR (the United Nations Protection Force), was marked by its inability to prevent serious ethnic cleansing of Muslim Bosniaks by the

Bosnian Serb Army.⁷⁸ It necessitated significant NATO involvement, culminating with Operation Deliberate Force, an alliance campaign of aerial bombardment alongside a ground offensive by Bosnian Croat forces. That operation finally arrested the human rights abuses in Bosnia and paved the way for the subsequent diplomatic resolution of the conflict, the Dayton Peace Accords. It also affected the broader strategy of armed humanitarian intervention, taking responsibility for enforcement out of the hands of the UN and offering an alternative NATO-led air-centric response instead. In the years between Operation Deliberate Force in 1995 and Operation Allied Force – the NATO intervention in Kosovo in early 1999 – those insights, along with the lessons of previous interventions of that decade, were amalgamated into the latest form of the West's strategy of armed humanitarian intervention. Operation Allied Force was the manifestation of that strategy, and to that extent represented the ascendancy of air power as a tool of Western foreign policy. But, as with every other such operation, it was inherently flawed. This section will therefore suggest that even at the zenith of its development, the strategy of armed humanitarian intervention could not effectively operate in the changing international society, and that from 1999 onwards, it was largely in decline in Western political thought.

UNPROFOR undermined the West's faith in the UN as the primary means of implementing armed humanitarian intervention. As had happened under UNOSOM-I, it was neither adequately resourced nor given the appropriate powers to protect civilians in designated safe zones, as per its mandate.⁷⁹ NATO did deploy a small ground-based Rapid Reaction Force to support UNPROFOR in its mission, but that too was stifled by a restrictive command and control structure which incorporated the UN as an authority-holder.⁸⁰ Where NATO was able to have a greater effect in preventing human rights abuses was in the air. It had been conducting Operation Deny Flight since 1993 to enforce a UN-mandated No-Fly Zone over Bosnia,⁸¹ but, like the Rapid Reaction Force, this mission was hindered by the political constraints of working alongside the UN. Operation Deny Flight notably failed to prevent the massacre of Bosniaks in Srebrenica by Serb forces, the official UN report citing concerns over the boundaries of the peacekeeping mission itself, as well as the safety of the lightly-armed Dutch peacekeepers on the ground.⁸² NATO therefore escalated their air power involvement in 1995, launching Operation Deliberate Force on 30 August of that year. This new mission was to be an offensive air campaign against the Bosnian Serb Army designed to force them into negotiations with the other parties to the conflict.⁸³ By November, it had succeeded, and the Dayton Peace Accords were underway.⁸⁴ Operation Deliberate Force was not acting in isolation. Croat ground troops had been engaged in a major offensive against the Bosnian Serbs. It was likely the combination of this with NATO's air campaign which defeated the latter – Operation Deliberate Force was essentially supporting the unfolding situation on the ground.⁸⁵ However, air power had been 'a decisive factor in [NATO's contribution to] ending the 1992-95 Bosnian Conflict'.⁸⁶ Indeed, it had always been considered as the most likely operational approach for

‘[getting] results from what may have been NATO’s last bolt in Bosnia’, after the ineffectualness of its ground presence.⁸⁷ Air power had been employed in other roles prior to Operation Deliberate Force, but it was the robustness of the air bombardment and its quick success in ending the humanitarian crisis which endeared it to Western leaders. Bosnia, then, established the framework of how a Western strategy of armed humanitarian intervention would be operationalised in the future: non-UN forces would rely on the robust application of force by air power.

That template was actioned in another Balkan intervention four years later. In 1999, European governments (with mild support from the US) were attempting to avert a potential genocide against ethnic Albanians in the Serbian-owned province of Kosovo. At the helm of this effort was the UK Prime Minister, Tony Blair, who elucidated most clearly a Western strategy of armed humanitarian intervention (or, as he called it, the ‘Doctrine of the International Community’) in a speech to the Chicago Economic Club on 22 April 1999.⁸⁸ From the political perspective, it was an integration of two long-standing approaches to international relations: just war theory and classical realism. Blair argued that the international community had a moral obligation to intervene in other states to prevent or halt egregious human rights abuses. He caveated this obligation with certain limits, including the requirement for legitimate authority and reasonable prospects of success. And he also suggested that any such interventions should involve some degree of national interest on the part of interveners, in order to sustain the political will to reach a conclusion.⁸⁹ As he spoke, RAF aircraft were striking targets in Serbia on his orders, alongside other NATO aircraft as part of a wider NATO intervention in the country: Operation Allied Force. Blair, who viewed the campaign as part of his ‘Doctrine of the International Community’, provided the will to action, while the US offered the majority of the resources which made it possible.⁹⁰

Operation Allied Force was designed in the image of its precursor in Bosnia, Deliberate Force, though notably without any ground presence which, it was feared, would destabilise the alliance.⁹¹ It was intended to be a short campaign – only a few days at most – but intense. Planners envisaged debilitating strikes against a limited number of Serbian military targets, after which the Serbian government under Slobodan Milosevic would request a ceasefire and re-enter negotiations over Kosovo’s political status.⁹² But despite the aggression of the initial NATO air campaign, far more robust than any humanitarian intervention of the past decade, it was wrought with difficulties. Planners had underestimated the importance of Kosovo to the Serbian military and people, and their target selection was hampered by political disagreements between the leaders of NATO’s member states. This meant that the level of force directed against Serbia was, at first, insufficient to coerce them into returning to negotiations with the West.⁹³ Yet there was serious concern that if the air campaign were to expand its target list beyond military forces – the sort of strategic targeting that had formed the core of Operation Desert Storm – it would inspire a form of negative ‘CNN Effect’ in

Western public opinion, turning the operation from an armed humanitarian intervention into ‘terror bombing’ of Serbia by NATO.⁹⁴ Nonetheless, the Western leadership was keen to see results, and the air campaign was consequently expanded to include strategic targets in and around Belgrade, including key production industries and infrastructure (this was the approach desired by the Combined Force Air Component Commander, USAF Lieutenant General Michael Short, from the beginning of Allied Force).⁹⁵ Escalation eventually brought Milosevic to negotiations, though not without a concerted diplomatic effort accompanying the intervention and the initiation of planning for a ground invasion.⁹⁶ On 10 June 1999, air strikes against Serbia were halted. The same day, the Security Council passed UNSCR 1244, establishing UNMIK (the United Nations Interim Administration for Kosovo).⁹⁷ It would be supplemented two days later by KFOR (Kosovo Force), a NATO peacekeeping mission intended to maintain the security which Operation Allied Force had introduced to Kosovo.⁹⁸ The NATO intervention had been extremely aggressive. It had lasted for 78 days, far longer than initially planned, during which time 38,400 sorties were flown (60% by the US), of which 10,484 were strike sorties (80% by the US) and a total of 26,614 air munitions were expended.⁹⁹ Operation Allied Force was the air-centric armed humanitarian intervention towards which Western thought had been gravitating for the previous decade.

That is not to say that it transpired smoothly. The Kosovo Report questioned whether the intervention did alleviate ethnic cleansing in the province, noting that huge population displacement did occur and that up to 10,000 Kosovars were killed, while many more were wounded, raped or assaulted.¹⁰⁰ It is difficult to judge whether the human suffering would have been even greater had NATO not intervened, but the campaign can claim some success in having forced Milosevic to an accord which granted autonomy to Kosovo and withdrew Serbian military and police units from its territory.¹⁰¹ A more ominous weakness of Operation Allied Force was that it closed off the permissive space which had made it possible in the first place. Co-operation within the international society had heretofore placed armed humanitarian intervention at the heart of the legitimate use of force. But NATO had exploited the goodwill underpinning that approach. It had endeavoured to act so swiftly against Serbian abuses in Kosovo that it had pre-empted any UN authorisation for its actions. It was to a degree vindicated by the post-conflict Kosovo Report, which famously called the intervention ‘illegal but legitimate’,¹⁰² and its subsequent inclusion alongside the UN in the peacekeeping process.¹⁰³ But, ultimately, NATO’s air campaign raised questions about how the West’s strategy of armed humanitarian intervention could be reconciled with traditional principles of state sovereignty.¹⁰⁴ Moreover, it eroded trust between the West and Russia and China, both of which were deeply troubled by what they perceived to be NATO’s aggressive posture in a country beyond its own collective borders.¹⁰⁵ Indeed, the Russians had attempted consistently throughout the intervention to bring the fighting to an end through their own diplomatic initiatives.¹⁰⁶ Though more profound divisions in the international society were on the horizon, the aftermath of the Kosovo intervention

hinted that the West's freedom to develop its strategy of armed humanitarian intervention was about to be rapidly curtailed in the face of international opposition.

Nor did Operation Allied Force necessarily represent the dominance of air power as a tool of force in international relations. The air campaign over Kosovo occurred in a unique context. Massive quantities of air power could be rapidly deployed because of the proximity of Serbia to NATO's European infrastructure.¹⁰⁷ Selection of both strategic and tactical targets was relatively easy (political micro-management aside) thanks to Serbia's developed state, prevalence of infrastructure, and conventional fielded forces (although prosecuting Serbian fielded targets in Kosovo once they had been selected was to prove difficult).¹⁰⁸ And Western strategy could still be employed within a permissive environment in the lead-up to the conflict.¹⁰⁹ But these factors were not immediately transferrable to other cases of humanitarian emergency. Western forces (notably not under the control of the UN, but operating with its authority) would conduct two further armed humanitarian interventions in the immediate aftermath of Operation Allied Force. In neither instance did air power play as decisive a role as it had done over Kosovo and Serbia, and in both cases ground troops were relied upon as the primary *supported* element.

The first of these interventions occurred in East Timor from late-1999 to early-2000. INTERFET (International Force for East Timor) was a UN-authorised, Australian-led multinational force deployed to the territory to assist its transition to independence. Air power was used sparingly, relying on Royal Australian Air Force and Royal New Zealand Air Force C-130s, Caribous and F-111s for transport, reconnaissance and deterrence against Indonesian intervention.¹¹⁰ The UK's contribution to INTERFET – primarily elements of the Royal Gurkha Rifles¹¹¹ – was indicative of a preference amongst the Western states of the coalition for a physical ground presence as the best way to restore stability to the area. Furthermore, unlike in the NATO intervention in Kosovo, INTERFET was deployed in support of a political solution which had already been reached,¹¹² obviating the need for a significant application of force which had been required to bring Milosevic to negotiations.¹¹³ The second operation in which air power was relegated to a *supporting* role was the UK intervention in Sierra Leone in 2000, in support of a faltering UN operation there. Intervening in a civil war against a poorly-equipped and -trained enemy in difficult terrain, air involvement was limited to intelligence, surveillance and reconnaissance, performed by thirteen Harrier GR7s operating off HMS *Illustrious*.¹¹⁴ Additionally, the operation saw C-130s and Chinooks used in the air transport role and in direct support to special forces (indeed, special forces Chinooks facilitated Operation Barras, a hostage-rescue mission whose success fatally undermined rebel forces).¹¹⁵ Both the INTERFET mission in East Timor and the UK intervention into Sierra Leone were successful in that they respectively preserved and restored peace without undue disturbance to the international order. Interestingly, too, both handed post-conflict duties over to UN missions (the same template which had

been employed in Kosovo). But neither had made as extensive use of air power as NATO had done in either Bosnia or Kosovo. It seemed that a strategy of armed humanitarian intervention did not require air-centric campaigns as a prerequisite to success.

However, by the turn of the millennium, a Western strategy of armed humanitarian intervention was apparent, the result of an eventful development over a decade of conflicts. Moreover, air power had at least demonstrated that it could, in certain circumstances, be the decisive force component in a given campaign, as it was in Bosnia and Kosovo. Neither of these developments in international relations was without its limitations: in the smaller interventions in East Timor and Sierra Leone, air power was not the defining contribution to military success, and the 1999 campaign in Kosovo and Serbia had engendered some opposition to the broader strategic direction of Western foreign policy. But efforts were being made to better integrate armed humanitarian intervention into the institutional processes of the international society, most notably by the *International Commission on Intervention and State Sovereignty*,¹¹⁶ the *Independent International Commission on Kosovo*,¹¹⁷ and the UN-led *Panel on United Nations Peace Operations*.¹¹⁸ It would take a significant shock to global politics to alter the West's strategic trajectory.

AFGHANISTAN AND IRAQ: AIR POWER AND REALIGNMENT

The 11 September 2001 terror attacks not only brought unheralded tragedy to the US. They also altered the dynamics of the international society. Western strategy, which had been focused around armed humanitarian intervention up to that point, required a radical re-evaluation in the face of a changing balance of threats. This final section explores the invasions and post-war counter-insurgencies in Iraq and Afghanistan and their implications for humanitarianism and air power. It argues that the permissive space for armed humanitarian intervention was closed following those campaigns, the result of a normative gap between certain interventionist Western states and purportedly non-interventionist rivals (compounded by disagreements between Western governments). It also touches on how air power reacted to the growth in ground-centric counter-insurgency as a result of strategic realignment. In the wider context of a Western strategy of armed humanitarian intervention, this second decade of the post-Cold War years represents a decline in support for – but not the end of – the concept.

The invasion of Afghanistan under US Operation Enduring Freedom began on the evening of 7 October 2001. It involved waves of US bombers (B-1B Lancers, B-2 Spirits and B-52 Stratofortresses), fighters (F-14s and F/A-18s), electronic attack aircraft (EA-6Bs) and Tomahawk cruise missiles (also launched by Royal Navy submarines). These were supported by C-17s which air-dropped supplies to Afghans fleeing cities, and by US KC-135 and KC-10 and RAF Tristar and VC10 tankers.¹¹⁹ Their targets were Taliban early warning radars, command and control sites and Al Qaeda training camps,

with the stated objective of securing air supremacy in order to provide unmolested assistance to Northern Alliance ground forces and create conditions for future US and allied intervention in Afghanistan.¹²⁰ Following the design of Operations Desert Storm and Allied Force in Iraq and Kosovo, Operation Enduring Freedom opened with an overwhelming application of force against enemy air defences. But beyond that opening phase, no strategic targets were identified or attacked. Instead, large numbers of ground forces were deployed as part of an effort to rebuild Afghanistan and support a post-Taliban government (they also pursued such open-ended objectives as '[preventing] the re-emergence of terrorism and [providing] support for humanitarian assistance efforts').¹²¹ In reality, this amounted to an unforeseen and lengthy counter-insurgency campaign. US and, subsequently, NATO commanders (the International Security Assistance Force – ISAF – superseded Enduring Freedom from December 2001) quickly realised the doctrinal issues of applying air power in this new operational environment. In early efforts, air power was not employed effectively: for close air support of ground troops; for intelligence, surveillance and reconnaissance across the country's mountainous terrain; or for attack against dispersed and well-concealed Taliban and Al Qaeda forces.¹²² These shortfalls prompted a shift in operational thinking amongst NATO air planners, such that concepts of air-land integration (ALI) took prominence over strategic targeting. The transformation of air power into a supporting role proved successful, with the British Army suggesting that 'the military has emerged from a 10-year campaign highly proficient in ALI'.¹²³ Compared to the air-centric campaigns in the First Gulf War and Kosovo, though, it represented a significant decline in air power's dominance as a force component.

Less successful were the strategic ends to which air power was employed in the Afghanistan War. The motivation for Western action no longer presupposed a humanitarian purpose but centred around traditional notions of self-defence (expanded to include counter-terrorism) and international stability. In the immediate aftermath of the terror attacks of 11 September 2001, the Security Council passed UNSCR 1368, which defined terrorism as a threat to international peace and security.¹²⁴ It also authorised 'all necessary steps' in response.¹²⁵ The following month, NATO invoked Article 5 of the North Atlantic Treaty,¹²⁶ permitting 'individual or collective self-defence' to 'secure or maintain the security of the North Atlantic area'.¹²⁷ Certainly, conspicuous efforts were made during the initial phases of Operation Enduring Freedom to accommodate humanitarian concerns in the air campaign, largely by air-dropping blankets and food to Afghans fleeing the bombing,¹²⁸ but the documented international response to the 11 September attacks shows that the purpose of intervention into Afghanistan was evidently to prevent further terror attacks against the US or its Western allies, not to alleviate any perceived human rights abuses. Even after US forces handed responsibility to ISAF – a UK-conceived mission – human rights were never explicitly stated as the aim of the Western presence there. Resolution 1386, which established the international force, was simply 'welcoming [of] developments in Afghanistan

[towards] inalienable rights and freedom' and stressed that 'all Afghan forces must adhere [to] human rights law'.¹²⁹ Its *actionable* clauses limited international assistance to 'the maintenance of security in Kabul and its surrounding areas' in support of the Afghan Interim Authority.¹³⁰ Beyond taking an approach which treated humanitarianism as a secondary issue at best, the war in Afghanistan also demonstrated a trend in Western foreign policy that would come to worry other states and, consequently, reduce the permissive space for further intervention. USAF General Wald, the Combined Force Air Component Commander in Operation Enduring Freedom, explicitly noted in his mission statement that the aim of the initial bombing campaign against Afghanistan was to 'set the conditions for regime removal and long-term regional stability'.¹³¹ The intervention did not yet dramatically split the international society, but it did set the precedent for a new Western strategy which prioritised the security of states over humanitarian concerns (regardless of how rationally threats to security had been assessed) and conflated regional stability with regime change.

That new strategy would visibly divide international opinion in a second intervention into Iraq in 2003, led by US, UK and Australian forces. The 2003 intervention exacerbated the changes to Western strategy and air operations which had been implemented in Afghanistan. In doing so it significantly reduced the scope for *any* future Western intervention (humanitarian or otherwise) and accelerated the realignment of air power towards ALI and away from strategic targeting in the second post-Cold War decade. A discussion of UK air power's role in the conflict – Operation Telic – appears elsewhere in this journal, but of concern to this paper's argument is the justification provided for the intervention. It is notable that the Western countries involved offered different reasons for action. The American government argued that they were acting (without explicit UN authorisation) in 'preventive self-defence', lest Iraqi weapons of mass destruction be targeted against the US, particularly through state-sponsored terrorism.¹³² The UK and Australian governments referred back to UNSCR 678 which had authorised the use of force against Iraq in Kuwait, and extended that mandate to a continued right of collective security against Saddam's Iraq in 2003.¹³³ They also claimed that they had the right to use force to apply Security Council resolutions (notably UNSCR 1441 which stipulated 'serious consequences' should Iraq not comply with an inspections regime)¹³⁴ even if those resolutions did not explicitly authorise such force.¹³⁵ Whatever the merits of their arguments, the UK, American and Australian intervention took place against broader international opposition – in contrast to the First Gulf War. It was one of the most overt examples of US and UK over-reach in the eyes of Russian and Chinese governments, who were beginning to strain against US hegemony.¹³⁶ And it heralded a divergence from other Western states such as France and Germany, whose interests when determining the strategic shift away from armed humanitarian intervention had not been considered. They were unsupportive of the Iraq War, and angry at being diplomatically sidelined by the US.¹³⁷ The moral authority of the West in general and of the UK and the US in particular had been sullied, and

their freedom to employ force with the implicit consent of the international society was subsequently hampered. Iraq had exposed the extent to which Western strategy had over-reached itself in the rapid changes since Afghanistan.

CONCLUSION

The story of post-Cold War international relations in the two decades from 1991 to 2011 had much to do with the development of a Western strategy of armed humanitarian intervention. This paper has framed that development within a few broad themes: the expansion and decline of the permissive space for intervention, the role of humanitarian motives in Western foreign policy, and the influence of air power in operationalising strategic ends. Observing the period from a wide perspective, it has noted the inconsistencies in implementing armed humanitarian intervention, and it has also determined that a fatal shift in thinking (and resultant disagreement) about the purpose of force in Western foreign policy occurred after the terror attacks of 11 September 2001. The wars in Afghanistan and Iraq did not represent an end to the strategy, but they did equate it with US aggression and exposed a growing divide within the international society over the perceived irreconcilability of inviolable state sovereignty with principles of intervention.

Such has been the rate of decline in support for armed humanitarian intervention, that NATO's 2011 operation in Libya – Operation Unified Protector – which might have heralded a new beginning for the strategy, instead marked another setback. It was the first time that the interventionist pillar of the internationally-agreed *Responsibility to Protect* had been invoked. It was an example of an air-centric campaign which applied rapid and devastating force to human rights abusers. And it did indeed prevent the catastrophe that had inspired it in the first place – the assault by Gaddafi's forces on Benghazi. But Operation Unified Protector overstepped its mandate in the eyes of many non-NATO countries (although certain Arab states, notably the UAE, participated to a significant degree). It engaged in regime change and once again proved the risks of permitting the West to use intervention to flout the norms of state sovereignty. It prompted an almost immediate sense of post-conflict regret from numerous Western and non-Western states which had acquiesced to the intervention and, in doing so, it widened the normative gap between supporters of armed humanitarian intervention and its critics. The *Responsibility to Protect* had already been condemned as a justification for Western adventurism overseas. The intervention in Libya confirmed that view, and resulted in the most restrictive scaling-back of the permissive space for intervention since the Cold War.¹³⁸

This paper has cantered through 20 years of intervention and air power. Every conflict referenced deserves far more attention than has been offered here. But this overview has hopefully provided one possible lens through which to view the immediate post-Cold War world and air power's role within it. If this idea of fluctuating periods in air

power's history – shaped by events beyond its own theoretical constraints – is to be pursued, then perhaps the rest of this edition of *Air Power Review* will provide insight into the coming age. As in the First Gulf War, the RAF now has access to phenomenal new technologies which must be integrated and adapted to the changing world. The opportunities and limits this entails are explored in the following articles, culminating in a viewpoint by Lieutenant General David Deptula (Retired) who, 28 years ago, helped to plan the first great intervention of the post-Cold War age from the Black Hole in Riyadh.

NOTES

¹ Carl von Clausewitz, *On War* (Princeton University Press, 1976) 87.

² Edward H. Carr, *What Is History?* (Cambridge University Press, 1961) 62.

³ Ibid.

⁴ David J. B. Trim, "Humanitarian Intervention," in *The Changing Character of War*, eds. Sibylle Scheipers and Hew Strachan (Oxford University Press, 2011) 151.

⁵ The 'international society' here refers to two or more states whose decisions must account for the behaviour of one another and who interact within a shared set of rules and norms. In this instance, the international society encompasses the global community of sovereign states, and one of the institutions by which change is managed within this society is armed conflict. For a discussion on the international society and its 'institutions' in the sense used here, see Hedley Bull's *The Anarchical Society* (1977).

⁶ John R. Ballard, *From Storm to Freedom: America's Long War with Iraq* (Naval Institute Press, 2010) 1.

⁷ Supremacy here is viewed as the freedom of action to pursue foreign policy without being impeded by international opposition. This article contends that such was the situation faced by Western governments at the beginning of the post-Cold War period, to a far greater degree and geographical scope than they experienced in the bipolar Cold War international order.

⁸ The period following the First Gulf War includes the Western-led No-Fly Zones over Iraq – Operations Haven, Provide Comfort (I and II), Northern Watch and Southern Watch – between March 1991 and March 2003, though they are not discussed further in the article.

⁹ Security Council Resolution 660, UN Doc S/RES/660 (2 August 1990).

¹⁰ Security Council Resolution 661, UN Doc S/RES/661 (6 August 1990).

¹¹ Security Council Resolution 665, UN Doc S/RES/665 (25 August 1990).

¹² United Nations, *Charter of the United Nations* (24 October 1945) Ch. VII, Art. 2.

¹³ Security Council Resolution 678, UN Doc S/RES/678 (29 November 1990).

¹⁴ United Nations, *Charter*, Ch. II, Art. 1-2.

¹⁵ Norrie MacQueen, *Humanitarian Intervention and the United Nations* (Edinburgh University Press, 2011) 19-38.

¹⁶ Margaret Thatcher, *The Downing Street Years* (Harper Collins, 1993) 817.

¹⁷ Ballard, *From Storm to Freedom*, 4.

¹⁸ Ibid.

¹⁹ MacQueen, *Humanitarian Intervention*, 49, 62.

²⁰ Nikolai Zlobin, "Iraq in the Context of Post-Soviet Foreign Policy," *Mediterranean Quarterly* (Spring 2004) 89.

²¹ Lilian C. Harris, "The Gulf Crisis and China's Middle East Dilemma," *The Pacific Review* 4, No. 2 (1991) 116.

²² Harlan W. Jencks, "Chinese Evaluations of "Desert Storm": Implications for PRC Security," *The Journal of East Asian Affairs* 6, No. 2 (Summer/Fall 1992) 447.

²³ Department of Defense, *Conduct of the Persian Gulf War: Final Report to Congress* (United States Government Printing Office, 1992) 69.

²⁴ Ibid. 120-1.

²⁵ James A. Winnefeld et al., *A League of Airmen: US Air Power in the Gulf War* (RAND, 1994) 68.

²⁶ Ibid. 66-68.

²⁷ Ballard, *From Storm to Freedom*, 38.

²⁸ Department of Defense, *Conduct of the Persian Gulf War*, 118.

²⁹ United States Air Force, *Gulf War Air Power Survey* (United States Government Printing Office, 1993) 151-2.

³⁰ Richard S. Lowry, *The Gulf War Chronicles: A Military History of the First War with Iraq* (iUniverse Star, 2003) 2-10.

³¹ General Accounting Office, *Operation Desert Storm: Evaluation of the Air Campaign* (United States General Accounting Office, 1997) 194.

³² Winnefeld et al., *A League of Airmen*, 127.

³³ Stephen T. Hosmer, *Psychological Effects of US Air Operations in Four Wars, 1941-1991* (RAND, 1996) 153.

³⁴ Thatcher, *The Downing Street Years*, 813.

³⁵ Ballard, *From Storm to Freedom*, 34-5.

³⁶ Department of Defense, *Conduct of the Persian Gulf War*, 45.

³⁷ Sebastian Ritchie, "Operation Granby: Maritime Air Reconnaissance," *Air Power Review* 19, No. 2 (2016) 206-228.

³⁸ Department of Defense, *Conduct of the Persian Gulf War*, 152.

³⁹ Ballard, *From Storm to Freedom*, 42, 62-3.

⁴⁰ Hosmer, *Psychological Effects*, 152-7.

⁴¹ Ibid. 155.

⁴² Winnefeld et al., *A League of Airmen*, 174-5.

⁴³ David E. Johnson, *Learning Large Lessons: The Evolving Roles of Ground Power and Air Power in the Post-Cold War Era* (RAND, 2006) 24-6.

⁴⁴ Ken Matthews, *The Gulf Conflict and International Relations* (Routledge, 1993) 232-3.

⁴⁵ MacQueen, *Humanitarian Intervention*.

⁴⁶ Ibid.

⁴⁷ Security Council Resolution 733, UN Doc S/RES/733 (23 January 1992).

⁴⁸ Security Council Resolution 751, UN Doc S/RES/751 (24 April 1992).

- ⁴⁹ Security Council, *Report of the Commission of Enquiry Established Pursuant to Security Council Resolution 885 (1993) to Investigate Armed Attacks on UNOSOM II Personnel Which Led to Casualties Among Them*, S/1994/653 (1 June 1994) 12.
- ⁵⁰ Security Council Resolution 794, UN Doc S/RES/794 (3 December 1992).
- ⁵¹ MacQueen, *Humanitarian Intervention*, 62.
- ⁵² Christiane E. Philipp, "Somalia – A Very Special Case," *Max Planck Yearbook of International Law* 9, No. 1 (2005) 535.
- ⁵³ Ibid. 538.
- ⁵⁴ Security Council Resolution 814, UN Doc S/RES/814 (26 March 1993).
- ⁵⁵ Gary Anderson, "UNOSOM II: Not Failure, Not Success," in *Beyond Traditional Peacekeeping*, eds. Donald C.F. Daniel and Bradd C. Hayes (Palgrave Macmillan, 1995) 268.
- ⁵⁶ Security Council, *Armed Attacks on UNOSOM II*, 26-33.
- ⁵⁷ Anderson, "Not Failure, Not Success," 268.
- ⁵⁸ MacQueen, *Humanitarian Intervention*, 108.
- ⁵⁹ Ibid. 111-112.
- ⁶⁰ Ibid. 112.
- ⁶¹ Security Council, *Armed Attacks on UNOSOM II*, 32-3.
- ⁶² Security Council Resolution 954, UN Doc S/RES/954 (4 November 1994).
- ⁶³ Benjamin Armstrong, "Precision Approaches: Leadership Targeting and the Helicopter as a Strategic Strike Asset in Small Wars," *Defence and Security Analysis* 25, No. 3 (2009) 275.
- ⁶⁴ Security Council, *Armed Attacks on UNOSOM II*, 27.
- ⁶⁵ Armstrong, B. (2009) 'Leadership Targeting and the Helicopter as a Strategic Strike Asset in Small Wars' in *Defence and Security Analysis*, Vol. 25, No. 3, Routledge, pp.274-5.
- ⁶⁶ In one such intelligence failure, US forces launched an air assault against the UN Development Programme headquarters in Mogadishu, taking its staff prisoner. By opting for a heliborne assault, they missed the large sign in front of the building which designated it as the UNDP offices. The story of the raid is recounted in *The Independent* (1993) <https://www.independent.co.uk/news/raid-fiasco-focuses-us-doubts-over-role-in-somalia-1464352.html>, last accessed on: 16/11/2018.
- ⁶⁷ Security Council, *Armed Attacks on UNOSOM II*, 32.
- ⁶⁸ Armstrong, "Precision Approaches," 275.
- ⁶⁹ Anderson, "Not Failure, Not Success," 278.
- ⁷⁰ MacQueen, *Humanitarian Intervention*, 111-2.
- ⁷¹ Gregory H. Stanton, "Could the Rwandan Genocide Have Been Prevented?" *Journal of Genocide Research* 6, No. 2 (2004) 211-228.
- ⁷² Ibid.
- ⁷³ Alan J. Kuperman, *The Limits of Humanitarian Intervention: Genocide in Rwanda* (Brookings Institute Press, 2001) 40, 44-51, 93.
- ⁷⁴ Ibid. 1-2.

- ⁷⁵ MacQueen, *Humanitarian Intervention*, 85.
- ⁷⁶ Kuperman, *Genocide in Rwanda*, 57-8.
- ⁷⁷ MacQueen, *Humanitarian Intervention*, 86.
- ⁷⁸ ICISS, *The Responsibility to Protect: Report of the International Commission on Intervention and State Sovereignty* (ICISS, 2001) 1.
- ⁷⁹ Carl Ceulemans, *Reluctant Justice: A Just War Analysis of the International Use of Force in the Former Yugoslavia (1991-1995)* (Brussels University Press, 2005) 105.
- ⁸⁰ Ibid. 105-6.
- ⁸¹ Security Council Resolution 816, UN Doc S/RES/816 (31 March 1993).
- ⁸² General Assembly, *Report of the Secretary-General Pursuant to General Assembly Resolution 53/35: The Fall of Srebrenica*, A/54/549 (15 November 1999) 104.
- ⁸³ Johnson, *Learning Large Lessons*, 53.
- ⁸⁴ Ceulemans, *Reluctant Justice*, 107.
- ⁸⁵ Johnson, *Learning Large Lessons*, 54.
- ⁸⁶ Robert C. Owen, "The Balkans Air Campaign Study: Part 2," *Airpower Journal* (Fall 1997) 24.
- ⁸⁷ Ibid. 18.
- ⁸⁸ Tony Blair, "Doctrine of the International Community," speech given 22 April 1999, <https://www.globalpolicy.org/component/content/article/154/26026.html>, last accessed on: 08/11/18.
- ⁸⁹ Ibid.
- ⁹⁰ MacQueen, *Humanitarian Intervention*, 80.
- ⁹¹ Johnson, *Learning Large Lessons*, 66.
- ⁹² IICK, *The Kosovo Report: Conflict, International Response, Lessons Learned* (Oxford University Press, 2000) 92.
- ⁹³ Johnson, *Learning Large Lessons*, 65-6.
- ⁹⁴ IICK, *The Kosovo Report*, 93.
- ⁹⁵ Johnson, *Learning Large Lessons*, 77-8.
- ⁹⁶ IICK, *The Kosovo Report*, 95-6.
- ⁹⁷ Security Council Resolution 1244, UN Doc S/RES/1244 (10 June 1999).
- ⁹⁸ IICK, *The Kosovo Report*, 101-2.
- ⁹⁹ Ibid. 92.
- ¹⁰⁰ Ibid. 97.
- ¹⁰¹ Ibid.
- ¹⁰² Ibid.
- ¹⁰³ Security Council Resolution 1244.
- ¹⁰⁴ ICISS, *The Responsibility to Protect*.
- ¹⁰⁵ Robert Caplan, "Kosovo: The Implications for Humanitarian Intervention," *Forced Migration Review* 5 (1999) 7.
- ¹⁰⁶ IICK, *The Kosovo Report*, 4, 269, 284.
- ¹⁰⁷ Andrew L. Stigler, "A Clear Victory for Air Power: NATO's Empty Threat to Invade Kosovo," *International Security* 27, No. 3 (2003) 143.

- ¹⁰⁸ Benjamin S. Lambeth, *NATO's Air War for Kosovo* (RAND, 2001) 38.
- ¹⁰⁹ IICK, *The Kosovo Report*.
- ¹¹⁰ Royal Australian Air Force, *Australian Air Publication AAP 1000-H: The Australian Experience of Air Power* (Air Power Development Centre, 2013) 154-6.
- ¹¹¹ Revor Findlay, *The Use of Force in UN Peace Operations* (Oxford University Press, 2002) 289-90.
- ¹¹² Ibid.
- ¹¹³ For a discussion on the impact of INTERFET on the development of armed humanitarian intervention, see Norrie MacQueen's *Humanitarian Intervention and the United Nations* (2011). Rather than referencing the operation in East Timor as an addendum to an air power-based approach, MacQueen argues that it is the ideal implementation of armed humanitarian intervention.
- ¹¹⁴ Ibid. 301.
- ¹¹⁵ Andrew M. Dorman, *Blair's Successful War: British Military Intervention in Sierra Leone* (Ashgate, 2009).
- ¹¹⁶ ICISS, *Responsibility to Protect*.
- ¹¹⁷ IICK, *The Kosovo Report*.
- ¹¹⁸ General Assembly, *Report of the Panel on United Nations Peace Operations*, A/55/305 (17 August 2000).
- ¹¹⁹ Benjamin S. Lambeth, *Air Power Against Terror: America's Conduct of Operation Enduring Freedom* (RAND, 2005) 79-80.
- ¹²⁰ Ibid. 83.
- ¹²¹ Johnson, *Learning Large Lessons*, 93.
- ¹²² Ibid. 97-103.
- ¹²³ British Army, *Operation Herrick Campaign Study* (Directorate of Land Warfare, 2015) 3-4.2.
- ¹²⁴ Security Council Resolution 1368, UN Doc S/RES/1368 (12 September 2001).
- ¹²⁵ Ibid.
- ¹²⁶ NATO, "Invocation of Article 5 Confirmed," posted on 3 October 2001, <https://www.nato.int/docu/update/2001/1001/e1002a.htm>, last accessed on: 11/11/18.
- ¹²⁷ NATO, *North Atlantic Treaty* (4 April 1949), Art. 5.
- ¹²⁸ Lambeth, *Air Power Against Terror*, 79-80.
- ¹²⁹ Security Council Resolution 1386, UN Doc S/RES/1386 (20 December 2001).
- ¹³⁰ Ibid.
- ¹³¹ Lambeth, *Air Power Against Terror*, 83.
- ¹³² Gerry Simpson, "The War in Iraq and International Law," *Melbourne Journal of International Law* 6, No. 1 (2005) 171-3.
- ¹³³ Ibid. 173-6.
- ¹³⁴ Security Council Resolution 1441, UN Doc S/RES/1441 (8 November 2002).
- ¹³⁵ Simpson, "The War in Iraq and International Law," 173-8.
- ¹³⁶ Deborah W. Larson and Alexei Shevchenko, "Status Seekers: Chinese and Russian Responses to US Primacy," *International Security* 34, No. 4 (2010) 63-95.

¹³⁷ Irwin M. Wall, “The French-American War Over Iraq,” *Brown Journal of World Affairs* 10, No. 2 (2004), 132-4.

¹³⁸ For a discussion on the intervention in Libya and its destabilising impact on international norms, see Michael Doyle’s *The Question of Intervention: John Stuart Mill and the Responsibility to Protect* (2015).

AIR POWER AND INTERVENTION: THE ROYAL AIR FORCE EXPERIENCE IN THE FORMER YUGOSLAVIA, 1992-1995

By Dr David Jordan

Biography: Dr David Jordan is one of King's College London's air power subject matter experts based at the UK's Joint Services Command and Staff College (JSCSC), Shrivenham. While at JSCSC he has served as the Air Warfare Historian for the Higher Command and Staff Course, is the academic director for the RAF Division at JSCSC and is a co-director of the RAF Centre for Air and Space Power Studies.

Abstract: The Royal Air Force's operations in the former Yugoslavia between 1992 and 1995 are little-publicised compared to the later intervention in Kosovo in 1999. However, they demonstrated the political utility of air power for states wishing to intervene in complex conflicts and illustrated its potential to play a dominant role in shaping political conditions when the use of force became necessary. This article discusses such success, but also explores some of the challenges that faced the RAF in conducting its operations: commitments to simultaneous No Fly Zones over Iraq engendered overstretch, and budgetary constraints required the Service to 'do more with less'. Ultimately, it argues that the RAF's experience over the former Yugoslavia highlighted the importance of achieving national policy objectives not only in terms of delivering military force, but in securing international influence too. This lesson is likely to remain a constant in the second century of the Service.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor.

INTRODUCTION

As early as 1994, Professor Eliot Cohen observed that air power was ‘like modern courtship, offering gratification without commitment’.¹ It is not unfair to suggest that this is one of the best-known asides about the use of air power thanks to its frequent repetition. Unfortunately, this witticism is often remembered to the exclusion of his principal point that politicians appeared to view the use of air power as a means of managing conflicts at lower human and political cost than might otherwise be the case. Hence, he proposed, air power offered a mechanism by which the post-Cold War ‘New World Order’ of peace and prosperity could be maintained without deploying large numbers of ground troops. Professor Cohen’s thinking was clearly influenced by events during and after the 1991 Gulf War. Air power played a vital part in this conflict, which appeared to be both an exemplar of how this era of peaceful co-existence would be enforced, and an illustration of air power’s potential.

Yet the period immediately following the end of the Cold War did not bring with it the peace and stability which many had predicted; rather, the ‘New World Order’ proved to be disorderly and violent, with significant interventions by the international community throughout the 1990s. As a Permanent Member of the United Nations Security Council (UNSC), the United Kingdom played a notable part in these operations. It did so against a back-drop of defence reductions (dubbed in the UK ‘The Peace Dividend’) and in an era where the use of air power as the principal tool of intervention became commonplace.

This article seeks to examine the Royal Air Force’s (RAF) part in the intervention in the Former Yugoslavia between 1992 and 1995 where air power was chosen as the tool for international involvement. It observes that although the RAF, along with other British forces, was subject to a series of reductions in strength and funding, the number of commitments and pressures did not reduce. The intervention in Yugoslavia was accompanied by the maintenance of standing commitments and involvement in the enforcement of No Fly Zones over Iraq, (a commitment which endured until the 2003 invasion of that country), in which the RAF played a notable part. Thus, this article seeks to highlight the fact that, while a little-publicised part of the RAF’s history to date, its operations in the former Yugoslavia in the 1990s illustrated the political utility of air power, and on occasion, its ability to play a dominant role in shaping political conditions when the use of force became necessary. The events between 1992 and 1995 demonstrated Cohen’s overall point that nations wishing to intervene in complex conflicts saw the use of air power as an alternative to the deployment of troops, either *in toto*, or with air power being used as an alternative means of delivering military power.

THE NEED FOR INTERVENTION: BACKGROUND TO THE CRISIS IN YUGOSLAVIA

The events in the Persian Gulf in 1990-91 had, to some extent, obscured the crisis in Yugoslavia which had been developing over the preceding decade. After the death of

Marshal Tito in 1980, Yugoslavia had been subject to growing political tension due to a resurgence of nationalist sentiment in the six republics which constituted the Federal State. Tito had been fully aware of the challenges to stability posed by unfettered nationalism, and had done his utmost to contain it, cognisant that only firm leadership mixed with an attempt to sate some of the sentiment might prevent disaster. Aware of his power as a unifying figure, Tito's speeches made regular reference to the importance of 'brotherhood and unity' amongst the six republics.² Tito's concept was popular, but was inextricably linked to him and his equally-popular Vice President Edvard Kardelj.³ Without Tito, there was a serious danger that long-held nationalist grievances would come to the fore. As Sabrina Petra Ramet noted, 'the story of Yugoslavia is a story...of the failure of political cooperation'.⁴ In the absence of cooperation, Tito used a mixture of coercion, conviction and constitutional change as a means of control, but feared that once he was no longer in power, the federal state would unravel.

In a bid to stop this, prior to his death in 1980, Tito introduced constitutional changes which brought about a rotating presidency of twelve months, with the post to be held by the leader of each Yugoslav republic and the two autonomous provinces of Kosovo and Vojvodina in turn. While this seemed like a sensible means of ensuring that no republic was perceived to have staged a takeover of the Yugoslav Republic, it in effect ensured that the head of state was hamstrung by a lack of time to achieve anything, or to set any particular direction for the country. The end result was that rather than alleviating any possible tensions between the individual republics, the new system simply helped to exacerbate them. Tito had been predeceased in 1979 by Kardelj – thus the two key unifying figures in the federal state were gone, and the new constitutional system was fatally flawed.⁵

The first flashpoint occurred with protests by ethnic Albanians in Kosovo as early as 1981. These were suppressed by the authorities, resulting in a number of fatalities, but marked the point at which the tensions which would ultimately lead to the collapse of Yugoslavia came to the fore.⁶ A burgeoning economic crisis in the mid-1980s added to the tensions, particularly as the wealthier republics, such as Slovenia and Croatia, sensed that they were being required to bail out the less well-off republics such as Serbia. This was coupled with a growing resentment of the Communist leadership of Yugoslavia, which was seen to be venal and corrupt. Economic mismanagement culminated in austerity and, in 1987 and 1988, a wave of strikes broke out in protest at the government's failings.⁷

The situation was exploited by an ambitious Serbian politician, Slobodan Milošević, who made several hard-line speeches which aimed to appeal to Serbian nationalist sentiment; these included calls for greater centralisation of the government, which implied a greater level of Serbian control. He further boosted his political power in 1989 through the installation of a pro-Milošević government in the Republic of Montenegro.

By early Spring 1989 his political position had improved considerably, as he had created a situation where, in the eight-strong Presidency of Yugoslavia, he could always rely upon half the votes – Serbia, Vojvodina, Kosovo and Montenegro.

This was not welcome news for Croatia or Slovenia, where the general sentiment was that they should seek to leave the Federal Republic and establish themselves as independent states. The collapse of the Communist party in the 1990 pan-Yugoslav elections only increased the influence of the nationalist politicians on all sides. Serbia and Montenegro sought a Serbian-dominated state under a centralised government, while the Croats, led by Franjo Tudjman, moved towards the notion of an independent state. The position in Slovenia was even worse for the supporters of a continuing Yugoslav federated state, in that a range of democratising reforms had been passed in 1989, and by the end of 1990 there was a distinct push towards the declaration of an independent Slovenia. This was confirmed in a referendum in December that year, in which 88 per cent of the electorate voted in favour of an independent state, a step which was unacceptable to Milošević and his supporters. Croatia followed suit in a referendum in May 1991, by which point there had already been sporadic ethnic violence between Serbs and Croats. In both Croatia and Slovenia, members of the Serbian population, anxious not to be separated from Serbia itself, became vocal in their opposition to independence, with clear support from Milošević.

This did little to change the secessionist mood in either Croatia's capital, Zagreb, or Slovenia's capital, Ljubljana, and on 25 June 1991, both republics declared independence. Even before the Croatian referendum, the deteriorating situation had led to the United Nations agreeing to establish a peacekeeping force – the United Nations Protection Force, or UNPROFOR – under Security Council Resolution 743. UNPROFOR's task was to ensure that conditions existed for peace talks, and to protect three so-called 'safe-havens' which were in Croatian territory, but claimed by the self-proclaimed Republic of Serbian Krajina on the basis of an unrecognised referendum in which the Serbian population of the areas had voted to leave Croatia.

The declarations of independence by Slovenia and Croatia were unacceptable to the government in Belgrade, and the federal Yugoslav People's Army (JNA) was despatched to Slovenia in a bid to stop the secession. The JNA was the only federal institution of note remaining and, under the 1974 constitution, was responsible for maintaining the Republic's territorial integrity.⁸ The JNA was not the sole defence component, since each republic had its own territorial force. The notion had been that this structure would ensure that the JNA could not mount a coup, but it also ensured that the secessionist states had the basis for their own armed forces.⁹ Those in Slovenia proved capable, and after what became known as the 'Ten Day War', the JNA had to admit defeat. The last federal troops departed Slovenia at the end of July 1991, and before the close of the

year, a new constitution had been adopted. Slovenia was recognised as a state in early 1992, first by the European Community and then by the United Nations.

The transition for Croatia was far less smooth, and when the JNA intervened there in August 1991, the fighting was more intense than had been the case in Slovenia. The conflict went on for several months, but by the end of the year, particularly after the unexpectedly long siege of Vukovar, the JNA had reached its culminating point, being short of manpower. The government in Belgrade decided to seek a negotiated peace rather than attempt to escalate the war, being painfully aware of the fact that the Croatian forces were growing in strength. The result was a ceasefire on 3 January 1992, bringing about an uneasy peace which would last for three years before the fighting resumed.¹⁰

The position was more complicated in the Republic of Bosnia and Herzegovina owing to its multi-ethnic status. The three main groups of inhabitants comprised Bosniaks (around 45 per cent of the population), Orthodox Serbs (approximately 33 per cent) and Croats (17 per cent), and views on the future of the Republic were polarised. An independence referendum called for 29 February 1992 was boycotted by the Serbian population, and the result – a clear victory for secession from Yugoslavia – was promptly rejected by the Bosnian Serbs, led by Radovan Karadžić.

International recognition of the independence of Bosnia was ignored by the Bosnian Serbs, who established themselves under the auspices of the Republika Srpska. Bosnian Serb units, fully supported by Belgrade, embarked upon a campaign to secure territory held by ethnic Serbs. These troops (subsequently the Army of Republika Srpska, known as the VRS) led by General Ratko Mladić, fought against the mainly Bosniak Army of the Republic of Bosnia and Herzegovina (ARBiH) and troops from the Croatian Defence Force (HVO). The relationship between the anti-Serb sides was tense, and by October 1992, the ARBiH and HVO were fighting each other for territory, as well as fighting against the Serbs.¹¹

The international community was in many ways taken by surprise by this turn of events. As Mark Almond remarked, attention turned to Yugoslavia only 'once the guns had begun to fire', and it was not surprising that the response was initially patchy.¹² The United Nations had imposed an arms embargo under UN Security Council Resolution 713 on 25 September 1991, but this passed a considerable advantage to the Serbs as the JNA was well-equipped and thus overmatched its Bosnian opponents.

In the United States, Congress took the view that the arms embargo should be lifted. This view gained some support from the Democratic party during the 1992 Presidential Election, but once President Clinton was in office, he came to the view that the policy was not helpful. Although he was not unsympathetic to the idea, Clinton felt that a

unilateral lifting of the embargo, accompanied by NATO air attacks against the Serbs (so called 'lift and strike'), would create a position where the Serbs would be less able to dominate their neighbours, causing more fighting and possibly serious political difficulties with key European allies.¹³

There was considerable reluctance on the part of the key European states to become involved in the war. In addition, there was a sense in Washington that the war was something for Europe to address, rather than call on the United States for help. The US and British governments initially felt that no good would come of intervention, and although the United States' frustration meant the notion of 'lift and strike' endured, the objections from the European Community and Russia meant that it was difficult to envisage it being implemented. The British government was wary of the implications of intervention in terms of long-term commitments to peacekeeping. Though supportive of peace plans from the United Nations and the European Community (EC), the even-handed approach that Prime Minister John Major's administration sought to adopt caused considerable controversy, both at the time and subsequently.¹⁴

The view that an even-handed approach should be adopted was difficult to sustain in the face of media coverage of events in Bosnia, particularly when the VRS surrounded Sarajevo in early May 1992 and placed it under siege. Media coverage of the besieging forces firing artillery and mortars into the city, as well as sniping against civilians, caused international outrage, and on 26 June, the UN Secretary General, Dr Boutros Boutros-Ghali issued an ultimatum to the Serbs that they permit UNPROFOR to operate the airport at Sarajevo. UNPROFOR units moved into Bosnia and took over the airport, without any VRS opposition, on 29 June. The siege of Sarajevo would last for four years, and marked the first significant intervention by the RAF in the former Yugoslavia, under the auspices of Operation Cheshire, an air mobility operation. A cynical air power historian might wearily observe that it is entirely unsurprising that little popular literature exists to describe this long-running commitment for the Hercules C1/C3 fleet of the Lyneham Transport Wing.

THE RAF AND OPERATION CHESHIRE

The request for support to Sarajevo led to the British government agreeing to deploy a Hercules to Zagreb to join a multi-national effort with Italy, Canada, France, Germany and the United States. The presence of the UN in Croatia was not well-regarded by all locals (UNPROFOR was known as 'Serbprofor' by some Croats), and the potential threat to the aircraft involved was demonstrated by a failed attempt to shoot one down as it took off from Zagreb.¹⁵ In August, one of the RAF Hercules flights received indications that a Serbian radar had locked on to it, while on 3 September 1992, an Italian G222 carrying aid was shot down by a surface-to-air missile.¹⁶ Although the dangers of the approach to Sarajevo could not be reduced other than by the use of defensive aids and the aircraft's

approach profile, it was possible to address the dangers of operating from Zagreb by relocating the airlift to the Italian airfield at Ancona. A more structured operation was established, with the creation of a Joint Air Operations Centre, which contained a UN Representative as a member of the staff. Liaison officer posts from all the participating nations were established at the headquarters of the UN High Commissioner for Refugees (UNHCR) to coordinate the airlift with the requirements of the UNHCR. The arrangement highlighted one notable issue with the humanitarian effort in that if an aircraft was threatened by one of the warring parties, all that could be done was a *post facto* protest from the UNHCR if the source of the threat could be readily identified.¹⁷

During 1993 there were greater efforts to engage participating aircraft, with some being damaged by small arms fire. Aircraft were also regularly tracked by the radars of surface-to-air missile sites, a source of particular concern after the loss of the G222. The hazards were highlighted again in 1994, when a German C.160 Transall only avoided being shot down thanks to the swift reactions of the crew to defeat the threat. The award of a Distinguished Flying Cross to one of the participating Hercules aircrew illustrated how hazardous humanitarian operations could be, even when fully authorised by the United Nations. Heavy fighting around Sarajevo airport in April 1995 caused a temporary cessation of flights, which would resume after the ceasefire arranged in September. By the end of Operation Cheshire in July 1996, the RAF had delivered over 26,000 tonnes of supplies, giving the British government a degree of influence in operations that was far beyond its initial desire to engage in the bitter Yugoslav conflict.¹⁸ In many ways, Operation Cheshire marked a considerable escalation in Britain's role in the war. Although the operation was presented as a humanitarian airlift, it was, in effect, a declaration of support for the Bosnians, and the Serbians might have taken the view that while the operation was supposedly conducted under the auspices of the UN, it was, in fact, a demonstration of partiality:

In practice, [the UN's] studied impartiality was highly misleading. It was always going to be difficult to confine UN actions to the conflict's symptoms without taking any steps to address its causes. When sieges of population centers [sic] were so central to one side's strategy, breaking them could never be a neutral act. Over time the actual role of the UN operation became more overtly to sustain the rump of a Bosnian state.¹⁹

Nevertheless, the Serbs allowed the breaking of the siege, quite possibly influenced by concern over just how far their efforts to disrupt the flights would be allowed to go before provoking NATO nations into action.

DEEPER INVOLVEMENT

Although the British government was reluctant to become more deeply involved in the Yugoslavia crisis, even by the middle of 1992 it had become clear that this was

neither politically acceptable, nor was it in keeping with the view that Britain's position as a permanent member of the UNSC bestowed a certain responsibility on it to participate in peacekeeping operations and that the humanitarian airlift alone would be insufficient.²⁰

The events of the spring and summer of 1992 saw increasing reports of 'ethnic cleansing', where those of other ethnic groups were murdered or forced from their homes. This was particularly prevalent in Serb areas, although not exclusive to them. The media coverage meant that the British government's preferred option of not becoming too deeply involved in a complex and difficult conflict became unsustainable. The duty of chairing the EC had recently been assumed by the UK (which saw the task rotate between member states), and Prime Minister Major took the opportunity to call a joint EC-UN international conference on Bosnia, held in London in August 1992. This created a War Crimes Commission to examine the extent of the atrocities, and led to the Serbian leaders giving pledges that they would withdraw their heavy weaponry from around Bosnian towns and cities so that the artillery pieces could be placed under UN supervision, and the sieges of several locations would be lifted. The conference agreed that one option which should be implemented was a No Fly Zone (NFZ) over Bosnia, although there was no immediate mechanism to enforce it.²¹

Within a month, hopes that the conflict might be brought under control were dashed. Serbian forces were again shelling Sarajevo and other towns which were supposedly no longer being targeted. It was becoming clear that without any credible threat of action to enforce the terms agreed at the London Conference, the war would continue. There was little will in either Washington or European capitals to commit large numbers of troops in a bid to separate the warring parties and to begin peacekeeping.

While the British government could make justifiable references to the amount of aid being delivered, the political climate meant that it was almost inevitable that British forces would be committed on a remit beyond that of Operation Cheshire. Indeed following UNSCR 776 in September 1992, it was agreed that British troops would participate in what was known as UNPROFOR2. This brought with it the deployment of helicopters (from all three services) in support of the troops. The hope was that Lord (David) Owen and Cyrus Vance would succeed in bringing about some sort of agreement between the various sides in the civil war.²² The subsequent Vance-Owen plan was issued in January 1993 and, following negotiations, was accepted by Radovan Karadžić on 30 April. Hopes that it might bring about peace foundered when the plan was rejected by the Republika Srpska National Assembly in May, a decision confirmed by a referendum in Republika Srpska territory the following month. Cyrus Vance had resigned by this point, and had been replaced by the Norwegian politician and diplomat Thorvald Stoltenberg who worked with Owen in a bid to come up with a new plan.²³

In the interim, the vague hope of the London Conference that air attacks on the Bosnian Muslims would end had not been realised: without an enforcement mechanism, the plan had just been ignored. This led to UNSCR 781 on 9 October 1992 which banned military flights. Once again, though, enforcement was singularly absent from the Resolution, which instead called upon UNPROFOR to monitor flights and to report violations.²⁴

Frustration at the failure of what was known as Operation Sky Monitor led to the UNSCR 816 on 31 March 1993. This noted the non-observance of the ban on military activities and called upon member states to take 'all necessary measures' to close airspace over Bosnia to military aviation. This task was taken on by NATO under the auspices of Operation Deny Flight.

Any thoughts that the Vance-Owen plan might be enforced by the UN were rejected at the Washington conference between Britain, France, Spain, Russia and the US on 22 May 1993. The conference agreed that the plan was unworkable, and instead, Bosnia's Muslim population would be concentrated in safe areas which would be protected by UNPROFOR troops.²⁵ UNPROFOR's rules of engagement limited them to self-defence, which meant that the troops were unable to protect the population of the safe havens. This was a significant issue which would, in due course, lead to tragedy.

The United States, in particular, had not abandoned notions of 'lift and strike' and seeking to coerce the Republika Srpska towards accepting peace proposals, but found that its allies were still unconvinced. An element of coercive force was introduced, though, with the decision under UNSCR 836 on 4 June to authorise the use of air support for UNPROFOR. Control of the strikes was to prove complex and frustrating. Assets were held under a 'dual key' arrangement whereby attacks had to be approved by both NATO and UN Headquarters in New York. This proved incredibly unwieldy, and the UN command and control function was devolved to the Secretary General's special representative, Yasushi Akashi. Even this was problematic, since all requests for support went to the UN Air Operations Centre in Kiseljak, from where they would be passed to Akashi. He then considered the request, and if approved, the authorisation to attack would come in the form of a request to NATO for the delivery of close air support, whereupon NATO would issue orders for the strike to be carried out.²⁶ It is difficult to think of a less timely means of providing air support.

THE RAF DEPLOYS

The RAF's contribution came in the form of the Tornado F3 force. Eight aircraft were deployed to Gioia del Colle in Italy in a commitment which was to last for two years. This occurred as the size of the Tornado F3 force was reduced under defence cuts, while the ongoing commitments to both national Quick Reaction Alert (QRA) and QRA in the Falkland Islands remained at the same level. Each F3 squadron was committed to a three-month period in which it would maintain the RAF's contribution before handing

over to another unit. The F3s maintained daily Combat Air Patrols (CAPs) in a bid to ensure that the NFZ was maintained.

The growing fear that UNPROFOR troops were at risk of being overmatched by the Serbian forces also led to a decision to commit close air support assets. This saw the deployment of elements of the RAF's Jaguar GR1 force from Coltishall. The Jaguar force had recently handed over the Iraq NFZ commitment to the Harrier force, but any thoughts of a return to normal training routines and addressing any skills fade which had occurred had to be put to one side as orders came to deploy twelve aircraft to Gioia del Colle under the auspices of Operation Hampden.²⁷ The scale of the detachment should not be underestimated. Although the fast jet component inevitably gained the most media attention, support helicopters also played an integral part in UNPROFOR operations, while the sustainment of the RAF's detachment at Gioia began with thirty-six C-130 loads of personnel and equipment necessary for a deployment of uncertain duration. Once again, the whole force was used to provide the assets and personnel for the detachment, with the Jaguars' duties again being to provide a reconnaissance capability in addition to being able to deliver weapons against ground targets if called upon to do so. The Jaguar force might fly up to eight sorties a day, although unlike the Tornados, the Jaguars operated only during daylight hours. All the operations were conducted through NATO's 5th Allied Tactical Air Force (5ATAF), which would authorise any close support missions which were required by UNPROFOR units.²⁸ As noted, the tasking chain proved to be particularly cumbersome and frustrating, with political considerations over the use of air attacks sometimes ensuring that the ability to deliver timely attacks was all-but negated as the situation on the ground changed long before any attack could be carried out.

Most of the Jaguar deployment's routine saw a split between being airborne and ready to provide CAS (about 60% of the tasking) and reconnaissance (for the remainder). On some occasions, aircraft came close to delivering weapons against threats to UNPROFOR units, although shows of presence were frequently sufficient to dissuade the threat from developing further, or to bring about a cessation of firing on the UNPROFOR positions.²⁹

The deployment further highlighted the problem that detachments to support specific operations could lead to skills fade amongst the pilots, with low-level flying, weaponeering and air combat training all suffering as a result of the nature of the deployment over Bosnia. Meanwhile, other commitments – such as deployment for arctic training for the Jaguar force – also had to be met with stretched resources. By November 1993, the government felt compelled to halt the major defence restructuring that was underway, and announced a further review, which was to become known as 'Front Line First'.³⁰ The review was, in many ways, disappointing, as the solutions it produced might have been summed up as 'Second Line Second', since

supporting functions and resources were reduced and restructured, creating further difficulties in sustaining the Front Line, which did not benefit as much as might have been the case. As Colin McInnes later observed:

Neither [Options for Change nor Front Line First] was a comprehensive review, looking at the totality of defence policy and programmes; nor did either take a perspective extending much more than a few years into the future. Further, defence budgets proved vulnerable to regular and unplanned cuts as the economy weakened and pressure to contain public expenditure grew. The period 1990–7 was therefore characterized more by a rolling review than by stable planning.³¹

This hardly helped when it came to taking on a series of deployed commitments. This was particularly true for the RAF, which had spent most of the period between 1945 and 1991 operating from well-found Main Operating Bases (MOBs), and the transition to what was essentially long-term expeditionary warfare proved to be a notable challenge. This began a cycle where aircrew saw a number of their skills reduce as they flew operations over Iraq and Bosnia, and then had to work up to regain them once the deployment was over, in case these skills were required elsewhere. The experience of the RAF (and, for that matter, the Fleet Air Arm) during the 1990s is a key demonstration that multiple commitments of air power require a robust force structure which is able to accommodate a proportion of aircrew (and their support) being deployed without there being a deleterious effect on overall capability.

By April 1994, the situation in Bosnia had, if anything, deteriorated. USAF F-16s had shot down four Serbian aircraft violating the NFZ on 28 February, and while this had a salutary effect on Serbian fixed-wing activity, there were considerable difficulties in tracking low-flying helicopters using terrain to make locating them on radar difficult. Although the Tornado F3 force developed a high degree of proficiency at locating and following helicopters violating the NFZ, the ROE were never met to the necessary degree for an engagement to be prosecuted.³² The Serbs continued with their operations with little regard for the UN or UNPROFOR, although the deaths of 68 civilians in Sarajevo when a Serbian mortar shell struck a market briefly seemed to offer the prospect of action being taken against the besieging forces. NATO declared an exclusion zone around Sarajevo for heavy weapons, and threatened to attack Serb forces if they did not withdraw.³³ Compliance with the NATO demands brought the end to the shelling of Sarajevo, but any thoughts that this would moderate the VRS's approach were soon abandoned.

A threat to the safe haven at Gorazde led to a UN ultimatum to the Bosnian Serbs that action would be taken against them if they continued their attack. During the Serb attack on 16 April 1994, a pair of Sea Harriers from HMS *Ark Royal* had been tasked to provide air support. The target – a tank – was in a wood and difficult to locate, and

while attempting to find and engage it, the Sea Harrier flown by Lieutenant Nick Richardson was hit by a SAM, and he was forced to eject. He was safely recovered in an operation which called upon the services of a French helicopter to recover both him and the Special Forces team he had been attempting to support.³⁴ The incident also highlighted some of the frustrations about the provision of air support through the UN tasking chain, with Richardson reporting that the UNPROFOR commander, General Sir Michael Rose, expressed his 'anger and frustration at how he had been prevented from handling Gorazde the way he would have liked by the bureaucrats at the UN.'³⁵ Rose's frustrations were a reflection of the dilemma the UN faced. Unwilling to be seen to be taking sides through effectively providing air support to one of the warring parties, the decision-making process to authorise strikes was laborious and doubts as to the possible outcomes of attacks seemed to have frequently dissuaded the UN from granting approvals.³⁶

As the UN 'wandered about in a conceptual void', apparently unwilling to turn peacekeeping into peace enforcement, the utter disregard shown by the Serbs towards the UN Safe Havens and the apparent lack of willingness to respond robustly increased the number of questions asked about the way in which the UN was dealing with the crisis.³⁷ This, in turn, led to calls for NATO to be given the task of imposing peace. This was not an attractive proposition at that time for a number of NATO states, anxious not to become embroiled in the seemingly open-ended commitment which might result.

Nevertheless, the operational tempo for the Jaguar detachment further increased, with extra taskings for CAS and reconnaissance sorties. 5ATAF's procedures had developed so that a considerable emphasis began to be placed upon the presence of airborne Forward Air Controllers to direct strike assets against ground targets. The importance of being able to deliver weapons accurately against targets in the midst of a confused situation on the ground was fully understood by NATO and the UN. The concern that an air attack might accidentally strike civilians, or cause serious collateral damage was ever-present, particularly amongst UN officials, and it was appreciated that both parties in the civil war would be more than ready to make use of such accidents for their own propaganda purposes.

Still the situation worsened, and by the start of November 1994, the fighting in and around the so-called Bihać Pocket in north-west Bosnia had become serious. The Bosnian Serbs were using surface-to-surface missiles, which was a source of particular concern to UNPROFOR, but it was an air attack on Bihać on 19 November which brought about a dramatic – if brief – escalation in the air activity.

The attack, which was a violation of the NFZ (and illustrated the challenges of enforcing an air exclusion zone), had been conducted by two Serbian Orao attack aircraft from

the air base at Udbina. The UN concluded that this could not go without response, and requested that NATO attack the airfield. The raid on Udbina was a true coalition effort, involving British, American, Dutch and French assets, with the RAF providing four Jaguars. Two Jaguars were detailed with the job of attacking the airfield with 1,000lb unguided bombs, while the other pair carried out post-strike reconnaissance for analysis of the damage caused by the raid.

The value of the attack at Udbina is open to debate. It certainly ensured that the Bosnian Serbs were clear that there were limits to the UN and NATO's tolerance of breaches of the NFZ, but it did little to ameliorate the general behaviour towards UNPROFOR troops on the ground. The VRS response was to take over 300 members of UNPROFOR hostage. An unwillingness to risk the lives of those in Serb hands saw a scaling back of air operations, and the release of hostages. Unfortunately, the response gave the VRS and the Karadžić regime the impression that while there were limits to the UN's tolerance of their actions, there was also a limit to how far UN was prepared to go in risking the lives of its personnel.

The raid also held a lesson for the RAF in that despite the importance of Precision Guided Munitions (PGMs) being demonstrated in the Falklands Conflict and then again in Iraq, the development of the capability had been slow. The demand for precision drew the RAF's senior leadership to the uncomfortable realisation that the Service's lack of a self-designation capability for the aircraft on Deny Flight was starting to have an adverse effect upon perceptions about the Service's contribution.

The Chief of the Air Staff, Air Chief Marshal Sir Michael Graydon, therefore raised Urgent Operational Requirement 41/94 in June 1994, with the aim of increasing the range of aircraft which could be deployed with a laser designation capability. While the Tornado GR1 force was becoming ever-more capable in the PGM delivery role through the provision of TIALD designator pods, neither the Harrier nor Jaguar fleets were so equipped. The demands on the Harrier force both in terms of commitments (including to the Iraq NFZs) and integration of new equipment on the relatively new Harrier GR7 variant meant that the decision was taken to integrate the TIALD pod onto the Jaguar as a means of fulfilling the UOR.³⁸ The integration of the TIALD pod with the Jaguar went smoothly, and by early 1995, when the Jaguar detachment to Gioia had been replaced by aircraft from the Harrier force, the Jaguar/TIALD combination was ready for deployment. Two TIALD-equipped Jaguars were kept on 48 hours notice to deploy to Italy if required to support the delivery of PGMs by the Harrier force.³⁹ Nevertheless, the need to use a UOR to obtain TIALD capability on the Jaguar force perhaps gave a broader and still relevant illustration of how tenuous the RAF's – and thus national – influence might be if capabilities germane to the contemporary operating environment are not developed and maintained.

DELIBERATE FORCE

Throughout April and May 1995, fighting intensified, and Sarajevo was bombarded once again. NATO requested permission to attack the Serbian artillery positions, but concerned that the Serb response would only escalate the situation further, agreement was not forthcoming from the UN. Continuing Serb action led to a decision that some response was required, and the UN finally agreed to a request from the new UN Commander in Sarajevo, Lieutenant-General Rupert Smith, to act. Ammunition supply bunkers in the hills around Pale, were bombed on 25 and 26 May by USAF and Spanish aircraft.⁴⁰ This coincided with a preliminary visit to theatre by the TIALD Jaguars, which almost saw them being called into action.⁴¹ The VRS commander, General Ratko Mladić, responded by attacking the safe area at Tuzla, causing 71 deaths, and taking yet more UNPROFOR personnel hostage. An attempt to take Gorazde was thwarted by a small force of the Royal Welch Fusiliers and Bosnian troops, and the Serbs moved on to Srebrenica, where a number of war crimes were committed, including the massacre of most of the male population.

By this stage, the patience of a number of governments, particularly the British and French, had been pushed too far, and at another conference in London on the Yugoslav crisis, they declared that they would move from the more passive status of peacekeeping to peace enforcement. This effectively reduced UN influence, and saw the creation of a so-called 'trip wire' which would lead to major air operations against the Serbs if triggered. A Rapid Reaction Force, including elements of the Royal Artillery, supported by the RAF Chinook force was also despatched to bolster the forces in Bosnia.

While this was taking place, the Croatians launched a major offensive – Operation Storm – against the Serbs, retaking almost all the territory which had been lost in the fighting in 1991. President Clinton despatched a new peace envoy, Richard Holbrooke. Holbrooke was attempting to promote a new peace plan when, on 28 August, a mortar attack on Sarajevo left at least 37 people dead. Admiral Leighton Smith (Commander-in-Chief Allied Forces Southern Europe) and General Smith – who was standing in for the UNPROFOR commander General Janvier while the latter was on leave – made preparations for the NATO response. General Smith ordered the UN forces at Gorazde and Zepa to leave, with the former making a dash for friendly territory, whereupon he 'turned the bombing key.' The RAF's Harriers were to play a significant role in what followed, namely Operation Deliberate Force.⁴²

Operation Deliberate Force, coupled with serious reverses to their campaign in Croatia, came as a serious shock to the Serbs. Serbian air defences were attacked, with the first bombs falling on an SA-6 SAM site near Sarajevo early on the morning of 29 August, with a series of major attacks following throughout the day.⁴³

The TIALD Jaguars were given notice to deploy on 29 August, and began supporting operations the following day, when the two Jaguars and four Harriers attacked an ammunition storage depot near Sarajevo with PGMs.⁴⁴ Twenty five sorties were eventually flown by the Jaguar/Harrier combination, with two dozen Paveway LGBs being delivered. The Jaguars also used their TIALD pods on a number of occasions to locate targets which the Harriers then struck with unguided 1,000lb bombs.⁴⁵ This was followed by a bombing pause on 1 September, which was intended to give the Serbs time to withdraw from around Sarajevo. They chose not to do so, suggesting that the level of coercion required to break their will was higher than NATO had assumed.

By 10 September, Serbian positions throughout Bosnia had been subjected to renewed attacks, although the main weight of effort had fallen in eastern Bosnia. A strike against the major radar and communications hub near Banja Luka (Bosnia's second city) using Tomahawk missiles was planned for 11 September, but before this was launched, an attack by Jaguars (including from the French Air Force) and Harriers toppled the communications mast north of Tuzla.⁴⁶ This cut off Mladić's ability to communicate with many of his troops, just as a major Croat offensive against Banja Luka was beginning. This placed the VRS at a serious disadvantage, and the Croats made good progress. The attack on the communications site gave a good demonstration of the flexibility of the assets involved, since some of the strike package had been diverted to provide CAS to UN forces, but when not required to deliver weapons, had continued its pre-planned mission.⁴⁷

Attempts by General Janvier (now returned from leave) to negotiate with Mladić failed, and the attack on the hub at Banja Luka was launched, with the site being struck with Tomahawks. Further attacks by US Navy and USAF aircraft against communications sites in western Bosnia left the VRS forces there without communications, and they began to break and run. By 12 September, NATO had exhausted the list of authorised targets in eastern Bosnia, but the Serbs foolishly fired an artillery barrage against UN troops in the vicinity of Tuzla, which prompted a significant attack on the ammunition storage dump at Dobo, which was utterly destroyed.⁴⁸ It was clear that the Serbs had been left in serious difficulties as a result of the Croatian offensive and Deliberate Force. Richard Holbrooke was sent to Belgrade to speak to Milošević, in a bid to see if he might influence Karadžić and Mladić. The weight of NATO's air attacks had taken all the Serbian leaders by surprise, and Milošević concluded that the VRS position was hopeless. He informed Mladić that he would no longer support the VRS unless Mladić agreed to withdraw from around Sarajevo. Mladić's analysis of his position was gloomy, and he agreed to a ceasefire and the withdrawal of those heavy guns which had survived the bombing and Rapid Reaction Force counter-battery fire.⁴⁹

An initial deadline to withdraw weapons lest further attacks be launched had to be extended by 72 hours when it became clear that the VRS forces had suffered serious

losses to their logistics chain and were literally incapable of moving their weapons. The UN airbridge to Sarajevo had been closed since April 1995 because of the heavy fighting around the airport, and began again on 15 September, seeing a resumption of Operation Cheshire. Air operations continued, in order to monitor Serb compliance with the ceasefire, and there were some instances where Serbian positions were engaged. Holbrooke's efforts culminated in the Dayton Peace Accords, under which NATO provided an Implementation Force (IFOR) to create the conditions under which the agreed peace settlement could be implemented. IFOR took over from UNPROFOR on 20 December 1995, itself handing over to a Stabilisation Force (SFOR) a year later. The RAF continued to contribute, with support helicopter operations taking on even greater importance as IFOR established separation zones between the former combatants and worked with Special Forces units tasked with detaining persons indicted for war crimes. Although there was some tension which occasionally looked like escalating into renewed fighting, by the time of elections in September 1997, peace had largely returned.

CONCLUSION

When considering the RAF's contribution to operations in the Yugoslavia crisis, attention invariably focuses upon the final instalment in the fighting which came during the Kosovo crisis and NATO's use of air power to force a conclusion to Milošević's repressive policies in the province of Kosovo. This has sometimes been to the detriment of looking at the long and often frustrating period between 1992 and 1995. Yet it is a useful subject area to consider, given some of the factors which affected the RAF during the period.

The first conclusion which might reasonably be drawn is that the deployment of the RAF's combat air assets illustrated the importance of possessing depth, both in terms of the numbers of airframes and the personnel available to support an enduring commitment. Supporting Deny Flight as well as the Iraqi No Fly Zones was a significant challenge for an air force which was expected to contribute to control of the air, reconnaissance and sometimes attack missions. 'Skills fade' became a serious issue for aircrew, and the tempo of operations meant that there were potential issues with retention as experienced personnel became tired of what became known as 'overstretch.' Defence planning and policy, as noted by McInnes, was not as coherent as it might have been. The key driver of attempting to reduce defence spending was not matched by a sensible analysis of the commitments the armed forces were required to carry out. The concept that the British armed forces might 'do more with less' may perhaps be said to have had its origins in the intervention operations of the 1990s. Standing commitments were joined by intervention operations, including an open-ended requirement to maintain two No Fly Zones (three if the northern and southern components of the Iraq NFZ are treated as separate entities), placing significant demands on the RAF and its personnel.

The second, frustrating, conclusion for the historian is that although other RAF assets such as the support helicopter and transport and tanker fleets were an important part of the efforts in Yugoslavia, little source material highlighting this can be found beyond occasional references to the participation of, for example, Chinooks, VC10s and Hercules. This is highly regrettable, since it means that it is difficult to reach a full understanding of the RAF's contribution, as a key element of the era is likely to be under-researched until the archives open in the 2020s, and possibly not even then.

In difficult circumstances where international consensus was lacking, and the UN was perceived to be weak and vacillating, the use of air power played a significant role in bringing about peace. This is not to claim that air power did so independently, but to illustrate the value of 'joined up' planning and a willingness to employ force in a clear, effective manner; where UNPROFOR was seen to fail, NATO was considered by observers to have succeeded, hinting at the need for a willingness to use force in some circumstances.

The Yugoslav intervention illustrates how ongoing RAF operational commitments after the Cold War left the Service attempting to rebalance against continual deployments and contingent operations (long before the phrase 'return to contingency' became popular). This, in turn, highlighted the importance and relevance of the RAF to achieving national policy objectives, not only in terms of delivering military force, but in securing international influence, a function likely to remain a constant in the second century of the Service.

NOTES

¹ Eliot A Cohen, 'The Mystique of US Air Power', *Foreign Affairs*, January/February 1994; <https://www.foreignaffairs.com/articles/1994-01-01/mystique-us-air-power> (accessed 12 October 2018); President George H W Bush, Speech to Congress, 6 March 1991; Lawrence Freedman, 'The Gulf War and the New World Order,' *Survival*, Volume 33 No. 3, (1991), 195-196.

² Vesna V Godina, 'The outbreak of nationalism on former Yugoslav territory: a historical perspective on the problem of supranational identity', *Nations and Nationalism* Volume 4:3 (1998), 413-416.

³ Sabrina Petra Ramet, *Balkan Babel: The Disintegration of Yugoslavia from the Death of Tito to the Fall of Milošević* (London: Routledge, 2002, 4th edition), 4, 6.

⁴ Ramet, *Balkan Babel*, 4.

⁵ James Gow, 'Deconstructing Yugoslavia', *Survival*, 33:4 (1991), 294; Ramet, *Balkan Babel*, 6.

⁶ Ramet, *Balkan Babel*, 6.

⁷ Ibid, 7.

⁸ Gow, 'Deconstructing Yugoslavia', 294. Yugoslav People's Army is the translation of Jugoslavenka Narodna Armija (JNA), thus 'JNA' is used.

⁹ Ibid, 298-299.

¹⁰ James Horncastle, 'Croatia's bitter harvest: Total National Defence's role in the Croatian War of Independence', *Small Wars and Insurgencies*, Volume 26:5 (2015), 754-758; Norman Cigar, 'Croatia's war of independence: The parameters of war termination', *Journal of Slavic Military Studies*, Volume 10: 2 (1997); 34, 36-40.

¹¹ In addition to the sources noted above, the preceding paragraphs are further distilled from several sources, particularly Misha Glenny, *The Fall of Yugoslavia* (London: Penguin, 1996; 3rd edition); Mark Almond, *Europe's Backyard War* (London: Mandarin, 1994) and Christopher Bennett, *Yugoslavia's Bloody Collapse: Causes, Course and Consequences* (London: Hurst & Co, 1993).

¹² Almond, *Backyard War*, 185.

¹³ See letters from Merrick S Baker-Bates, the British Consul General in Los Angeles, and Maryann Zovak to the *Los Angeles Times*, 11 August 1995 http://articles.latimes.com/1995-08-11/local/me-33911_1_bosnian-muslims-serbs-lift (accessed 15 October 2018).

¹⁴ Ibid, 243-45; Brendan Simms, *Unfinest Hour: Britain and the Destruction of Bosnia* (London, Allen Lane, 2001), 4-6. Both Almond and Simms are damning in their assessment of the British government's reluctance to intervene, particularly because of concerns that to do so would almost inevitably lead to having to take sides. The European Union came into force in 1992, after the Maastricht Treaty, succeeding the European Community.

¹⁵ Christopher Bellamy, 'Croats Cool as British Convoy Rolls into Split', *The Independent*, 31 October 1992.

¹⁶ Robert Fisk, 'UN Fears Aircraft Was Shot Down by Missile', *The Independent*, 4 September 1992.

¹⁷ Group Captain DKL McDonnell, 'Humanitarian Airlift', *Royal Air Force 94*, <http://www.ukmams.co.uk/Humanitarian.html> (accessed 11 October 2018).

¹⁸ <https://www.rafbf.org/news-and-blogs/rafs-longest-running-airlift-helped-save-people-sarajevo> (Accessed 11 October 2018).

¹⁹ Lawrence Freedman, 'Why the West Failed', *Foreign Policy*, No. 97 (Winter, 1994-1995), 63.

²⁰ Stuart Croft, Andrew Dorman, Wyn Rees & Matthew Uttley *Britain and Defence 1945-2000: A Policy Re-evaluation* (London: Longman, 2001), 42.

²¹ Joyce Kaufmann, NATO and the Former Yugoslavia: Crisis, Conflict and the Atlantic Alliance *Journal of Conflict Studies*, <https://journals.lib.unb.ca/index.php/jcs/article/view/4355/5009> (accessed 14 October 2018).

²² Lord Owen, previously David Owen, had been the UK Foreign Secretary from 1977-1979 as part of the Callaghan administration; he left the Labour Party in 1981 and was one of the founders of the Social Democratic Party. Upon the merger of the SDP with the Liberal Party in 1988, Owen led a 'rump SDP' for two years prior to its disbandment in 1990. He was made a peer in 1990, and was appointed as the EU co-chairman for the conference on former Yugoslavia in August 1992, succeeding Lord Carrington.

Cyrus Vance had been US Secretary of State between 1977 and 1980. Following his departure from office after Ronald Reagan won the 1980 US Presidential election, he was frequently asked to serve on various diplomatic missions. In 1991, as the UN Secretary General's Special Representative, he proposed a peace plan for the former Yugoslavia, but this was rejected by the Krajina Serbs. He then became the UN Special Envoy to Bosnia, where he and Owen attempted to broker peace. He resigned from the position in April 1993.

²³ Thorvald Stoltenberg served as Norwegian minister of defence and Minister of Foreign affairs in two Norwegian governments. His tenure as foreign minister (1987-89 and 1990-93) was interrupted by service as Norway's ambassador to the UN, and becoming the UN High Commissioner for Refugees, although he held these two posts for less than a year. He was appointed as Cyrus Vance's replacement.

²⁴ United Nations Security Council Resolution 781, 9 October 1992, [https://undocs.org/S/RES/781\(1992\)](https://undocs.org/S/RES/781(1992)) (Accessed 11 October 2018).

²⁵ Kaufmann, 'NATO and the Former Yugoslavia' (note 10).

²⁶ Barbara Starr, 'Deny Flight forces poised for Bosnia strikes; *Jane's Defence Weekly* 14 August 1993.

²⁷ Hampden (sometimes referred to using 'Grapple', the codename for the British Army's contribution) was the British contribution to peacekeeping operations in the Former Yugoslavia.

²⁸ Martin W Bowman, *SEPECAT Jaguar: Tactical Support & Maritime Strike Fighter* (Barnsley: Pen & Sword, 2007), 184-186.

²⁹ Ibid, 187-188.

³⁰ House of Commons Debates (hereafter, *Hansard*), 30 November 1993, Column 928; *Front Line First: The Defence Costs Study* (London: Ministry of Defence, 1994).

³¹ Colin McInnes, 'Labour's Strategic Defence Review', *International Affairs* Volume 74 No.4 (1998), 824-825.

³² Reuter et al, *Tornado F3*, 142.

³³ Kaufmann, 'NATO and the Former Yugoslavia'.

³⁴ Nick Richardson, *No Escape Zone* (London: Sphere, 2001).

³⁵ Ibid, 298.

³⁶ See Hikaru Yamashita, 'Impartial' Use of Force in United Nations Peacekeeping', *International Peacekeeping*, Volume 15:5, 615-630; Freedman, 'Why the West Failed', 63-64.

³⁷ John Gerard Ruggie, 'The UN and the collective use of force: Whither or whether?', *International Peacekeeping*, Volume 3 No. 4, 4.

³⁸ Andy Evans, *SEPECAT Jaguar* (Marlborough: Crowood Press, 1998), 155.

³⁹ Bowman, *Jaguar*, 200.

⁴⁰ Tim Ripley, *Conflict in the Balkans 1991-2000* (Oxford: Osprey, 2001).

⁴¹ Evans, *Jaguar*, 157.

⁴² Tim Ripley, *Operation Deliberate Force; The UN and NATO Campaign in Bosnia, 1995* (Lancaster: CDISS, 1999), 244.

⁴³ Ripley, *Conflict*, 28-29.

⁴⁴ Bowman, *Jaguar*, 200.

⁴⁵ Evans, *Jaguar*, 161.

⁴⁶ Ripley, *Deliberate Force*, 284.

⁴⁷ Ibid.

⁴⁸ Ripley, *Conflict*, 32.

⁴⁹ Ibid.

THE RAF'S EXPERIENCE OF COMMAND AND CONTROL IN OPERATION TELIC, THE SECOND GULF WAR, 2003¹

By Dr Sebastian Ritchie

Biography: Dr Sebastian Ritchie obtained his PhD from King's College London and lectured at the University of Manchester before joining the Air Historical Branch (RAF) as an official historian. He is the author of a number of classified official histories covering RAF operations in Iraq, the Former Yugoslavia, Libya, Afghanistan, and more widely on aspects of air power and air operations.

Abstract: Operation Telic – the UK name for the US-led coalition intervention in Iraq in 2003 – was the Royal Air Force's largest single undertaking since the First Gulf War. It represented a marked departure from the air operations of the 1990s in that air power was deployed primarily in support of the Land Component's advance on Baghdad, and in the Counter-Theatre Ballistic Missile role alongside coalition Special Forces. Drawing on official sources, this article describes the RAF's experience of air command and control (C2) in Telic, highlighting some of the novel challenges involved in the exercise of air C2 and the means by which they were addressed in the context of the build-up to hostilities, the transition to war, and the operation itself. Finally, it offers a brief assessment of the air C2 lessons identified from Telic and their longer-term implications.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor.

INTRODUCTION

This article surveys the Royal Air Force's experience of air command and control (C2) before and during Operation Telic – the UK name for the US-led coalition operation entitled Iraqi Freedom, also commonly referred to as the Second Gulf War. The aim of the article is to provide a clear, factual narrative of the subject in so far as this can be accomplished using official sources. It is also necessary to provide a limited amount of background information to place the key air C2 issues in context. In what follows, air C2 is initially considered in relation to preparatory planning for Telic. Subsequently, the focus shifts to the deployment phase of the operation, the transition from Operation Southern Watch No-Fly Zone (NFZ) operations to Telic, and air C2 during the operation itself.

Operation Telic was launched in March 2003; three weeks later, its primary aim was achieved as coalition troops entered Baghdad and precipitated the downfall of Saddam Hussein's regime. Telic was the RAF's largest single undertaking since the First Gulf War (UK Operation Granby) by a substantial margin. At peak, some 8,000 personnel were deployed in theatre along with 126 aircraft, comprising 67 fast jets and 59 other fixed and rotary wing platforms. Between 19 March and 15 April, the fixed-wing aircraft flew more than 2,500 sorties, and RAF combat aircraft released 919 munitions.

Yet if Telic was comparable to Granby in terms of forces committed, tempo sustained and effort expended, the two operations were very different in a number of important respects. Telic did not involve a drawn-out and pre-planned air offensive similar to the coalition campaign mounted in 1991. Instead, air power was predominantly used in support of the Land Component during its rapid advance from Kuwait to Baghdad and in Counter-Theatre Ballistic Missile (Counter-TBM) operations over Western Iraq in conjunction with coalition SF. Consequently, while air C2 in Operation Telic involved at least some obvious continuities, important new challenges had also to be confronted.

BACKGROUND, PLANNING AND COMMAND ARRANGEMENTS

The RAF's involvement in Operation Telic followed on from some 13 years of almost continuous UK air operations in the Persian Gulf. After Granby, the RAF was committed to the protracted task of patrolling the Southern and Northern Iraqi NFZs as part of another US-led coalition. Throughout, the coalition operation names were Southern Watch and Northern Watch; by 2002, the UK contribution to these two operations occurred under the operation names Resinate (South) and Resinate (North). The RAF maintained detachments of eight Tornado GR4s and six Tornado F3s in the south with air-to-air refuelling (AAR) support, while the northern commitment was assigned to four Jaguars. The coalition and UK Air Headquarters and the CAOC were located at Prince Sultan Air Base (PSAB), Al Kharj, in Saudi Arabia.

In March 2002, Headquarters Strike Command (HQSTC) received the first indirect intimations that the United States was preparing contingency plans for a major operation against Iraq. By May, contingency planning was also being conducted within the MOD. An assessment produced on the 22nd suggested that the UK might deploy some 88 fast jets and 38 supporting aircraft within a period of between three and four months for an operation of the scale of Granby.

At the beginning of July, the MOD confirmed to the Prime Minister that US military thinking on Iraq was ‘quite well advanced’, but that there was, as yet, no political authority to commit US forces. US contingency planning assumed that the objective of any prospective operation would be to overthrow Saddam Hussein’s regime, destroy his weapons of mass destruction (WMD) capability and reduce the perceived threat that Iraq posed to surrounding countries and the US itself. Although US CENTCOM at first envisaged that only American forces would be involved, by July there was a *de facto* invitation to the UK and Australia to participate.

As a first step, the US invited a small number of British military personnel to join their planners at various levels of command. Consequently, the Secretary of State sanctioned the early dispatch of a six-man team to Tampa, on the strict understanding that this would not prejudice the outcome of any decision on UK participation in an operation. The UK was officially informed and briefed on US planning on 16 July, and the Permanent Joint Headquarters (PJHQ) was then tasked to make an assessment of the plan to inform ministers and to examine UK contingency options in a US-led operation against Iraq. The Contingency Planning staff at HQSTC also initiated work on the potential UK air contribution at this time.

A more detailed picture of American planning soon emerged. CENTCOM’s basic operation plan (OPLAN), numbered 1003V, was designed to overwhelm the Iraqi regime through a co-ordinated multiplicity of threats applied across a number of lines of operation. These were:

1. Operational fires
2. Operational manoeuvre
3. SF operations
4. Unconventional warfare/support to other governments
5. Influence operations
6. Humanitarian assistance
7. Political-military engagement

The intention was to launch coalition forces into Iraq across both her southern and northern frontiers.

Within this very broad concept, the Combined Forces Air Component Commander (CFACC), Commander CENTAF, Lieutenant General TM 'Buzz' Moseley, was assigned five key offensive tasks.

1. Counter-air (airfields and IADS)
2. Counter-TBM in Western Iraq
3. Counter-land
4. Strategic attack against regime targets (seen as vital to early regime collapse)
5. Support to SF

Initially, however, air power would be employed primarily for effect and with the aim of achieving what was famously termed 'shock and awe'. Hostilities would be initiated by a massive bombing effort covering a very wide range of targets. The US believed that 'the initial "shock and awe" created by the synchronised opening of both air and ground operations' would 'lead to the rapid collapse of much of the potential opposition, enabling the coalition to seize control of up to two thirds of the country within days'.

Kuwait, although small and potentially vulnerable, could always be counted on for support and was to be the launching platform for the southern offensive. But the northern axis was dependent on Turkey's willingness to permit large numbers of coalition troops and aircraft to be based on her soil, and her government proved unwilling to enter into any such commitment. Nevertheless, in Washington, there was every confidence that these difficulties would be resolved, and planning proceeded on the assumption that the coalition would be able to operate from bases in Turkey. This would have profound implications for the UK because CENTCOM quickly assigned a key role to British land and air forces on the northern front.

HQSTC's first outline plan for RAF participation appeared at the end of July, and reflected the increased exchange of information between the UK and the US, as well as CENTCOM's enthusiasm for UK involvement in Northern Iraq. The plan envisaged offensive air operations by Tornado GR4s from their existing base in Kuwait, Ali Al Salem, and from Akrotiri or Southeast Turkey, and air support to UK land forces by Harrier GR7s from Southeast Turkey. The F3s already located in Saudi Arabia would operate in the air defence role, while GR4s and Jaguars flew tactical reconnaissance missions from both the south and north. E-3Ds, PR9s and Nimrod R1s and MR2s were to operate from Cyprus or Oman. Twelve tankers would be deployed to Akrotiri and to Turkish and Gulf bases, along with in-theatre air transport and air support for SF.

The RAF's tasking, as then understood, was as follows:

- a. Contribute offensive air assets to the US campaign against Iraq
- b. Contribute additional 'niche' air capabilities that can add value to the US

campaign against Iraq

- c. Support a UK land campaign inserting from Southern Turkey into Northern Iraq
- d. Enable an Air Point of Departure (APOD) in Turkey for the deployment of UK Land Forces

HQ STC's plan emphasised the RAF's pronounced dependence on Turkish basing and overflight.

By the beginning of August, knowledge of OPLAN 1003V was being extended across key areas of the UK defence community, including the Front-Line Commands (FLCs). On the 5th, PJHQ formed a Crisis Planning Team, and the Defence Staff issued PJHQ with formal planning guidance four days later. PJHQ in turn presented a submission to the Defence Staff on UK contributions to the prospective operation on 13 September. During this period, the RAF was assigned the additional task of supporting Counter-TBM operations in Western Iraq primarily through the deployment of a detachment of GR7s, which were to collaborate with similarly committed USAF elements and coalition SF.

Between 19 and 22 August, the Chief of Staff, Joint Force Headquarters (JFHQ), visited CENTCOM to discuss command and control, and how the UK component could be integrated into a deployed CENTCOM forward headquarters. Although the nomenclature changed somewhat, the system that emerged differed little from that employed during Operation Granby. The Chief of Joint Operations (CJO) was to become Joint Commander for the operation, exercising his responsibilities through PJHQ to the National Contingent Commander (NCC) at his deployed headquarters in the Gulf. As Joint Commander, he would have operational command over all UK forces assigned to the operation, while the NCC exercised operational control of the three UK contingents – Air, Land and Maritime. In turn, the NCC delegated tactical command to the three Contingent Commanders; where the Air Contingent was concerned, Tactical Control was to pass to the coalition Air Commander (the CFACC) during the execution of agreed tasks on the Air Tasking Order (ATO).

The command structure was trialled in a five-phase exercise entitled 'Internal Look' during November and December and, as the NCC for an operation against Iraq had obviously to be involved in the exercise, it became necessary to settle his appointment before it began. Air Marshal Brian Burridge, the Deputy C-in-C at HQSTC, duly became NCC Designate at the beginning of October. During the exercise, Air Marshal Burridge, the staff of the JFHQ and augmentees from the three FLCs manned the National Contingent Headquarters (NCHQ). Phases 4 and 5 of Internal Look took place at CENTCOM's prospective forward headquarters in Qatar.

The exercise ended on 15 December 2002. It provided a clearer picture of the targeting delegations needed by the NCC, and highlighted a number of potential

areas of concern, such as the adequacy or otherwise of AAR provisions; many important lessons were apparently identified. Yet the exercise seems only to have been a partial success from the Air Contingent's perspective. According to one subsequent assessment,

The 3 vignettes played out were insufficiently long to draw significant conclusions. The crucial first few days of the campaign were not covered, which failed to expose fully the problems of synchronisation between A and G days,² and the full air operations cycle was never achieved. In addition, many of the processes (ISR³, BDA⁴ and the capacity of the ASOCs⁵ to manage the planned levels of KI/CAS⁶) that eventually proved [to be] key weaknesses were not highlighted.

As for the overall command and control structure, it probably represented the only logical framework for the UK to employ, given the established functions of the MOD, PJHQ and the FLCs. The advantage of the system was that it provided a single operational commander in theatre acting on behalf of all deployed UK forces – and thereby a single point of contact for Commander CENTCOM, while effectively integrating the three UK contingents into their respective coalition components. The one possible disadvantage had been highlighted during Operation Granby, 12 years before: arguably, with its PJHQ, deployed NCHQ and individual contingent headquarters, the UK command structure had too many layers. During Telic, a small minority questioned whether the NCHQ was necessary. Although both CDS and the Chiefs of Staff supported the NCHQ concept, CJO was unhappy to find that his influence waned within CENTCOM after the NCHQ arrived in the Gulf and CENTCOM itself deployed forward. To the UK Land Contingent Commander (UKLCC), the NCHQ seemed to represent an extra link in the command chain that caused inertia.

On the other hand, the NCHQ's abolition would have required elements of PJHQ to deploy to the Gulf in its place, if a single commander, positioned in theatre, was still to represent all three deployed UK contingents. It would then have been necessary for the (deployed) PJHQ to deal with each of the UK FLCs and the MOD from overseas. Clearly, the implications of such a change in UK command arrangements would have been far-reaching; where communications alone were concerned, the challenges would have been daunting. The approach employed in Granby and Telic did at least offer the advantage of a single chain between the deployed and UK headquarters, as well as, in PJHQ, a conduit in the UK linking the MOD and the FLCs with deployed forces. Interestingly, the UK Air Contingent Commander (UKACC), far from questioning the role of the NCHQ, argued that it had been empowered too late (20 February 2003) by CJO. In his view, this exerted an adverse effect on both the management of UK force deployments and the C2 of deployed forces.

DEPLOYMENT

When planning for the prospective operation in Iraq began, PJHQ believed that the US might commence hostilities as early as October 2002. However, primarily to ensure the participation of the UK and other countries in a coalition against Iraq, the US began a concerted diplomatic effort within the United Nations (UN) to bolster the case for military action. The decision to 'follow the UN route' postponed the start of any conflict to early 2003. This delay did provide both the US and the UK with valuable additional time to complete their preparations, but it introduced a second critical uncertainty into the process, adding to the difficulties caused by CENTCOM's determination to open a northern front.

Ultimately, the UN Security Council passed Resolution 1441 on 8 November 2002, declaring Iraq to be in 'material breach' of earlier disarmament resolutions, insisting on the provision of a full declaration of WMD holdings and demanding the resumption of weapons inspections. In December, Iraq produced what it claimed was an accurate and complete declaration of its WMD and weapons delivery programmes, but the UN Monitoring, Verification and Inspection Commission (UNMOVIC) reported on the 19th that that this declaration fell short of the full, final and complete disclosure required. Up to this point, it had been difficult for the UK to embark on open preparations for war, but a more visible build-up now began.

At the beginning of 2003, it became clear that Turkey would not provide basing in the event of hostilities with Iraq, and UK deployment plans were extensively revised. Alternative base facilities for eighteen GR4s at Al Udeid airfield were requested from Qatar, and PJHQ worked with CENTCOM to secure basing for the E-3D and VC10 detachments in Saudi Arabia, for more tankers in Bahrain, and for twelve GR7s in Kuwait. A planned and routine Operation Resinate deployment of four GR4s to Ali Al Salem on 27 January was used as a first step towards enlarging the detachment, and six GR4s engaged in pre-deployment training in Cyprus were held there pending movement to the Gulf. Ultimately, the larger GR4 detachment was established at Ali Al Salem and 12 aircraft were based at Al Udeid.

The objective was now to deploy the UK Air Contingent into theatre during the second and third weeks of February to reach full operating capability by 3 March. This was thought to be the earliest possible date for the start of the air campaign. However, to achieve this deadline, the UK needed to finalise the new basing plans, ground equipment had to be conveyed to the Gulf – largely by sea – and it was necessary to complete the protracted diplomatic clearance processes of the various Gulf states. By 31 January, Kuwait and Bahrain had agreed to provide base facilities. By 4 February, it was assessed that Qatar would accept the UK basing request, and reports from Washington suggested that a decision on military action would probably be delayed by US deployment hold-ups and international pressure to give UNMOVIC inspections more time. The original UK deployment timescales could therefore be extended.

In the meantime, from 20 January, a staff that combined elements of the Joint Forces Air Component Headquarters (JFACHQ), the standing Operation Resinate (South) Headquarters and additional augmentees established the UK Air Contingent Headquarters (UK ACHQ) for Operation Telic. The Air Officer Commanding 1 Group, Air Vice-Marshal Glenn Torpy, assumed his appointment as UKACC on 9 February. The ACHQ was structured as follows:

- A1 - Personnel
- A2 - Intelligence
- A3 - Air Operations and Force Protection
- A4 - Logistics and Infrastructure
- A5 - Strategy and Plans
- A6 - Communications and Information Systems
- A8 - Contracts/Civil Secretariat

The A2, A3 and A5 cells comprised the operations section of the headquarters, while the A1, A4, A6 and A8 cells made up the support section. The headquarters ultimately numbered some 220 personnel, including support staff. Additionally, 55 personnel were fully embedded within the CAOC. Meeting this commitment drew heavily on the RAF's resources of trained C2 manpower, which were stretched to the limit. A problem repeatedly identified in earlier operations – the shortage of trained targeteers – was encountered once again.

Nevertheless, the ACHQ and embedded RAF CAOC staff are said to have exerted a considerable influence on the conduct of the air campaign at the operational and tactical levels. The CFACC was content to place UK officers in senior CAOC positions – a reflection not only of the credibility and experience of the officers concerned but also of the trust and respect that had built up between the RAF and the USAF on the basis of near-constant collaboration since 1990.

The Air Contingent deployment process was far from straightforward. The UKACC believed that the task of establishing his headquarters should have been completed well before the various force elements began to deploy, and subsequently maintained that too many decisions on the structure of his force had been taken in the UK. In his view, specific theatre requirements should have been more influential: there was 'too much "UK push" rather than theatre pull'. He also recorded that he had been unable to build up his forces as quickly as he had hoped due to the time involved in securing diplomatic clearances to bring personnel, equipment and aircraft into theatre.

Daunting logistical hurdles had also to be overcome. As one commentator remarked, 'the size of the task, together with fragile communications, has caused difficulty in maintaining visibility of exactly what equipment has been scheduled to arrive where and

when, whether moving by sea or air.’ Seaborne equipment packages originally prepared for Turkish bases (and which, of necessity, left the UK before the Turkish option was ruled out) were inevitably not optimised for the revised basing arrangements. Deployed Operating Base (DOB) commanders complained that enabling equipment and personnel arrived in the wrong order and at short notice. Hub-and-spoke air transport operations centred on the UAE base at Fujarah (but originally planned for Akrotiri) did not begin as early as had been hoped. Difficulties securing diplomatic clearance then disrupted flying and led to the accumulation of a four-day backlog of freight movement. Shortages of weapons and ground support equipment (GSE) delayed the establishment of full operational capability at Al Udeid and PSAB, and required some redistribution from Ali Al Salem and Bahrain respectively; GSE sent to PSAB from the UK, which reached Bahrain by sea on 10 March, was not delivered until the 17th because of further diplomatic clearance problems. Nuclear Biological and Chemical (NBC) stores proved inadequate and were unevenly distributed between force elements.

The early stages of the deployment were also beset by chronic communications problems at ACHQ level – both forward to the DOBs and back from the headquarters to the UK. Communications bearers and gateways proved insufficiently robust, and difficulties also arose because a multitude of different communications and information systems (CIS) were employed across the UK defence community. Moreover, there was little interoperability with American systems. After Telic, the UKACC identified CIS as his gravest area of concern.

Of course, many early teething troubles in the communications sphere were ultimately resolved, but the more fundamental weaknesses within the UK CIS infrastructure could not be rectified in the middle of a major operation. The urgent need for a single robust defence-wide system was perhaps the most prominent lesson identified from the operation. By contrast, the other physical deployment obstacles were overcome in due course.

AIR C2 AND THE SOUTHERN NO-FLY ZONE

Against a background of mounting international tension, the second half of 2002 witnessed a marked increase in the intensity of air operations in the Iraqi NFZs. Sometimes described as ‘spikes’, they led Iraq to deploy more SAMs into the Southern NFZ, and there were increasingly frequent SAM launches against coalition aircraft, which duly gave rise to a growing number of so-called Response Options – coalition attacks on Iraqi targets. The increase was so pronounced that the more senior RAF officers in theatre began to suspect that a transition might be taking place from extended NFZ operations to shaping activity for a planned assault on Iraq. One UK observer noted in November that ‘the UK position within the coalition ops had to be carefully guarded to remain within the Op RESINATE (S) remit and not stray into preparation for a possible action against Iraq.’

That US objectives now extended beyond the immediate parameters of Southern Watch was also apparently reflected in a new coalition CONOPS introduced in November. UK analysis of the so-called CONOPS 2003 concluded that it was chiefly concerned with the expansion and rationalisation of targeting delegations from Washington down to the Combined Joint Task Force Operation Southern Watch. CENTCOM was said to have no imminent plans for *expanding* the Southern Watch target set. Yet the new CONOPS did provide for strikes against 'targets from the CENTCOM-approved Response Option target list *or targets other than those on the CENTCOM-approved Response Option target list.*'⁷

Yet the reality seems largely to have been that the Response Options, while increasing in intensity, still struck the type of air defence sites that had been targeted almost continuously since 1998. Moreover, they remained confined to Southern Iraq. RAF assets in the Gulf continued to operate in accordance with an earlier CONOPS – CONOPS 2001 – and, by the end of the year, this had led to their exclusion from Response Options on just a few occasions.

However, during January, US timelines for the launch of OPLAN 1003V began to slip. At the end of 2002, US planning still envisaged that a short preliminary air campaign preceding a ground offensive into Iraq would be launched late in February, but the UK was advised on 15 January of 'a possible marginal shift to the right' for the American political decision to go to war. The delay was apparently required to give more time both for military preparations and the 'political process' – i.e., the presentation of a case for war based on UNMOVIC's expected failure. Furthermore, the gap between A-Day and G-Day had been compressed so that G-Day was now expected to commence five days after A-Day.

As the weapons inspection and UN processes ground on, the timetable slipped again. In mid-February, the UK Chiefs of Staff learnt that the Combined Forces Land Component Commander (CFLCC) was working towards a G-Day of 15-16 March, only slightly preceded by A-Day. This scenario was effectively confirmed on 22 February, when the US administration took the political decision to launch OPLAN 1003V in mid-March. Ultimately, citing the authority of UNSCR 1441, the Americans prepared an ultimatum demanding that Saddam Hussein leave Iraq within 48 hours or face military action. It was issued on 17 March, making the 19th D-Day for OPLAN 1003V.

The revised timetable confronted the CFACC with a fundamental problem. As the time allowed for the preliminary air campaign was compressed, he found himself facing the formidable challenge of discharging his five main tasks (see above) almost simultaneously. He was given hardly any time to shape the battlespace or dismantle Iraq's most capable array of ground-based air defences (GBAD) around Baghdad –

known as the Super-MEZ⁸ – which was crucial if the Republican Guard divisions protecting the Iraqi capital were to be targeted effectively. It must have appeared eminently sensible in these circumstances to conduct at least some shaping operations under the auspices of the NFZ mission through the medium of Response Options. He therefore secured such authority as was necessary to extend the parameters of Southern Watch, and the number of Response Options duly increased, as did the coalition air presence in Southern Iraqi skies. By contrast, the UK targeting directive (TD) continued to impose tight restrictions on RAF participation in any activity extending beyond the basic NFZ tasks.

This placed the UKACC in an awkward position, and he eventually felt constrained to ask for his TD and ROE to be amended. His perspective is easy to understand, but the problem was viewed rather differently in London, predictably enough. The suggested changes in the directives would have been difficult to reconcile with the government's declared position that no decision had yet been taken to go to war, and with its determination to observe the weapons inspection and United Nations processes before committing the UK to hostilities. Moreover, at the time, the precise legal basis for taking military action to disarm Iraq was still under discussion. Although very seriously considered, therefore, the request was rejected. However, there was rather more flexibility where ISR activity was concerned, and the TD was altered to permit strikes against Iraqi forces deemed to be threatening the coalition build-up in the Gulf. The UKACC remained far from content with the situation, but the revised directive did more closely align the US and UK positions.

On 3 March, the MOD authorised aircraft deployed on Operation Telic to participate in Resinate (South), and most of the RAF detachments that formed the UK Air Contingent took full advantage of this changed situation when the CFACC introduced a new concept of operations the following day. This involved spreading a series of air 'packages' over each 24-hour period. However, apart from operating on a 24-hour basis, the coalition would maintain the established flying patterns as far as possible, avoiding any further increase in the number of Response Options and thus acclimatising the Iraqis to more intensive air activity. This would avoid confronting them with a sudden and dramatic air offensive that would obviously herald the launch of 1003V. At the same time, the CFACC reiterated that he attached the highest importance to maintaining coalition and international support, and that this should be reflected in the CAOC targeting process. His stance was welcomed at the UK ACHQ, as it promised to moderate at least some of the difficulties that had arisen in the preceding weeks.

In addition to the GR4s at Ali Al Salem and the F3s at PSAB, which were already involved in Resinate (South), several force elements deployed for Operation Telic were now included in the ATO, such as the Nimrod R1, VC10 and E-3D detachments. The Al Jaber GR7s began flying Resinate sorties on 12 March. Only the Ali Al Salem GR4s were

committed to Response Options, and no other RAF aircraft released weapons against Iraqi targets before the start of Operation Telic.

AIR C2 IN THE SECOND GULF WAR

By the second week of March, coalition planning had compressed A-Day and G-Day to such an extent that they were eventually scheduled to take place at the same time – on D+2. This was partly because the US administration desired the shortest possible period of live hostilities and believed extensive battlespace preparation was unnecessary, given the relative strengths of coalition and Iraqi forces. The CFLCC may also have considered that large-scale preliminary air strikes, while desirable to degrade enemy ground forces, might warn the Iraqis of the impending assault and give them an opportunity to sabotage the all-important oil fields before coalition forces began their advance. Equally, it was believed in some quarters that an air campaign designed to achieve shock and awe might undermine coalition Information Operations (IO) by causing civilian casualties and collateral damage, and that the destruction of Iraqi infrastructure might significantly complicate the task of post-war reconstruction.

At the ACHQ, the days preceding the outbreak of hostilities were dominated by last-minute planning for the opening phase of operations. Work on clearing OPLAN 1003V targets started on 9 March and the UKACC also instituted table-top targeting exercises to ensure that robust targeting and clearance procedures were in place. He himself participated in a CENTCOM VTC table-top exercise on 12 March intended to 'war-game' the early days of the campaign. At the same time, ATOs were prepared covering D-2 to D+4. This proved extremely difficult because of the prevailing uncertainty about how 1003V would actually begin – how the political and military processes would be synchronised, how A-Day would be co-ordinated with D-Day and how the end of Southern Watch would lead into the beginning of OPLAN 1003V. A Master Attack Plan for the A-Day ATO was finally briefed to the CFACC on 13 March, but changes were being introduced into some of the other ATOs for this critical period as late as the 18th. Ultimately, it was necessary for the UK ACHQ to prepare a variety of Air Operations Directives to cover a broad range of circumstances in which hostilities might start. Much of this planning effort inevitably proved to be nugatory.

The UKACC duly adopted the Operation Telic ROE on 19 March at 1800Z – the same time as the Americans switched to the ROE for OPLAN 1003V. However, air planning was again in a state of flux by that time. If 19 March was D-Day, the original plan had envisaged launching the ground and air operations on D+2 – the 21st. But Commander CENTCOM then decided that the ground offensive should begin on D+1 – the 20th – apparently in anticipation of the early collapse of resistance in Southern Iraq. In other words, he now envisaged that G-Day would actually *precede* A-Day. As some unknown comedian in the CAOC put it, 'A before G, except after D.'

This had profound implications for A-Day: a Master Attack Plan designed to contribute independently to the achievement of shock and awe could hardly be appropriate to a situation in which large-scale ground operations had been in progress for more than 24 hours. Ultimately, numerous missions scheduled for the opening stages of Telic were cancelled altogether, and much of the targeting associated with shock and awe was abandoned. Similarly, the Baghdad Super-MEZ was left intact and was not systematically targeted for several days – a striking reversal of the order of events normally associated with air campaign planning.

In the initial coalition offensive, the US Army's V Corps drove north-west along the western bank of the Euphrates, while the Marine Expeditionary Force (1 MEF) and 1 UK Armoured Division concentrated on securing southern areas of Iraq, including the port of Umm Qasr, the Rumaylah oilfields, the Al Faw Peninsula and Basra. Responsibility for this area then passed to 1 UK Armoured Division, freeing the bulk of 1 MEF to follow V Corps as far as Nasiriyah, where they crossed the Euphrates and advanced north. The campaign then developed into a headlong rush for Baghdad.

For the deployed RAF units, the revision of coalition planning in this period overturned a number of earlier assumptions. The GR4 and GR7 detachments arrived in the Gulf expecting to fulfil a variety of roles, including attack, interdiction and CAS. In the event, they received – at most – two or three days of pre-planned tasking before being switched to CAS or, to be more precise, KI/CAS. KI/CAS (standing for Kill-Box Interdiction/Close Air Support) was a US Marine Corps (USMC) concept, which was adopted by the CFACC for the operation. The whole of Iraq was divided into kill-boxes and each box was then subdivided into nine equal squares, so that it resembled a telephone keypad. Operations were planned into individual kill-boxes with set rules for entry and exit.

Outside a Fire Support Coordination Line (FSCL), some distance beyond the Forward Line of Own Troops (FLOT), aircraft were cleared to attack any targets they could find in their assigned kill-boxes – assuming they had been declared 'open'. If they were 'closed', aircraft could only attack under positive direct control, normally from a Forward Air Controller (FAC). Inside the FSCL, kill-boxes were automatically closed unless opened with the agreement of the CFLCC. In the absence of such agreement, they were subject to three types of CAS, all of which necessitated positive direct control of the aircraft. Type 1 required the terminal controller to have sight of both the aircraft and the target – a rare occurrence during the campaign; Type 2 required the terminal controller to have sight of either the aircraft or the target, while Type 3 enabled air strikes to take place when the terminal controller could see neither aircraft nor target. This typically occurred when a forward ground unit reported the location of a target to a terminal controller in radio contact but not visual contact with both the ground unit and the attacking aircraft.

For the GR7s committed to Counter-TBM, a slightly different system was employed. Western Iraq was divided into four Areas of Operation (AOs), each being assigned to specific SF elements. Each AO included a number of Joint Special Operations Areas (JSOAs), which corresponded with the kill-box grid system employed by coalition air forces. SF within the JSOAs were responsible for searching them for Scud activity and were also protected by strict fire support control measures – a vital safeguard against fratricide. Outside the JSOAs, it was unnecessary for fire support control to be quite so rigid, and air assets were responsible for the Scud hunt.

The contrast with the RAF's experience in Granby and post-Granby operations in the Gulf could hardly have been sharper. For more than a decade, crews had been accustomed to extensive mission planning and pre-briefing on their targets, as well as target folders containing up-to-date photographs, intelligence and other mission-specific information. In the KI/CAS role, on the other hand, aircraft were simply dispatched to a kill-box to await any tasking that became necessary. The GR7s committed to Counter-TBM were sent out to observe potential Scud hide sites. Detailed targeting information normally emerged only during transit to the target area.

Other functions associated with pre-planned targets, such as the application of the TD and the selection of weapons – previously undertaken by the CAOC – were delegated to the cockpit during KI/CAS missions, and this was in addition to more familiar aircrew responsibilities, such as the location and positive identification of the target. Moreover, the critical tactical control function of assigning aircraft to targets was handed off to 1 MEF's Tactical Air Operations Centre (TAOC), the US Army's V Corps Air Support Operations Centre (ASOC), and, for Counter-TBM, the Special Operations Task Force's Joint Fires Element.

This sudden, large-scale and high-intensity transition from pre-planned to dynamic tasking raised acute difficulties; the fact that small, mobile, tactical targets were involved – often in dispersed, concealed or urban locations – complicated matters further. The search for solutions was not helped by poor liaison between the different components. Intelligence was a particularly vital commodity in a campaign of this nature, yet the analysis and exploitation processes took far too long. Although the US maintained an enormous ISR collection capability, the fusion of intelligence products could not keep pace with operational requirements, and BDA was rarely made available in time to influence planning or targeting decisions.

Ultimately, significant numbers of coalition combat aircraft were left untasked or were unable to attack assigned targets for other reasons and returned to base with their weapons. This quickly became a source of concern at higher levels of the command chain. The V Corps ASOC appeared unable to control the air support assigned to it, and aircrew soon discovered that they were more likely to be allocated targets by 1 MEF.

As V Corps drove rapidly north towards Baghdad, some aircraft also found themselves operating beyond the effective range of the ASOC's communications. However, work was soon ongoing to improve KI/CAS procedures, and provision was also made for aircraft to attack pre-planned or alternate targets. These tended to be fixed targets with predetermined GPS co-ordinates, such as headquarters, barracks and depots to which troops or equipment might have been dispersed. So-called 'bomber boxes' were also introduced, where aircraft could release unguided weapons against low collateral damage targets.

Meanwhile, the V Corps ASOC was asked to review its CAS procedures in an attempt to reduce the number of aircraft left untasked, and some improvement in its performance was subsequently noted. In due course, it was moved north to Tallil, in Southern Iraq, to improve communications with forward areas. At the same time, ISR and AAR assets that had been held south of the Iraqi frontier for their own safety were permitted to orbit over the border area to improve intelligence supply and on-station time for KI/CAS assets. Subsequently, some of these aircraft began operating inside Iraqi airspace despite the risks involved.

Nevertheless, notwithstanding what were referred to as 'process improvements in KI/CAS', the situation remained far from satisfactory. When the UKACC visited Ali Al Salem, Al Jaber and Al Udeid at the end of March, he noted considerable frustration among the GR4 and GR7 crews. He subsequently convened an operations/tactics seminar on KI/CAS at the UK ACHQ, which identified four key areas of concern. These were communications, the V Corps ASOC's performance, the non-availability of Kill Box imagery, and the prioritisation and flow of aircraft between the two control centres and individual Kill Boxes. It was also suggested that imagery from the GR4's RAPTOR reconnaissance pod and from the PR9s could be employed far more effectively to support 'time-sensitive' targeting.

In the end, at least some of these issues were addressed through tactical-level initiatives. For example, some direct transfer of RAPTOR and PR9 imagery occurred to both UK and US force elements to permit more rapid analysis and exploitation. Harrier Force South succeeded in obtaining more alternate targets and these were regularly attacked if no dynamic KI/CAS tasking was available. They were identified through the combined efforts of their Mission Support Cell (MSC) and the DOB Intelligence Cell. This involved careful study of future ATOs to establish the location of assigned kill-boxes, and close liaison with the 1 MEF Deep Strike Cell – also conveniently based at Al Jaber. If the location of possible targets was confirmed by the Deep Strike Cell, the MSC's commanding officer (who was also the 4 Squadron Ground Liaison Officer) would attempt to match the information with any available imagery of the areas covered. If the secondary targets were fixed, he could also clear the Collateral Damage Estimate (CDE) with the CAOC and relieve the pilots of this responsibility. Alternate targets were also identified by the Air Cell within 1 (UK) Armoured Division.

On the ground, progress slowed during the last week of March. Commander CENTCOM subsequently felt that V Corps and 1 MEF had focused too much attention on seizing ground rather than destroying enemy forces. It became clear that their extended lines of communication were vulnerable to attack, and that measures had to be taken to ensure their security. Iraq's best Republican Guard divisions were also known to be defending the southern approaches to Baghdad, and it would have been unwise of the CFLCC to launch a major ground assault against them while his supply lines were threatened. Neither corps was at first strong enough to execute such a task. The weather also turned against the coalition, Central and Southern Iraq being hit by violent and prolonged sandstorms between 24 and 26 March. By the 28th, a more-or-less formal pause in the ground offensive had been called. Plans to move against the Republican Guard divisions were postponed from the 29th to 2 April to allow V Corps and 1 MEF to marshal their resources for the forthcoming 'Battle of Baghdad'.

The Air Component was thus handed an unexpected but welcome opportunity. During this period, strikes on the so-called Super-MEZ substantially degraded Iraqi air defences around Baghdad, although the CFACC began to suspect that their capability had been overestimated by coalition intelligence earlier in the operation. They rarely presented much direct threat to coalition aircraft. By 31 March, he was referring to Baghdad and its environs as a 'threat area' rather than a MEZ. Over the following days, Iraqi early warning cover began to disintegrate and the number of SAM launches steadily declined.

Meanwhile, coalition air power continuously targeted the Republican Guard. The Baghdad Division was reduced to an estimated combat effectiveness of just 10 per cent, while for the Medina Division the estimated combat effectiveness was on 25 per cent. For the Adnan and Hammurabi Divisions, the figure was 55 per cent, while for the Nebuchadnezzar and Al Nida Divisions it was 70 per cent. The divisions that suffered least apparently reduced their vulnerability to air attack by employing such far-reaching dispersal and concealment measures that their combat capability was also substantially undermined. Thus the Republican Guard and other formations south of Baghdad were rendered incapable of effective resistance – a fact that became all too clear when the ground offensive resumed. The anticipated set-piece battle for the Iraqi capital simply failed to materialise.

As V Corps and 1 MEF closed on Baghdad and Iraqi resistance crumbled, coalition air forces were confronted with the prospect of the FSCL being extended north of the Iraqi capital and with virtually all fires short of this line having to be co-ordinated and controlled. Baghdad was carefully mapped and divided into zones; each zone was then subdivided into sectors, and GPS co-ordinates were produced for every building. The tactics appropriate for Urban CAS over Baghdad now became the focus of attention at the UK ACHQ and detachment level.

At the same time, the UKACC became concerned that the procedures formulated to manage the flow of aircraft into the restricted battlespace would not sufficiently address the increased risk of blue-on-blue engagements, mid-air collisions and collateral damage. This latter problem was particularly worrying because the smallest precision-guided munition (PGM) in the UK inventory was the 1,000lb Paveway/Enhanced Paveway 2.⁹ Paveway 2 could be very accurately directed at a single building, but its explosive force often threatened to cause at least some damage beyond the immediate boundaries of the target. In short, it was not especially suitable for employment in an urban environment. In an attempt to find a rapid solution, proposals emerged for using inert Paveway 2 bombs, and the UK ACHQ submitted a request for their dispatch to the Gulf as a matter of the highest priority on 3 April. However, in practice, it was found that troops on the ground requesting air support preferred the effect of conventional explosive, and would assign any available tasking to US aircraft if the RAF could only offer them inert weapons.

Coalition forces took control of Baghdad over the following days, and air tasking over the Iraqi capital then declined considerably, but there was some intensification of operations in Northern Iraq. Airborne troops had landed at Bashur Airfield on 26 March, and coalition SF were also infiltrated. The aim was to safeguard Iraq's oil fields around Kirkuk, uphold her territorial integrity and further her military defeat by preventing forces in Northern Iraq from reinforcing Baghdad. As the airborne and SF units lacked heavy weapons, they were largely dependent on air power for fire support. The CFACC also decided to target Tikrit from the air independently. As the city was Saddam Hussein's spiritual home and a base for other members of his government, he believed this would signify to the Iraqi people and to members of the armed forces the coalition's determination to remove the regime. Hence, as air tasking in support of V Corps and 1 MEF began to slacken, operations over Northern Iraq gathered momentum. Approximately 29 per cent of the air effort in the 5 April ATO was assigned to the north. This change of emphasis produced a limited amount of additional tasking for the RAF detachments, although the NCC ruled, on the basis of his TD, that they should not strike targets in the Tikrit area that were merely regime symbols. Ultimately, the fall of Saddam Hussein's regime during the second week of the month brought hostilities to an end.

From an air perspective, Telic will always be associated above all else with the trials and tribulations of KI/CAS. To many, the high weapon bring-back rate and the difficulties experienced by the various tactical C2 agencies were extremely troubling. The coalition air forces appeared poorly prepared for the KI/CAS task, whereas the USMC, with their organic air capability, seemed far more proficient. On this basis, the continued efficacy of centralised air C2 was challenged in some quarters after the conflict. At its worst, this critique involved a fundamental misrepresentation of the ATO system which, it was claimed, rigidly tied aircraft to specific duties three days in advance.

In actual fact, the vast majority of combat aircraft were assigned by the ATO to dynamic tasking in support of the Land Component and not to specific pre-planned attacks. Moreover, there is a case for arguing that tangible gains might have resulted from more rather than fewer pre-planned air strikes. As we have seen, the lack of tasking for aircraft assigned to KI/CAS ultimately resulted in numerous *ad hoc* attacks on secondary targets. Many of these were fixed facilities and could have been targeted far more economically and effectively by a conventional planned air campaign; at least some had in fact been removed from the A-Day ATO following the launch of the coalition ground offensive. Had such targets as headquarters buildings and barracks been attacked during the opening days of Operation Telic, it is also far more likely that they would have been occupied. In the event, by the time they were finally struck, most would probably have been empty.

Historically, the accomplishments of the USMC have undoubtedly been impressive where CAS is concerned, yet it is all too easily forgotten that they lack much air capability beyond the basic CAS role. While they may often benefit from very effective CAS, their organic air support provides little else. Moreover, the distribution of air assets on organic lines is always open to objection on resource-allocation grounds. Organic air assets that are not immediately required by the ground formation to which they are attached can be difficult to transfer to the support of other formations that have an immediate and pressing need for them. By contrast, via centralised command, available air assets can easily be apportioned in accordance with rapidly changing operational priorities.

The Counter-TBM story provides an illustration. Although, on paper, the air assets assigned to Western Iraq were under the command of the CFACC, they were to all intents and purposes locked into the Counter-TBM/SF-support task. As their role was so clearly defined before the onset of hostilities, they could train and prepare for it very thoroughly. However, when the anticipated Scud threat did not materialise – and as the requirement for SF support began to decline – it was difficult to reassign them elsewhere. In any case, coalition commanders were unwilling to reduce the Counter-TBM air effort while the Iraqis retained their hold on particular areas that had long been linked to Scud-related activity, such as the border town of Al Qa'im. Consequently, while the RAF and USAF combat air detachments played a vital role in operations in the west, their strike rate was low even by the standards of Operation Telic.

This is not necessarily a criticism of the whole concept of organic air power; it is simply a reminder that it can often involve the commitment of very substantial resources to quite limited and specialised tasks. In short, organic air support is not cheap. The RAF's participation in Counter-TBM operations involved the permanent allocation of some 32 fixed-wing and rotary-wing aircraft as well as tankers and RAF Regiment personnel; Tornado GR4s based at Ali Al Salem also participated intermittently. USAF operations were mounted on a very much larger scale.

It is also revealing to draw comparisons between GR7 operations flown in support of the Counter-TBM mission and those mounted by Harrier Force South from Al Jaber. Between 19 March and 14 April 2003, 3 Squadron flew 142 Counter-TBM missions for 290 sorties. Some 32 sorties released weapons and 73 weapons were dropped in all. Harrier Force South, between 21 March and 14 April, flew 179 offensive missions involving 367 offensive sorties (i.e., excluding reconnaissance missions with the Joint Reconnaissance Pod), 117 of which released a total of 265 weapons. In other words, 11 per cent of the Counter-TBM sorties released munitions compared with 32 per cent of sorties flown from Al Jaber; 3 Squadron had to fly nine sorties per weapon release, whereas Harrier Force South had only to fly three.

These figures partly reflect the fundamental difference between the two detachments' respective tasks. While 3 Squadron aircraft took off each day to perform both the 'non-traditional' ISR (NTISR) and attack roles, a large part of the NTISR task was focused on one specific object – the Scud missile – which was not in fact deployed in Western Iraq. By contrast, Harrier Force South's reconnaissance role was entirely separate from their attack role, and offensive missions were tasked to destroy virtually any legitimate Iraqi target that could be found. They also flew occasional pre-planned missions and benefited from the availability of more secondary targets than were allocated to 3 Squadron. Consequently, Harrier Force South aircraft were far more likely to be tasked against targets. However, their offensive capability was critically dependent on the availability of TIALD-capable aircraft and pods, and yet the over-riding priority attached to Counter-TBM compelled them to manage throughout the campaign with half the number of TIALD aircraft that was made available to 3 Squadron (four compared with eight), and with the same number of pods (five – initially four at Al Jaber). They faced a constant struggle to maintain these mission-critical resources.

Similar arguments could be applied where the PR9 detachment was concerned. Locked into an endless and unproductive search of potential Scud hide sites, 39 Squadron began pressing for alternative tasking, collecting much-needed imagery over Tikrit, Baghdad, Ramadi or Mosul. However, the CAOC ISR collections staff responded with strong counter-arguments, emphasising the continued importance of the Scud hunt and the fact that both Commander CENTCOM and the CFACC still believed the Iraqis might attempt Scud launches against Israel if the coalition dropped its guard.

Beyond offering such insights into the advantages and limitations of organic air power, Operation Telic also demonstrated once again the value of forward basing. When the Turkish option collapsed in January 2003, alternative basing arrangements had to be organised at very short notice. It was fortunate that Al Udeid could accommodate the second Tornado GR4 detachment in these circumstances. Nevertheless, the Al Udeid Wing faced a transit of about 900km to Southern Iraq –

six times the distance that confronted the Combat Air Wing flying from Ali Al Salem – and this was a significant handicap.

Excluding reconnaissance missions with RAPTOR, Counter-TBM, Storm Shadow and ALARM tasking, the Ali Al Salem Combat Air Wing planned 324 sorties between 20 March and 15 April 2003; 309 sorties were flown. The 309 sorties resulted in 148 weapon releases (48 per cent). By contrast, the 268 sorties flown by the Al Udeid Wing led to just 87 weapon releases – 32.5 per cent. If the data are confined to KI/CAS against fielded Iraqi forces before the virtual cessation of hostilities on 12 April, the results for the Al Udeid Wing would be based on 200 sorties, of which only 47 – 23.5 per cent – released weapons. Al Udeid's distance from Iraq provides the chief explanation for their lower strike rate. More unserviceabilities were experienced during the long transit north¹⁰ and they were far more dependent than the Ali Al Salem GR4s on AAR to hold over Iraq while awaiting tasking. If they were tasked, the subsequent processes of target location, positive identification and clearance also took time, with inevitable consequences in terms of fuel consumption. If AAR was unavailable, there was no alternative but to return to base.

Well before hostilities actually began, the drawbacks of operating from so far south were well understood. To an extent, they had to be accepted, but the original basing plan was reversed, as we have seen, to position the larger GR4 detachment at Ali Al Salem.

The ROE and TD employed during Telic were only finalised the day before D-Day (although drafts were available earlier), a process described by one report as 'long and tortuous'. Nevertheless, both ministers and legal advisers were made aware of the realities of high-tempo, high-manoeuver warfare while the TD was being prepared, and thus agreed to accept that rigid control over targeting from London was unrealistic. The NCC received more extensive delegations than the UK Air Commander had been granted during Operation Allied Force, four years before.

Delegations to contingent level were based on a CDE system that incorporated civilian casualty estimates and four tiers that reflected the proximity of civilian objects to coalition aiming points. Individual target categories were delegated up to specified tier and civilian casualty estimate levels. If the delegated civilian casualty or tier analysis criteria could not be satisfied at the appropriate level of command, the target would have to be referred upwards – for example from the NCHQ back to the UK targeting authorities. However, in practice, nearly all target approval decisions were taken in theatre.

US forces operated in accordance with somewhat different ROE and CDE procedures. Such divergences had become a familiar part of coalition operations since the end of the Cold War, and the friction they could sometimes generate came as little surprise.

The requirements of the UK TD were fully briefed to the responsible American staffs and it was very rare for RAF aircraft to be allocated targets that they were not allowed to attack. Moreover, through continuous discussion, it was often possible to identify and address potential problems well in advance. Then, if it was established that a target could not be assigned to UK aircraft or American aircraft flying from the UK or UK sovereign territory, it might be reassigned to an American aircraft flying from a non-UK base. The UK red card was only produced on a handful of occasions – usually when there had been no opportunity for preliminary Anglo-US discussions.

CONCLUSION

Lessons studies conducted after Operation Telic drew attention to several C2 issues raised in earlier after-action reports, such as those produced following Granby and the Kosovo conflict of 1999. There was concern about the weakness of the RAF's CIS infrastructure, and about the CAOC's shortcomings where intelligence exploitation and BDA were concerned. Nevertheless, the majority of assessments were broadly positive. C2 arrangements had benefited from the fact that there had been ample lead time for planning and preparation. Relatively few countries had participated in the coalition, and it had been dominated by the US and the UK, which had for long been operating together in the Gulf. When problems arose, they could often be dealt with informally and bilaterally. The laborious multinational processes that caused so many difficulties during the Kosovo operation were notably absent, and there was far less political interference and considerably more delegation to commanders in theatre. Although human resources were certainly stretched, the RAF successfully manned the UK ACHQ with trained JFACHQ personnel as well as augmentees and other staff who had gained C2 experience from operations over Iraq and the Former Yugoslavia since 1990, and filled influential embedded positions in the CAOC.

Yet while several past problems were addressed, the coalition was confronted by many new air C2 challenges. Some of these arose during the transition from Resinate to Telic; others were encountered during the operation. For example, after the outbreak of hostilities, the USAF quickly demonstrated a number of impressive advances in the field of time-sensitive targeting, and this prompted recommendations for the RAF to review its targeting procedures and implement measures to accelerate approval processes when fleeting high-priority targets were involved.

But the most problematic issue for coalition air commanders was the move away from deliberate or pre-planned operations, which had been central to UK air doctrine in the 1990s, towards dynamic tasking, chiefly in the form of KI/CAS. This required the delegation of some C2 functions to the V Corps ASOC and 1 MEF TAOC. The many and varied difficulties involved were reflected in the fact that numerous combat aircraft were left untasked by these agencies – something that led to the development of secondary targeting of a more deliberate character. Furthermore, the coalition air forces

were no longer cast in the lead role they had played in Granby, and over Bosnia and Kosovo. Instead, they found themselves supporting what was essentially a ground plan in which the direct effect of air power appeared considerably less important than the volume of support provided to the land component. In this context, it was easy for both air and land to underestimate the importance of truly integrated planning based on the achievement of operational effect.

NOTES

¹ Unless otherwise stated, this chapter is based on the unpublished Air Historical Branch narrative *The Royal Air Force in Operation Telic*.

² 'A' day was the first day of the air campaign while 'G' day was the first day of the ground campaign.

³ ISR – Intelligence, Surveillance and Reconnaissance.

⁴ BDA – Battle Damage Assessment.

⁵ ASOC – Air Support Operations Centre.

⁶ KI/CAS – Kill-Box Interdiction/Close Air Support.

⁷ Author's italics.

⁸ MEZ – Missile Engagement Zone.

⁹ Enhanced Paveway 2 incorporated GPS guidance as well as Paveway 2's conventional laser guidance.

¹⁰ Lower serviceability was exacerbated by a lack of prepared base facilities at Al Udeid, including aircraft sunshades.

UK AIR POWER IN OPERATION UNIFIED PROTECTOR, LIBYA 2011¹

By Dr Sebastian Ritchie

Biography: Dr Sebastian Ritchie obtained his PhD from King's College London and lectured at the University of Manchester before joining the Air Historical Branch (RAF) as an official historian. He is the author of a number of classified official histories covering RAF operations in Iraq, the Former Yugoslavia, Libya, Afghanistan, and more widely on aspects of air power and air operations.

Abstract: Operation Unified Protector (UK designation: Operation Ellamy) was the seven-month campaign waged against the regime of Colonel Muammar Gaddafi in Libya by a coalition of NATO and allied states through the imposition of a no-fly zone and a naval arms embargo. The operation was launched at short notice in response to regime efforts to suppress the rebellion that engulfed Libya in 2011. Ultimately, UK fixed and rotary-wing aircraft flew some 3,000 sorties on Unified Protector out of a coalition total of 26,320, including 2,100 strike sorties directed at 640 targets. This study summarises the Air Historical Branch narrative of Unified Protector and considers the RAF's contribution to the broader coalition air effort. It also corrects some of the errors and misconceptions that have crept into earlier histories of the operation.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor.

INTRODUCTION

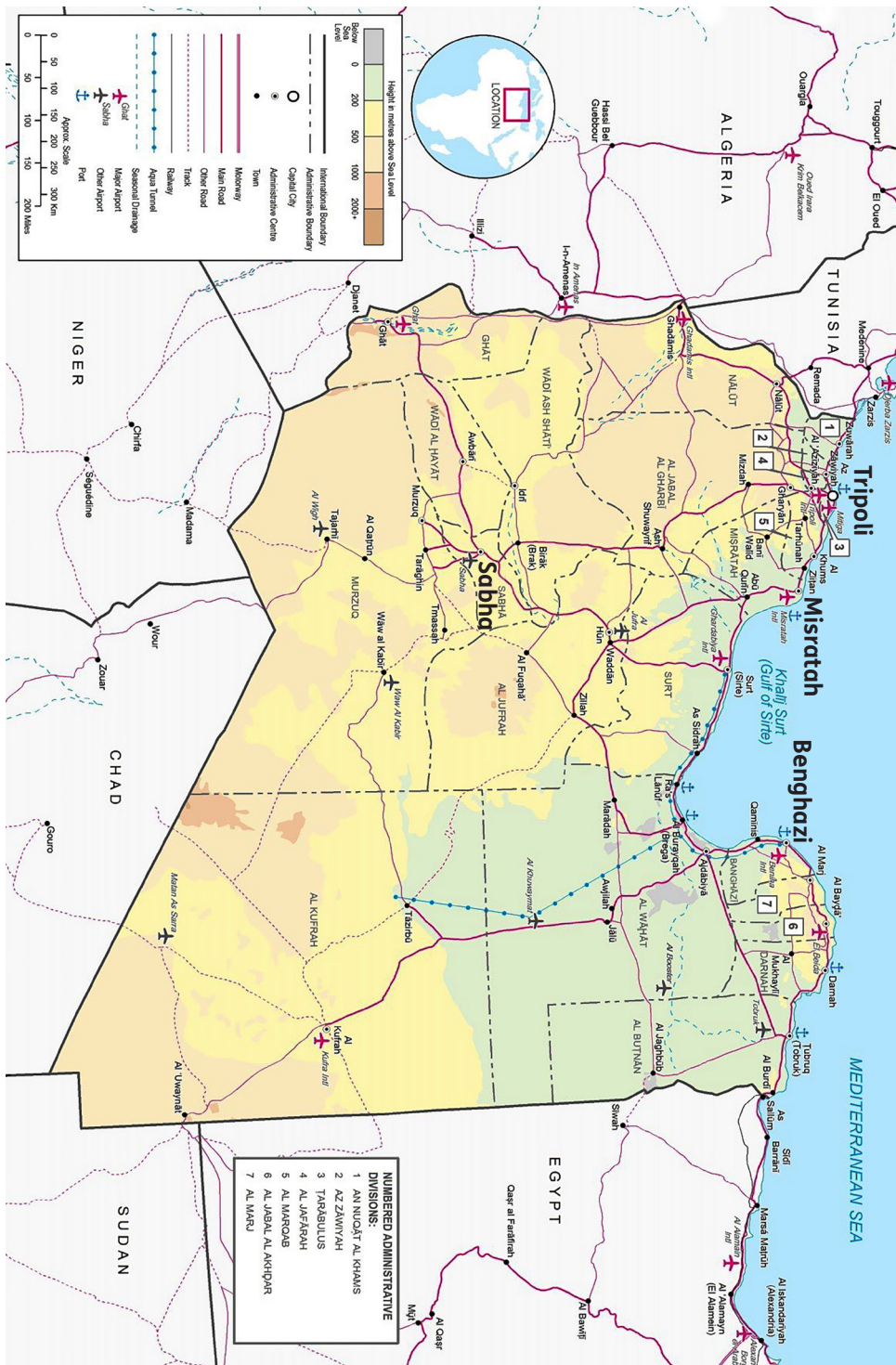
Operation Unified Protector (UK name Operation Ellamy) was the seven-month campaign waged against the regime of Colonel Muammar Gaddafi in Libya by a coalition of NATO and allied states through the imposition of an air no-fly zone and a naval arms embargo. The operation (originally named Odyssey Dawn under a short period of American leadership), was launched at short notice in response to the regime's efforts to suppress the mass rebellion that engulfed Libya in February 2011, itself part of the broader wave of popular uprisings then sweeping through North Africa and the Middle East – the so-called Arab Spring. During the course of the operation, the deployed UK fixed and rotary-wing aircraft flew some 3,000 sorties out of a coalition total effort of 26,320, including 2,100 strike sorties out of 9,658; UK aircraft attacked 640 targets. This impressive effort was mounted alongside continuing operations in Afghanistan (Operation Herrick), which remained the main effort for UK Defence.

At the start of the Libyan conflict the coalition confronted an adversary that still controlled most of the country. Assessments of regime strength at this stage can only be approximate, but the backbone of Gaddafi's army, the Regime Protection Force, was intact and numbered some 30 battalions, and he could also still call on the bulk of the far less capable Armed Personnel on Duty force of 85 battalions, as well as a 'People's Guard' of militia and mercenaries. Their inventory of heavy weapons – tanks, armoured fighting vehicles, artillery pieces and rocket launchers – was thought to number more than 3,300 deployed items, and Libya also had an air force and an integrated air defence system (IADS). And yet, by mid-October, all that remained of Gaddafi's regime amounted to a handful of combatants with a single tank and a rocket launcher fighting desperately in defence of a tiny enclave in Sirte. Within days, even they would be overwhelmed.

This study summarises the Air Historical Branch (AHB) narrative of Unified Protector and considers the RAF's contribution to the broader coalition air effort. It also corrects some of the errors and misconceptions that have crept into earlier histories of the operation. The initial objective is to consider the background to the Libyan crisis and how the UK's response first came to focus on the establishment of a no-fly zone; then, after examining the creation of the coalition and the opening of hostilities under American leadership, the focus shifts to the transition to NATO command and control (C2) and the development of a longer-term concept of operations. The subsequent goal is to assess the impact of NATO's intervention in Libya, the coalition's analysis of how the operation was progressing, and the measures pursued to transform Unified Protector from an indefinite commitment to the protection of civilians into a campaign that would ultimately lead to the successful coercion or overthrow of Gaddafi's regime.

ORIGINS

In February 2011, following the overthrow of the Tunisian and Egyptian governments, multiple demonstrations against Colonel Gaddafi began in Libya and were violently



suppressed by his security forces. The protestors then took up arms and at first achieved a significant measure of success. Libya was soon effectively divided between the west (including Tripoli) and Sebha in the south, which remained firmly under regime control, and the east, centred on Benghazi, where the rebels prevailed, although there were other pockets of resistance nearer Tripoli – notably in the port of Misratah, east of the capital, and in the Nafusah Mountains to the south-west.

The UK initially responded to the Libyan crisis by evacuating expatriates (under Operation Deference), and deploying a number of aircraft into theatre including a Nimrod R1, a VC10 tanker and two E-3D Sentries, which flew in support of the C-130s conducting the evacuation. Then, on 23 February, President Sarkozy of France called for the imposition of European Union (EU) sanctions upon Libya and the establishment of a no-fly zone to prevent Gaddafi using air power against rebel forces. On 26 February, the United Nations (UN) passed a resolution (UNSCR 1970) demanding an end to the violence in Libya, imposing an arms embargo, freezing the overseas assets of the Gaddafi family and referring the regime leadership to the International Criminal Court. Meanwhile, the Prime Minister requested guidance from the Ministry of Defence (MOD) on possible options for military intervention if Gaddafi failed to heed international calls for restraint. On 28 February he addressed Parliament, calling on Gaddafi to relinquish power and announcing that he had asked the MOD and the Chief of the Defence Staff (CDS) to work with the UK's allies on plans for a military no-fly zone over Libya.

Two key issues – to an extent interrelated – subsequently dominated the development of British policy. The first centred on the nature of military action: how would a no-fly zone be enforced and what could it reasonably be expected to achieve? The second concerned participation in any prospective air operations over Libya: should a no-fly zone be established by the UK alone, by a coalition of states, or by NATO? In drawn-out deliberations over the following fortnight, both the MOD and Permanent Joint Headquarters (PJHQ) urged caution and expressed doubts about the feasibility and effectiveness of a no-fly zone. The UK was already heavily committed in Afghanistan. To the MOD, it seemed unlikely that a no-fly zone on either the Iraqi or Bosnian model would influence events on the ground and there were concerns within the department that a Bosnia-type situation might develop in which regime troops continued to attack the rebels while coalition aircraft patrolled overhead, unable to intervene under the terms of their mandate. By contrast, the Prime Minister strongly favoured a no-fly zone strategy applied under NATO auspices. Across NATO and the EU there were equally pronounced differences of opinion but the prevailing view was that potential coalition or NATO intervention should be underpinned by demonstrable need, a clear legal basis and support from the region.

By the middle of March these preconditions were all but satisfied. In Libya, regime forces had taken to the offensive, employing air power in support of operations to capture Ras

Lanuf, seizing Brega and advancing on Ajdabiyah. World leaders were now confronted by the prospect of an imminent and bloody offensive against Benghazi and the outright suppression of the uprising. Meanwhile, both the Gulf Co-operation Council and the Arab League had proclaimed their support for a no-fly zone. Against this background it was possible to secure stronger international backing for military action and the UK began drafting another UN Security Council Resolution (UNSCR). If the MOD influenced this process, it was chiefly by impressing upon those involved that the no-fly zone concept should be extended beyond the limitations previously imposed. And so it was that when UNSCR 1973 was passed on 17 March, it not only banned all flights in Libyan airspace and the use of aircraft to attack the civilian population; it also authorised all necessary measures to protect civilians and civilian objects. Effectively, therefore, it permitted general air-to-ground action against the Libyan security forces.

By this time, NATO and its member states had initiated preparatory measures. Chief of Joint Operations (CJO), Air Marshal Sir Stuart Peach, was appointed UK Joint Commander for the Operation and the RAF was instructed to prepare a force comprising Tornado GR4s, Typhoons, Sentinels, the E-3D Sentrys and the Nimrod R1 already deployed for Operation Deference and additional tankers. Short-term planning was based on the need to halt the regime forces' advance on Benghazi before the demands of the longer-term no-fly zone task were addressed. This suggested a US-led campaign at first, followed by a transition to NATO leadership after the initial objectives had been fulfilled – a sequence of events broadly approved by the Americans on 18 March. On the same day, an agreed statement was issued from Washington, London and Paris threatening military action if the advance on Benghazi continued and demanding the withdrawal of regime troops from Ajdabiyah and Misratah. The first air strikes were launched by the French Air Force the following afternoon in accordance with an agreed timetable that allowed for the possibility that French intervention might precede US and UK action by several hours.

OPERATION ODYSSEY DAWN

The Air Headquarters for the brief US-led Operation Odyssey Dawn was located at the United States Air Force (USAF) Combined Air Operations Centre (CAOC) at Ramstein air base in Germany. The UK Joint Force Air Component Commander (JFACC) for the operation, the Air Officer Commanding 1 Group, Air Vice-Marshal Greg Bagwell, flew out to Ramstein on 19 March. At this stage, the coalition was confronted by five basic tasks. The first was the launch of the initial strikes against Libya and the deployment of British, French and US aircraft into theatre. Second, there was the expansion of the initial tri-nation venture into a far broader coalition of air forces functioning within a single Air Tasking Order (ATO) and in accordance with the same operation plan, Rules of Engagement (ROE) and Special Instructions (SPINS). Third, but concurrently, it was essential to ensure that operations over Libya effectively supported the key coalition goals of establishing a no-fly zone and protecting the Libyan people from Gaddafi's forces. Fourth, this had all to be achieved in such a way that the operation could be

transferred relatively easily and seamlessly from American to NATO leadership. Finally, the transfer itself had to be implemented.

The initial American and British strikes were executed largely with Tomahawk Land Attack Missiles (TLAM) and with Storm Shadow missiles launched by UK-based Tornado GR4s and were primarily designed to degrade the Libyan Air Defence System and regime C2; the vast majority of targets were heavily damaged or destroyed. Within 48 hours the Libyan air force had effectively been grounded and the IADS heavily degraded. Then, with the number of aircraft committed to Odyssey Dawn increasing steadily, coalition targeting shifted towards regime ground forces in the east – the focus of French intervention from the outset. The RAF's GR4s and Typhoons now deployed forwards to Gioia del Colle in Italy. The fast jets that provided ground-attack, suppression of enemy air defences (SEAD) and air-to-air combat capabilities were reinforced by contributions from other NATO countries and allied – including Arab – nations and augmented by airborne C2 and intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) platforms and more tankers.

Facing mounting losses, Gaddafi was left with little option but to withdraw his forces from Ajdabiyah back through Brega and along the coast. Although the coalition continued to attack ground targets in this region, the removal of any immediate threat to Benghazi at the same time allowed a higher proportion of the overall air effort to be directed towards Misratah. Regime forces sustained heavy losses in this area during the last week of March, and Libyan weapon storage areas were also targeted to restrict their supply of munitions. By 28 March, intelligence assessments of the situation in Eastern Libya were becoming increasingly optimistic and a rebel assault on the regime stronghold of Sirte was even predicted.

While air operations over Libya were progressing, Odyssey Dawn was being transformed into the NATO-led Operation Unified Protector. Planning was based on the establishment of a typical two-tier NATO headquarters structure comprising an Air Headquarters at Izmir in Turkey and a CAOC at Poggio in Italy. They were to 'shadow' the ATO cycle maintained from Ramstein until the transition to NATO command, when they would take over responsibility for the process. Also within this period it was essential to effect a formal Transfer of Authority (TOA) of Odyssey Dawn assets to NATO C2.

The transition was far from smooth. The schedule originally devised did not provide sufficient time for coalition members to familiarise themselves with such C2 fundamentals as ROE and target approval processes. Moreover, while it was clear that American combat air support for the operation would be substantially cut back after US leadership ceased, there was much uncertainty about the precise scale of the force reductions and thus about the shortfalls that would have to be made good by other coalition members. After the original timetable was delayed for 24 hours, TOA duly

occurred on 30 March and the first NATO ATO ran from 0600Z on 31 March. However, the Americans imposed restrictions on the participation of their combat aircraft that prevented their assignment to ground attack missions that day, and operations by other coalition members were disrupted by adverse weather. US intelligence feeds available at the Ramstein CAOC were also suspended.

Unfortunately, at this critical juncture, there was a pronounced change in the tone of intelligence reporting on the situation in Eastern Libya. The rebels' advance faltered and they were then driven back through Brega and towards Ajdabiyah. On 1 April, coalition air power – bolstered again by the Americans – halted the regime offensive but the damage had already been done. There would be no rebel counter-attack against Brega until the middle of July and the city would remain under regime control until 22 August. This situation was not entirely advantageous for the Libyan regime. Gaddafi's forces now found themselves dispersed across an enormous belt stretching from the Tunisian border in the west through Tripoli, Misratah and Sirte to Brega in the east. And yet, simultaneously, the dispersion of regime forces also created acute difficulties for the coalition. The available air resources had now to be spread even further across what was, in any case, a very large country.

OPERATION UNIFIED PROTECTOR

And so, in less than ideal circumstances, Odyssey Dawn made way for Unified Protector. The post of Commander Combined Joint Task Force (COM CJTF), Unified Protector, was assigned to the Deputy Commander of the Allied Joint Force Command, Naples, Lieutenant General Charles Bouchard of the Royal Canadian Air Force. A former helicopter pilot with a subsequent command specialisation in air defence, Bouchard was serving out the final appointment of his career. At the Izmir Air Headquarters, the USAF's Lieutenant General Ralph Jodice became the Combined Forces Air Component Commander (CFACC). The coupling of Naples and Izmir reflected a C2 relationship that was well established within NATO but the geographical dispersion of the Naples and Izmir headquarters and the Poggio CAOC quickly proved to be far from ideal.

The RAF experienced considerable difficulty securing a senior position within the command chain. In March 2011 there were no senior UK air officers in NATO's southern flank command apparatus. While two members of Bouchard's NATO-appointed senior staff – including his head of operations – were British, neither was an RAF officer. There proved to be no requirement for the UK JFACC after Unified Protector superseded Odyssey Dawn, so the role of UK Air Component Commander (UKACC) passed to Air Commodore Edward Stringer, who effectively served as UK senior national representative to the CFACC. In other words, he was positioned alongside the formal command chain rather than inside it. Initially the most senior RAF representative in the Air Headquarters was the head of strategy, although an RAF officer also assumed responsibility for intelligence in June.

This was but one manifestation of a broader problem that confronted the RAF during the early stages of the Libyan conflict. For some years the UK had collaborated closely with the United States in the Gulf and Afghanistan and had thereby maintained a full understanding of US C2 processes, but there was far less knowledge of NATO air C2. Indeed, over time, there had been a steady decline in UK investment in the alliance. The many and varied C2 problems encountered in this period extended beyond the sphere of personnel and appointments and into such critically important areas as deployable communications and information systems (CIS) and CIS interoperability.

April was inevitably a month of consolidation. The critical immediate challenges involved establishing the new Air Headquarters on a sound footing, generating sufficient forces to sustain the campaign and, in Libya itself, stabilising the main battle zones.

Where the headquarters were concerned, their structure and functions had obviously to be shaped to meet the unique characteristics of the operation. These included the extensive geographical area over which it was conducted, with multiple fronts, the high fluidity of the battlespace, the very limited coalition intelligence picture, the fleeting nature of many ground targets, the similarities between the two ground forces, and the location of many potential targets within conurbations such as Tripoli, Misratah and Brega, where there was inevitably a significant risk of collateral damage.

This was an environment in which the targeting process could become particularly challenging. Throughout the operation, air strikes against Libyan ground targets fell under two headings. While deliberate targets were pre-planned and specified by the ATO, dynamic targets were typically unanticipated, unplanned or newly detected. The overwhelming majority of air strikes and all deliberate attacks required prior clearance from the CAOC via a three-phase process involving positive identification (PID), the application of ROE and the preparation of a collateral damage estimate (CDE). Targeting was subject to the approval of the various national representatives at the Air Headquarters (the so-called 'red card holders') and there were significant variations in ROE across the coalition. PID often proved very difficult when aircraft were compelled to operate at higher altitudes to reduce the threat from Libya's ground-based air defences.

The complexity of both the operational environment and the target clearance procedures quickly revealed weaknesses in the dual Air Headquarters and CAOC system and persuaded the CFACC to move forwards to Poggio with a number of his senior staff. Throughout April, early problems involving CIS, ATO production, targeting and airborne C2 were systematically addressed. Intelligence was completely overhauled to provide better support to the targeting mechanism. By the second half of April these measures were bearing fruit and the Poggio facility was assuming the proportions

of a fully functional CAOC. The UK Air Component Headquarters developed more slowly but was firmly established by the end of the month.

The force generation task was tackled in a number of ways. A few relatively minor basing adjustments allowed better use to be made of available resources such as the RAF's E-3D Sentry, which were moved from Akrotiri to Trapani in Sicily, closer to Libya. But it proved more difficult to enlarge the coalition air order of battle. US ground-attack aircraft were withdrawn from Unified Protector on 7 April and the only manned US combat aircraft subsequently committed to the operation were assigned to SEAD (broadly defined) and 'air presence'. To reconstruct the ground-



An RAF E-3D Sentry prepares to taxi at Trapani air base in Sicily, bound for operations in support of NATO forces over Libya.

attack force, France agreed to commit more aircraft to Unified Protector and to operate more intensively. The UK deployed four more GR4s, transferred two more aircraft formerly under national command to NATO, and declared four Typhoons as multi-role platforms; this number was increased to six in May. Italy and Belgium also contributed more aircraft. These various augmentations allowed the coalition to maintain a planned flying rate of around 50 ground-attack sorties and 10 SEAD sorties per day.

By contrast, largely due to the scale of commitments in Afghanistan, it proved far more difficult to enlarge NATO's ISTAR force. Historically it has generally been considered that the strategic focus or chief priorities of an air campaign can most accurately be identified from the apportionment of offensive air assets. Yet increasingly, with precision-guided weapons, only a limited kinetic effect may be needed to attack the highest-value targets in campaign terms. To a far greater extent, effort is now being expended on the extensive preliminary ISTAR activity that the prosecution of these targets invariably requires. ISTAR has become fundamental to the successful application of air power and the prevailing shortage of collection platforms during Unified Protector was therefore a serious handicap. The RAF's Nimrod R1s – scheduled for retirement in the spring of 2011 – received a temporary stay of execution but their extremely valuable contribution ended in June. The provision of more USAF tankers also allowed some ISTAR platforms to extend their time on task.

Nevertheless, resources were never adequate and important command decisions – notably judgements on target clearance – had often to be made on the basis of far less

information than would normally have supported comparable engagement decisions in Afghanistan. Apart from slowing down the approval process and thus reducing operational tempo, the lack of intelligence left those with delegated target authority in a very exposed position and compelled them to accept considerable risks. That very few mistakes were made despite the high pressure under which they were operating testifies to their ability and professionalism.

Despite the many problems posed by C2 and force generation, the coalition's primary mission was fulfilled in Libya itself. By the middle of April it was assessed that any threat from Libyan combat aircraft had been eliminated, that Gaddafi no longer possessed a strategic surface-to-air missile (SAM) capability (although tactical SAMs and man-portable air-defense systems (MANPADs) remained a source of concern), and that his IADS C2 was ineffectual. On the ground, coalition aircraft had destroyed 176 main battle tanks, 108 other armoured vehicles, 50 artillery pieces and much else besides. The Libyan army had been subjected to sustained air attacks around Brega, which effectively ruled out any renewed advance towards Benghazi. Increasingly they assumed entirely defensive postures in the east and their main effort became the recapture of Misratah. Towards the end of the month the situation at the port became desperate, but coalition air power ultimately played a vital role in halting the regime advance. Once the threat had been lifted, the rebel position at Misratah was bolstered by supplies and reinforcements shipped in from Benghazi.

On the other key front – the north-western mountains generally known as the Jebel Nafusah – the position was more complex. The main rebel towns endured heavy and sustained bombardments and repeated attacks by Gaddafi's forces, but (given the scale of commitments elsewhere in Libya) it was never possible for the regime to achieve a decisive advantage. Unfortunately, however, NATO found itself in a similar position. Heavily committed around Brega and Misratah, the coalition simply did not have the means to support the Jebel Nafusah rebels as well. Luckily, two of the Arab participants in Unified Protector, the UAE and Qatar, became increasingly committed to sustaining the Jebel's defence by providing Special Forces (SF) support, weapons, equipment and training under national rather than coalition auspices. France also became involved in these activities in due course.²

In the meantime, extended deliberations were taking place at Naples and Poggio, between the two headquarters and in national capitals over the more general direction of targeting. While it was obvious that many air strikes in Libya would continue to be reactive in nature, there was a strong case for arguing that greater effect could be achieved more economically by influencing the regime's behaviour – so-called 'force on mind'. This suggested that a higher proportion of attacks should target vital C2 nodes or key items of military infrastructure. One of the only examples of this approach during the early stages of the conflict occurred on 17-18 April in a UK-devised operation that

successfully struck regime communications links between Tripoli and Brega, but it was very much the exception to the rule.

In the first week of May, to increase pressure on the Libyan regime, there was a pronounced shift in the focus of NATO targeting towards Tripoli. Further UK proposals were submitted to the CJTF HQ soon afterwards, comprising a fully developed set of targets, a carefully sequenced implementation schedule and proposals for integrated information operations (IO). However, while NATO aircraft ultimately struck the nominated targets, the proposed sequencing and IO elements of the plan were not implemented.

THE SEARCH FOR A STRATEGY

By mid-May the tone of coalition campaign assessments was beginning to change. Although Unified Protector's immediate objectives had been secured, the outlook for the future appeared less favourable. Time seemed to be on Gaddafi's side. His forces retained the initiative and they were adapting their tactics to reduce their vulnerability to air attack. The limitations of their rebel adversaries were becoming clearer every day. Equally, it appeared that the regime was better placed than the rebels and the NATO-led coalition to sustain operations in the longer term. Yet the coalition was effectively committed to an open-ended campaign that lacked a clearly identified end state.

At first, two basic perceptions of Unified Protector had prevailed within NATO and among the other nations committed to the operation. Some governments chose to interpret the UN mandate narrowly, focusing on the objective of protecting Libyan civilians. Others, the UK included, believed Libyan civilians could never be fully protected while Gaddafi remained in power. Yet in time this difference was rendered less meaningful by the general realisation that air operations could not be continued indefinitely. Against this background, the search for a coherent strategy began.

A notable feature of Unified Protector was that the CJTF HQ did not assume a significant role in this process. The Naples headquarters sought neither to integrate the operations of its two components – air and maritime – nor to provide them with detailed strategic guidance. The development of an air campaign therefore became the focus of the strategy division at Poggio during May. The first task was to establish a clear end state for the operation, which was defined as follows:

An enduring condition exists where the population of Libya is not under attack or threat of attack thereby meeting the conditions of UNSCR 1970 and 1973.

This provided the basis for a strategic plan that was developed throughout the month and presented to the COM CJTF on 26 May. The plan employed classic US four-line DIME (Diplomatic, Information, Military, Economic) principles and was designed to protect the

Libyan population 'by forcing an enduring change in the behaviour of Belligerent Actors (BA)'. Its aims were to:

- Protect the population from attack from BA.
- Deny BA the ability to attack.
- Isolate BA from mechanisms of power:
 - From support mechanisms
 - Capital from Regions
 - Within Region



An RAF officer works alongside staff from multiple NATO countries in the CAOC at Poggio, the operational centre for the air campaign over Libya.

The strategy linked so-called 'decisive conditions' to objectives, tasks and targets within the component planning and joint planning processes. However, it also stressed that military operations had to be conducted in parallel and in coordination with extensive strategic communications (STRATCOM), IO and psychological warfare activity to stand any chance of exerting genuinely coercive effect. Clear and quantifiable measures of campaign progress were suggested and there was a detailed strategy-to-task breakdown. As far as the future direction of the air campaign was concerned, particular importance was attached to the sequenced targeting of command, control and communications to isolate the regime from the key instruments of power.

The CFACC afterwards sought as far as possible to implement the main air proposals contained in the strategic plan, and the analysis behind these proposals was drawn on by the relevant staffs within the CAOC to inform targeting and ISTAR to support targeting. NATO aircraft in due course attacked many of the recommended targets and target sets. And yet these new initiatives were rarely, if ever, accompanied by appropriate parallel activity at CJTF HQ level. Whereas the Air Headquarters stressed the importance of effects-based targeting and the force-on-mind approach, these concepts were not firmly established within NATO air targeting doctrine in 2011. Instead there was a preference for maximum kinetic effect and for hitting targets as and when they became available. A shift towards more systematic targeting and regular Joint Targeting Coordination Board meetings only occurred at Naples during the later months of Unified Protector.³

Meanwhile, quite separately, the French government tabled a number of proposals that included more strategic air-to-ground targeting, direct support to rebel forces in the form of arms, supplies and training, and the employment of carrier-based attack helicopters (AH). Subsequent deliberations effectively determined that there would be no shift in targeting beyond the ongoing reorientation towards Tripoli and ruled out any coalition strategy that involved direct military support for the rebels beyond air support and the provision of non-lethal backing by mentoring teams already active in Benghazi, which was largely confined to C2 and logistics. Unified Protector had to be conducted within the parameters laid down by UNSCR 1973 and the North Atlantic Council.

Hence there was only scope to implement one of the French ideas under NATO auspices – the deployment of AH. This single measure, originally recommended to enhance tactical support to the rebels around Brega, now publicly assumed the proportions of a strategy in itself. Yet there were pronounced differences of opinion regarding its likely effectiveness. Within the combined Air Headquarters/CAOC at Poggio it was doubted that AH would exert strategic effect and there were concerns that the deployment would divert senior command and staff effort and other scarce resources such as ISTAR and SEAD, which were of critical importance to broader air operations over Libya. These would prove to be very well founded. No less problematic was the vulnerability of AH; the loss of a single aircraft would have handed a significant propaganda victory to Gaddafi. The risks were highlighted on 18 June when a British Apache was nearly shot down by a MANPAD. Thereafter, as the new UKACC, Air Commodore Gary Waterfall, noted, the balance of resources, risks and potential operational rewards had to be weighed with extreme care before Apache missions were sanctioned. In the end, while a total of 44 missions were planned, only 22 were executed.

COALITION VICTORY

Ultimately the decisive strategic initiative was devised by the main force contributors in close collaboration with NATO's Arab allies and the Libyan rebel leadership and was

designed to exploit improved C2 and communications among the rebel forces (by then commonly known as the Free Libya Forces (FLF)). Launched early in July after a series of important rebel gains in the Jebel Nafusah, it was based on the concept of coordinated parallel operations including FLF offensives (supported by coalition air power) in areas like Brega and Misratah, and a further UK targeting and information operations plan designed to encourage upheaval and insurrection in Tripoli. This was referred to as ‘full-spectrum’ targeting.⁴ The aim of combining these operations was to stretch regime forces to breaking point before a *coup de grace* was administered by an FLF assault from the Jebel.

The first of the coalition’s four operational stages involved an offensive by rebel forces towards Brega, in the east. Despite the commitment of air support on a substantial scale, they were soon halted. Full-spectrum targeting was then initiated. Although the CJTF HQ had embraced the principles behind the concept, it proved necessary to narrow the targeting focus towards regime C2, which had largely been dispersed for its own protection by this stage of the conflict. Some of the new C2 facilities proved difficult to locate but a list of appropriate targets was prepared in due course.

Full-spectrum targeting was originally divided between four phases – preparation, shaping, strike and exploitation. The shaping and strike phases were to be accompanied by information operations such as leaflet dropping and radio broadcasts and other supporting operations by a variety of coalition aircraft. However, in the middle of July, the plan was revised as it became clear that no rebel offensive in the Jebel Nafusah was imminent. Furthermore, the flow of intelligence from within Libya improved significantly in this period, providing greater clarity of the ground situation between Misratah and Zlitan, east of Tripoli, and suggesting that the FLF might soon achieve a breakthrough in this area. There was also a marked upsurge in the volume of targeting information from the Zlitan front, which was complemented by the fusion of intelligence products from a range of UK and NATO agencies.

The intent had been that such targets would be struck dynamically but all of them involved buildings, and the accompanying collateral damage estimates made dynamic attacks virtually impossible to prosecute. After much consideration, it was therefore decided to develop a new targeting and boarding process to treat targets as deliberate but then strike them dynamically within the ATO cycle. ‘Deliberate-dynamic’ targeting was born.

And so it was that the shaping phase of the operation became largely focused on the Misratah to Zlitan front with the aim of employing air power to clear a path for a rebel advance. A breakthrough would have directly threatened Tripoli from the east, preventing any concentration of regime forces south of the capital to confront the projected FLF offensive from the Jebel Nafusah. The central role of deliberate-dynamic

targeting is illustrated by the fact that the NATO clearance process had at best produced an average of around seven deliberate targets per week during the preceding month. From 18 July, in a single morning, it was possible to clear twice this number for attack within the following 24 hours.

Deliberate-dynamic targeting resulted in a three-fold increase in the RAF's monthly strike rate against deliberate targets including C2 nodes, defensive positions, fielded forces, ordnance depots and fuel storage sites. In terms of both accuracy and effect, coalition air strikes in this period were particularly successful. Nevertheless, on the ground, the FLF were confronted by Gaddafi's 32nd Brigade – probably the best trained and equipped formation in the Libyan army – and stopped in their tracks. A significant degree of tension now began to develop between the various concurrent operations. Aircraft were frequently reapportioned between Brega, Zlitan and Tripoli, the stalled Brega offensive imposing a particularly severe drain on resources. The pressure of competing commitments became all the more acute when certain countries were compelled to withdraw aircraft from the coalition on sustainability grounds.

The majority of full-spectrum strike phase missions were not flown until 25-27 July. All the targets were destroyed but the impact proved extremely difficult to measure. It was the delayed FLF offensive in the Jebel Nafusah, launched immediately afterwards, that finally promised to end the stalemate. On 6 August, the rebels captured the town of Bir Al Ghanam, only 80km from Tripoli, opening one of the major roads north out of the mountains and towards the coast. This now became their main axis of advance. Air support chiefly took the form of ISTAR and a relatively small number of deliberate-dynamic strikes against key regime targets such as C2 nodes. Otherwise, coalition combat aircraft continued to operate over Tripoli, Zlitan and Brega, 'pinning' regime forces in these areas and exploiting the continuing flow of target intelligence while FLF forces edged forwards on the ground.

By 19 August regime resistance was collapsing and the FLF were converging on Tripoli from west and east. At this stage, the coalition launched a second full-spectrum operation designed to complement the first, and this continued the following day. On 21 August, a mass insurrection began and the first FLF troops arrived in the Libyan capital soon afterwards. Initially, coalition assessments of the situation were predictably upbeat and Gaddafi's apparently imminent overthrow led to the cancellation of all planned kinetic air activity that day. Aircraft were restricted to patrolling and maintaining presence.

Yet the euphoric mood that initially prevailed at Naples and Poggio gradually subsided as it became clear that the conflict was by no means at an end. Kinetic strikes resumed on 22 August, although there was much uncertainty about the situation on the ground. Targeting opportunities were both limited and complex due to the presence of rebel

troops, civilians and foreign media reporters, and the clearance of Tripoli ultimately involved a drawn-out and laborious process whereby rebel troops repeatedly advanced and then halted again while the coalition arranged air support to deal with particularly tough pockets of resistance. The last and most significant was located in a compound south of the city under the command of Gaddafi's son Khamis. After it was repeatedly targeted from the air on 26 August, the rebels moved forward once more and the compound was overrun a few hours later, ending organised regime resistance in the Libyan capital.

The remaining regime forces then withdrew into central Libya, chiefly to Bani Walid and Sirte in the north and Sebha in the south. During the first week of September, there was some reduction in the intensity of coalition air operations while the rebel leadership sought unsuccessfully to persuade pro-Gaddafi forces in Sirte to surrender. Subsequently, efforts to subdue such areas as remained under Gaddafi's control imposed an even greater strain on coalition resources, and improvisation was often essential to make the best possible use of available air assets. This was especially true where deeper targets in the south were concerned.

By the last week of September, Sebha had fallen and regime forces in Bani Walid no longer posed a threat, so the coalition focus turned to Sirte, where a rebel ground offensive was keenly anticipated. However, any hopes that Sirte might be swiftly subjugated were soon dashed. The target set in the city proved particularly difficult to discern. There were few defined military facilities and it was therefore necessary to classify civilian areas as military by function in order to meet the established targeting criteria – something that often required more intelligence than was actually forthcoming. As always, target identification was hampered by the dynamic nature of the conflict.

Eventually the supply of intelligence improved and Sirte was subjected to continuous air attack in late September and early October. Rebel forces approaching the city from east and west finally linked up on 4 October to split Gaddafi's remaining troops into northern and southern pockets. The main rebel effort was then directed towards the southern pocket but progress was again slow and faltering. Regime troops effectively used local civilians as human shields, positioning their rocket launchers in civilian areas to limit the scope for their adversaries to employ heavy weapons or air power.

This occurred at a time of increasing concern within the coalition that the closing stages of the conflict might witness a major civilian casualty incident. Such fears soon led the COM CJTF to impose rigid restrictions on deliberate targeting, but dynamic targeting opportunities declined at the same time, partly because of a period of unfavourable weather and partly because there was insufficient intelligence on the location of ground targets and on their proximity to civilians and FLF units.

By 9 October, regime resistance in south-east Sirte had been overwhelmed and the focus of residual operations was moving into residential areas further north. Air missions on a much-reduced scale now primarily took the form of armed over-watch as the rebels made their way slowly forwards. On 14 October, COM CJTF decreed that an organised military threat to civilians in Libya no longer existed. On this basis he revoked all previously issued delegations of authority for the use of force, making himself the sole authority for any further air strikes. After more intense fighting on the ground, Gaddafi's capture and execution on 20 October effectively brought the conflict to an end. The final RAF sorties were flown on 31 October.

THE RAF'S ROLE

The UK Air Component at first consisted of a single Expeditionary Air Wing (EAW) numbered 906 and incorporating all RAF combat, ISTAR and air-to-air refueling (AAR) assets. Subsequently, at the end of April, the ISTAR and AAR elements were transformed into a second EAW numbered 907. The Officer Commanding (OC) 907 EAW also functioned as Deputy UKACC. Later, in preparation for intensified operations in July and August, all deployed aircraft were incorporated back into one EAW numbered 906 under a single commander, leaving the Deputy ACC and other staff at Poggio free to focus on their core mission roles. At its peak, some 945 RAF personnel were deployed on the operation; many more fulfilled supporting tasks from the UK.

The EAW concept, introduced in 2006, was devised with expeditionary operations in mind, needless to say. Yet the experience of Unified Protector drew attention to the important distinction that must be made between genuinely expeditionary capabilities and the capacity to sustain an enduring deployed operation – a fundamentally different proposition. During the planning and deployment period in March 2011, it was hard to break the Herrick mind-set that inevitably prevailed across the UK defence community and challenge rigid assumptions that might have been eminently applicable to a very well established deployed operation, but which were far less appropriate in more expeditionary circumstances. The problem was exacerbated by over-optimistic expectations of the base facilities available at Gioia del Colle. It was expected that a NATO base in a European country would offer abundant amenities and support; in fact, the GR4 and Typhoon detachments initially found themselves in an austere environment that lacked power, water, sanitation, food, transport, fuel and on-base or even near-base accommodation for ground personnel. The contrast with a prepared and fully functional airbase like Kandahar could hardly have been more pronounced.

Yet although the deployment phase of the operation proved extremely difficult, the main problems were quickly overcome and Unified Protector ultimately provided the RAF with justifiable grounds for optimism. British airmen played a key role in air C2 at the ACHQ/CAOC level, exerting considerable influence. This reflected the scale of the UK air contribution, the training and experience of RAF personnel, their appointment to pivotal

positions in such areas as strategy and intelligence, historically close ties with the USAF and membership of the Five-Eyes community. Among other things, RAF officers helped to establish the new CAOC and were substantially responsible for producing the CFACC's strategic plan in May and the development of deliberate-dynamic targeting later on. There was periodic friction within the UK command chain, both UKACCs evidently believing that they had been required to refer too many issues upwards to PJHQ or beyond, but tension between centralised and decentralised C2 structures, functions and processes is as old as warfare itself. A more recent C2 problem that reappeared during Unified Protector – a feature of every major UK operation since the first Gulf War – concerned the supply of key C2 personnel such as targeteers and intelligence analysts, which barely satisfied the demand.

At the tactical level it is a fact that major combat operations invariably lead to the identification of multiple equipment deficiencies and proposals for enhancement, yet such recommendations were few during the conflict, and UK combat air capabilities quickly became central to the coalition effort. Throughout, the Tornado GR4 performed with characteristic effectiveness in the ground-attack and tactical reconnaissance roles. The detachment of 12 GR4s based at Gioia del Colle formed the spearhead of the UK air component in April, May and June and was enlarged to 16 aircraft in July to fulfil the requirements of the projected surge. Odyssey Dawn opened with GR4-launched



Armourers position and check Enhanced Paveway IV bombs prior to loading them onto aircraft taking part in Operation Ellamy.

Storm Shadow missiles amply demonstrating their combination of range, accuracy and penetration against targets in the Tripoli area, and the missile was also employed very successfully further south in August and September. However, the munition most commonly used by the GR4s over Libya was the 500lb Paveway IV. Key design features such as in-cockpit programming and aircrew selection of weapon impact angle, attack direction and fuzing mode were especially valuable. Moreover, Paveway IV proved more accurate than earlier RAF precision-guided munitions and was better suited to scenarios in which there was a significant collateral damage risk. Some 900 of these weapons were ultimately released during Unified Protector.

No less successful was the GR4's Dual Mode Seeker Brimstone (DMSB). Pinpoint accuracy, 'man-in-the-loop' operation and a light anti-armour warhead combined to make DMSB a near perfect low collateral damage weapon, ideal for use against small targets in the built-up and populated environments where so much of the fighting took place. At the same time, in the reconnaissance role, the GR4 employed RAPTOR to image nearly 48,000 points of interest across Libya, and GR4s also provided extensive 'non-traditional' ISR using their Litening III targeting pods. Given the general paucity of ISTAR assets, this achievement was of critical importance. Ultimately, the GR4s flew nearly 1,500 sorties for 7,700 hours over the course of the operation.

Much attention inevitably focused on the Typhoon's performance in its new air-to-ground role. The deployed aircraft flew 578 sorties between March and their withdrawal in September, for more than 3,000 hours. While the Typhoons could not at this stage carry Paveway IV or DMSB, their 1,000lb Enhanced Paveway IIs were regularly employed against targets involving lower collateral damage risks and they ultimately released 234 of these munitions. Furthermore, the great potential of mixed Typhoon and GR4 formations was quickly realised. Unlike the GR4, the Typhoon was equipped with MIDS – the Multifunctional Information Distribution System incorporating Link 16 and J-Voice. Via mixed formations, the benefits of MIDS and of the Typhoon's radar could be harnessed to the attack capabilities of the GR4, while the GR4 crews could pass on the benefits of their immense tactical experience to the Typhoon pilots. The variety of weapons available for attacking dynamic targets could also be extended.

Tactical success was not confined to the fast jets. Of Sentinel's achievements in the Libyan conflict, it can simply be noted that the operation led directly to the cancellation of plans to retire the aircraft from service in 2015. Apart from finding, identifying and tracking innumerable ground contacts, Sentinel regularly conducted change detection and activity monitoring at key military facilities, and surveyed the various battle-fronts and traffic flows along the main supply routes. Moreover, its onboard analytical capability enabled the production and dissemination of analysed, real-time, actionable intelligence directly to the CAOC, other airborne ISTAR assets like the Nimrod R1s,

or armed fast jets, although Sentinel's operators – V(AC) Squadron – also generated hundreds of post-mission intelligence products. Where such higher-value platforms were concerned, the principal constraint during the operation arose from their potential vulnerability to regime air defences. The assessed threat over Libya prevented the Sentinels from being exploited to their maximum potential for a time, although the range of their missions was gradually extended as the conflict wore on. They ultimately flew some 204 sorties during the operation for 2,228 hours.

Less conspicuous but no less important were the 8 Squadron E-3Ds and 101 Squadron VC10 tankers that flew daily throughout the campaign. The two deployed E-3D sentries mounted 225 sorties for 2,060 hours, providing airborne C2 for nearly 6,700 coalition air formations and coordinating humanitarian relief flights, AAR hook-ups and air strikes against hundreds of dynamic targets. The three deployed VC10s flew 422 sorties for nearly 2,000 hours and offloaded nearly 10 million kilograms (kg) of fuel to RAF and coalition aircraft during the course of the operation. UK-based Tristars provided further AAR support, flying 55 sorties for approximately 430 hours.

For the UK, participation in Unified Protector was all the more challenging because of the parallel requirement to support Operation Herrick – a combination of commitments that significantly exceeded the planning assumptions of the recent Strategic Defence and Security Review and those that preceded them. Throughout, the number of deployed RAF personnel on Unified Protector never exceeded half the number deployed on Herrick; some 37 RAF aircraft were positioned in Afghanistan and the Gulf (including eight Tornado GR4s) during the Unified Protector surge. Against this background it was inevitable that the various RAF force elements taking part in the Libyan conflict should have been severely stretched. Some GR4s flew in less than optimal equipment fits over Libya and the expenditure of DMSB had to be monitored with particular care; employment of the weapon all but ceased in Afghanistan during 2011. The inventory of Litening III targeting pods could also barely meet combined Herrick and Unified Protector requirements. The decline in RAF harmony breach rates, visible since the end of Iraqi operations in 2009, was reversed.

More generally, intensive sortie rates over long distances sustained for months on end placed a heavy burden on the older aircraft fleets and created a high demand for spares support from the UK that was not always fulfilled very easily. Reduced serviceability was the inevitable consequence. It was remarkable in these circumstances that very few tasked missions were actually lost and that such losses as did take place were partly made good by scheduling extra sorties later on. A variety of expedients helped to sustain operational flying, but the UK air component primarily remained airborne through a brilliant and unstinting engineering effort at detachment level and, where the GR4s were concerned, by flying at less intensive rates than were recorded in earlier and shorter operations such as the two Gulf Wars.

CONCLUSION

The operation that began as Odyssey Dawn and was then transformed into Unified Protector was generated at very short notice and so with the absolute minimum of planning or preparation. The speed with which an effective coalition was created is itself one of the more remarkable features of the Libyan conflict. While early air missions partly took the form of deliberate attacks on Libyan military infrastructure, they predominantly involved disjointed and reactive dynamic strikes on regime forces, when and where they were found, but the lack of any coherent plan was at first unimportant. The key objective was to halt the advance of Gaddafi's troops. This was successfully achieved, and they might have been pushed back further onto the defensive had there not been a temporary reduction of operational tempo during the transition from US to NATO leadership, which unfortunately coincided with a regime counter-offensive. Gaddafi was nevertheless forced to concede Benghazi to the rebels and his subsequent attempts to capture Misratah similarly ended in failure. His forces suffered very heavy losses in this period.

And yet, from the coalition's perspective, this approach suffered from one fundamental drawback: it was open-ended. There was no air campaign as such. By May this factor had become a source of mounting concern; it seemed that time was on Gaddafi's side. If the coalition's goal of protecting Libyan civilians was to be secured in the long term, his behaviour had to be quickly and decisively altered; the only alternative was regime change. A means to achieve either of these ends at first proved elusive. While there was a partial reorientation of targeting towards Tripoli, the coalition was unable to reach agreement on further measures. Strategic proposals drawn up by the Air Headquarters were never fully embraced by the CJTF HQ and attention was then diverted towards the Anglo-French AH deployment. This was publicly presented as a strategic measure but was, in truth, of little more than tactical significance.

Luckily, independent initiatives by the UAE, Qatar and France were in the meantime strengthening the rebel hold on the Jebel Nafusah, while broader training and mentoring activity was improving the capabilities of the FLF in the east. Gradually it became clear that this approach might break the prevailing stalemate. Improvements in rebel C2 created scope to implement a more coordinated strategy across the main battlefronts, backed by coalition air power and improved intelligence collection and processing, as well as faster exploitation in the form of deliberate-dynamic targeting. Yet the FLF offensives towards Brega and Zlitan were quickly halted. Full-spectrum and other air strikes in and around Tripoli subsequently maintained the pressure on Gaddafi, but coalition and regime forces were stretched to the absolute limit in the final week of July 2011. Fortunately, confronted by the FLF advance from the Jebel Nafusah, it was the regime that broke first, opening the way for the victorious rebel assault on the capital.

From this it might appear that the decisive factor in Gaddafi's overthrow was the direct military support provided to the FLF – particularly in the west – but the reality is more

complex. First, the FLF only triumphed after regime forces had been targeted from the air for a period of more than four months, during which time their strength and capability were very substantially written down either by direct attrition or desertion. Second, had Gaddafi been able to concentrate more of his forces in Western Libya, the rebel offensive from the Jebel Nafusah might well have run into difficulties. The offensive was only successful because relentless pressure was maintained against the regime right across Libya, not only in the Brega and Zlitan sectors but also in Tripoli, where growing popular unrest imposed yet another burden on the over-extended loyalist security forces.

Air power was instrumental in achieving this effect. Its inherent speed, agility and reach prevented the rebels in Benghazi and Misratah from being overwhelmed in March and April, and coalition air operations later pinned regime forces in these sectors by supporting FLF counter-offensives. Moreover, throughout the advance from the Jebel Nafusah to Tripoli, air power provided vital support to the FLF in qualitative if not quantitative terms by repeatedly neutralising targets of particular tactical significance. Interventions of this nature continued throughout the final battle for Tripoli and the following seven-week campaign to overcome residual regime resistance in Sebha, Bani Walid and Sirte.

Yet if the RAF had good reason to be satisfied with the outcome of Unified Protector, the experience also compelled the UK defence community to confront some less palatable truths. It revealed an obvious need for more investment in NATO, particularly in the area of C2. While the RAF's contribution at Poggio was vitally important, it was denied any equivalent influence at the CJTF HQ. Had a UK airman of one-star rank been positioned there, his presence might well have helped to improve collaboration and coordination between the two command tiers.

More broadly, the operation highlighted NATO's dependence on the United States. The Americans not only played a key role in establishing and operating the Air Headquarters and CAOC; they also provided critical coalition capabilities in the form of ISTAR, AAR, SEAD and CIS. An absence of US support on this scale would have left gaping holes in the coalition order of battle that could not have been filled by any other single NATO country. Instead it would have been necessary for alliance members to collaborate more closely and to pool complementary capabilities. Unified Protector certainly offered some important insights into how such a process might have worked but it also highlighted some of the potential difficulties, notably in the provision of adequate ISTAR and the distribution of intelligence.

Otherwise the Libyan operation gave the MOD reason to reflect on the very nature of twenty-first century conflict. In the decade following the First Gulf War, western countries consistently sought to avoid the extensive commitment of ground forces due

primarily to the costs and casualties involved. No-fly zones were established over Iraq and the Former Yugoslavia, the Kosovo conflict was won without the launch of a ground offensive; in Afghanistan, the Taliban were overthrown by a combination of air power, SF and 'proxy' ground forces.

Yet the following decade witnessed a pronounced change – a renewed confidence in so-called 'boots on the ground' first exhibited in the Second Gulf War but afterwards explicitly linked to the requirements of counter-insurgency (COIN) operations in Iraq and Afghanistan. These developments were accompanied by strident arguments to the effect that there had been a decisive shift in the nature of conflict towards COIN, which were regularly promoted alongside particular policy formulation, force structure and capability recommendations. The experience of Unified Protector, mounted without any major land deployments, clearly did not lend support to this stance and was thus an inconvenience to the more vociferous proponents of the boots-on-the-ground philosophy.

It would, of course, be quite wrong to maintain that Unified Protector somehow represented a turning point or a model for subsequent operations. The political advantages of the air and SF-based approach may be gauged from the fact that strategic victory was achieved in Libya in a period of just seven months with no formal land component, with no coalition casualties, with only a handful of civilians and rebels being killed by coalition fire and at a tiny fraction of the cost of the operations in Iraq and Afghanistan. They have since also been reflected in the RAF's extensive and protracted commitment to Operation Shader. Yet this does not necessarily mean that the nature of warfare has changed. Equally, however, no equivalent claim should have been made – let alone accepted – on the basis of the Iraqi and Afghan conflicts. The fact is that defence cannot simply prepare for one particular type of operation to the exclusion of all others. The key lesson of Unified Protector is that the armed forces must instead remain sufficiently flexible to respond to a broad range of operational contingencies despite the heavy cost and resource implications.

NOTES

¹ Unless otherwise stated, this paper is based on the Air Historical Branch narrative, *The Royal Air Force in Operation Unified Protector*.

² Camille Grand, 'The French Experience: Sarkozy's War?', p. 198, Bruce R. Nardulli, 'The Arab States' Experiences', pp. 341, 345, 346, 365-366, in Karl P. Mueller (ed), *Precision and Purpose: Airpower in the Libyan Civil War* (Rand, Santa Monica, 2015).

³ According to current NATO doctrine, the Joint Targeting Coordination Board is established by the Joint Force Commander (JFC). Typically, it reviews target information and develops targeting guidance and priorities while preparing and refining joint target lists for recommendation to the JFC. It is the primary agency for synchronising and managing joint targeting efforts. See AJP-3.9, *Allied Joint Doctrine for Joint Targeting*,

Edition A, Version 1, April 2016, Chapter 4, Section V.

⁴ On full-spectrum targeting see AJP-3.9, *Allied Joint Doctrine for Joint Targeting*, Chapter 1, Section V.

THE DISTANCE PARADOX: REAPER, THE HUMAN DIMENSION OF REMOTE WARFARE, AND FUTURE CHALLENGES FOR THE RAF

By Dr Peter Lee

Biography: Dr Peter Lee is the Director Security and Risk, and a Reader in Politics and Ethics, at the University of Portsmouth. He has been researching and writing about remotely piloted air operations since 2012. In 2016 Peter was granted unprecedented research access to the two RAF Reaper squadrons for his latest book, *Reaper Force: Inside Britain's Drone Wars* (2018).

Abstract: Since the advent of air power more than a century ago, the relationship between shooter and target has been characterised by steadily increasing physical and psychological distance. The advent of remotely piloted air operations in the twenty-first century, such as those conducted using the MQ-9 Reaper, produces a distance paradox: the physical distance of the crews from operational theatres now extends across continents, while the visual, emotional and psychological distance to their targets has regressed to that experienced by First World War aircrew. This paper reflects on key human aspects of remote air operations through the experiences of Reaper personnel, linking current challenges to historical precedent, and identifying future challenges that will need to be addressed to optimise performance and resilience in the decades to come.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor.



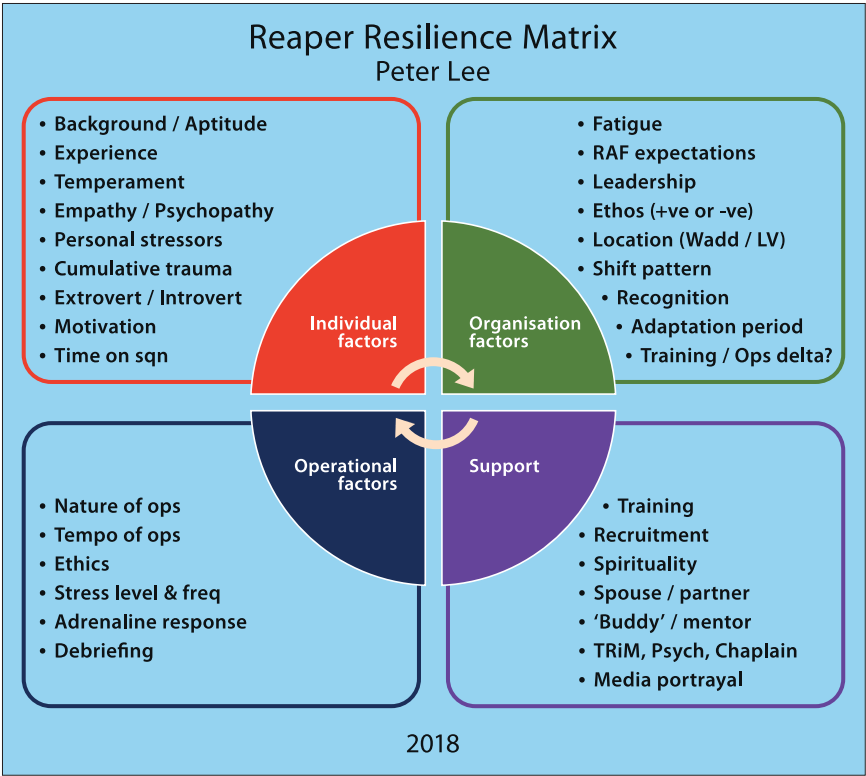
RAF MQ-9A Reaper, 2014. © Crown Copyright.

INTRODUCTION¹

In the final decade of the Royal Air Force's first hundred years of existence, the addition of the MQ-9A Reaper to its inventory has brought both operational benefits² and public controversy.³ In 2007 the Reaper was introduced as an Urgent Operational Requirement for Operation Herrick in Afghanistan.⁴ By 2014, the Reaper's dual Intelligence, Surveillance and Reconnaissance (ISR) and Attack capabilities had proved to be so effective and indispensable that it was brought into RAF Core Capability.⁵ To staff this new capability, personnel were brought together from a range of flying backgrounds – including the Harrier, Tornado F3 and GR4, Nimrod, Hercules, and various helicopters – and none. Individuals were drawn from the RAF, Royal Navy, Army and Royal Marines, to develop and apply the Reaper's ability to remotely deliver air power effect in counter-insurgency operations, initially in Afghanistan and latterly in Iraq and Syria. The disparate backgrounds and experiences of Reaper personnel have resulted in squadron cultures that have often reflected the dominant previous experiences and personal ethos of those involved.

The purpose of this paper is to reflect on key aspects of the human operator dimension of remote air operations through the experiences of Reaper personnel, linking current challenges to historical precedent, and identifying future challenges that will need to be addressed to optimise performance and resilience in the decades to come as the Reaper is eventually succeeded by the Protector.⁶ This article forms part of a wider study entitled, 'Royal Air Force Reaper: 21st Century Air Warfare from the Operators' Perspective',⁷ the major output of which was a book entitled *Reaper Force: Inside*

Britain's Drone Wars.⁸ Empirical, qualitative data was collected between July 2016 and February 2018, and comprises observational field research with 13 and 39 Squadrons and 90 semi-structured interviews with members of the RAF Reaper community.⁹ In the course of the data gathering, recurring factors that could contribute to sustained, long-term participation in operations, otherwise referred to as 'resilience', were identified. From this coding of notes and observations emerged the following Reaper Resilience Matrix:



There is not the scope within this paper to address every element of this matrix. However, several of the factors identified here will be explored below to understand some current and future challenges in the human dimension of RAF remotely piloted air operations.

The first section will provide a brief historical overview showing how physical and psychological distance in weapon use by air, land and maritime forces increased in tandem over time.¹⁰ Snipers, special forces, fast jet crews, intelligence personnel and others have experienced elements of this dynamic. However, this study focuses on remotely piloted aircraft and their crews: a point raised by Killeen and Jordan in 2013

and expanded upon here.¹¹ The subsequent sections will consider the potential effects of this visual intimacy and the re-humanising of targets on operators, introducing physical, emotional and psychological responses. The final section will pose questions about the costs and benefits of empathy with human targets, before a discussion about moral injury and the extent to which the previous factors might contribute to its occurrence or prevention.

AIR POWER, DISTANCE, AND KILLING

For the first 90 years of the RAF's existence, from its creation on 1 April 1918 to the advent of the Reaper MQ-9A and the formation of 39 Squadron in 2007, the trajectory of the relationship between shooter and target in the delivery of air power has been characterised by steadily increasing physical and psychological distance. Part of the psychological distancing is, for psychologist Albert Bandura, the use of 'euphemism' in what he sees as the mechanism of moral disengagement by military drone operators: 'Euphemistic language in its sanitising and convoluted forms cloaks harmful behaviour in innocuous language and removes humanity from it'.¹² His notion of 'harmful behaviour' seems to extend to all killing, including strikes against legitimate combatants which might save other lives on the ground. He refers to some of the euphemistic terminology used in the US drone community: 'touchdowns... jackpots...personality strikes...signature strikes', as well as 'collateral damage' (the unintended, accidental or indirect killing of civilians), the latter also being used by RAF Reaper personnel.¹³ Bandura's argument about the use of euphemism is, to a significant extent, echoed in the empirical research with military veterans conducted by Grossman.¹⁴ The practical result of the use of euphemistic language is to provide emotional distance between the shooter and the human target.

The reason for this use of euphemism in the delivery of air power, or in any other element of killing in war or armed conflict, is to help facilitate an activity – killing – that is difficult for even many hardened military personnel. Grossman points out that 'there is within most men [and women] an intense resistance to killing their fellow man [or woman]', going on to observe that 'throughout history the majority of men on the battlefield would not attempt to kill the enemy, even to save their own lives or the lives of their friends'.¹⁵ In his study, he presents evidence to demonstrate that only a small minority of combatants – throughout history and up to the present – are comfortable, or at ease, with killing, even in a life-threatening wartime scenario: 'The burden of killing is so great that most men try not to admit that they have killed. They deny it to others, and they try to deny it to themselves'.¹⁶

That trajectory of increasing distance in the air power 'killing' domain even precedes the RAF, starting with the Royal Flying Corps and Royal Naval Air Service in the First World War. The recollections of Major James McCudden VC provide a good indication of the distances involved in air-to-air combat a century ago. On 13 January 1918 he was flying

behind enemy lines at 17,000 feet when he spotted a two-seater enemy aircraft a few thousand feet below.¹⁷ He idled his engine and, almost silently, glided down behind his unsuspecting target at 9,000 feet:

[W]hen I got within good close range, about 100 yards, I pressed both triggers; my two guns responded well, and I saw pieces of three-ply wood fall off the side of the Hun's fuselage. Then the L.V.G. went into a flat, right-hand spiral glide until it hit the ground a mass of flying wreckage ... I hate to shoot the Hun down without him seeing me, for although this method is in accordance with my doctrine, it is against what little sporting instincts I have left.¹⁸

Two separate indicators of distance are captured in these few words: physical distance and psychological distance. At the time of firing, McCudden was about 100 yards physically distant from the German aircraft he shot down. Then, afterwards, he watched the downed enemy aircraft hit the ground. Assuming that McCudden maintained his altitude at 9,000 feet, to give him an advantage in any subsequent air-to-air encounter, he would be watching from almost 3,000 metres vertically away from the crash site. In addition, psychological distance is indicated in two ways. First, he refers euphemistically to 'the Hun', rather than the 'pilot' or 'crew' or 'people'; and second, he describes 'a mass of flying wreckage', focusing on what happened to the aircraft rather than on the deaths of the crew. A few days later, after shooting down another German aircraft, McCudden described:

This D.F.W crew deserved to die, because they had no notion whatever of how to defend themselves, which showed that during their training they must have been slack, and lazy, and probably liked going to Berlin too often instead of sticking to their training and learning as much as they could while they had the opportunity. I had no sympathy for those fellows, and that is the mental estimate which I formed of them while flying back to my aerodrome to report the destruction of my 43rd aerial victim.¹⁹

In this description, McCudden reduces the humanity of the crew he shot down, discursively imagining a pairing who 'deserved to die' for being 'slack', 'lazy' and too keen on having a good time in Berlin rather than training properly. One possible alternative explanation for McCudden's choice of words is that he was justifying their killing *to himself* on some psychological level and avoiding a possible alternative explanation: inexperienced crew with little or no chance against one of the RFC's – later RAF's – most effective pilots.

By the Second World War and afterwards, the dynamic of killing from the air had moved on considerably. That increasing physical distance, and accompanying sanitizing language, can be seen in Group Captain Leonard Cheshire's recollections from a

bombing raid against Cologne: 'If what we saw below was true, Cologne was destroyed... Cologne was burning, it was burning as no city in the world can ever have burnt, and with it was burning the morale of the German citizen'.²⁰ There was no possibility of seeing individuals from his bombing altitude even as Cheshire referred to the burning city below. His reference was to the burning of the *morale* of the German citizen and not to the burning of the German citizens themselves. Cheshire's use of language was consistent with the language of the official bombing directives issued to Bomber Command in the Second World War. A directive on 14 February 1942 to Acting Air Officer Commanding-in-Chief (AOC-in-C) Bomber Command, J.E.A. Baldwin stated: 'the primary object of your operations should now be focussed on the morale of the enemy civilian population and in particular, of the industrial workers'.²¹ The directive does not demand that civilians themselves are targeted, merely that their *morale* is undermined, through the bombing (including incendiaries) of their homes and neighbourhoods in the way that Cheshire observed. Garret argues that the Air Ministry maintained 'and sustained [a] public fiction about Bomber Command's strategy' through vague references to undermining morale.²² In October 1943 Arthur Harris, AOC-in-C, Bomber Command, encouraged greater candour about the reality of bombing and urged the Air Ministry to 'stop their public denials that the bombing campaign was focused on "the obliteration of German cities and their inhabitants as such"'.²³ The use of language to either describe or obscure the activities and aims of Bomber Command was a point of sustained debate until the end of the war.

Over the same period, American political and military leaders similarly sought to deploy language in a way that presented their actions more favourably to the public. Hays Parks points out that there was little evidence that the USAAF was more accurate with its 'precision', 'pickle barrel', and 'pin-point' bombing' than the RAF's area offensive being conducted against Germany at the time.²⁴ There is, however, evidence of two things that the British and Americans had in common in their respective bombing campaigns. First, bombing altitudes were getting higher (25,000 feet),²⁵ thereby increasing the physical distance of the bomber crews from those they killed beyond that experienced by First World War aircrew. Second, the use of sanitising language, like 'area bombing', 'morale bombing', or 'carpet bombing', psychologically protected those involved from confronting the stark reality of killing civilians over entire city areas.²⁶ The use of language was a factor in emotionally distancing political leaders, military commanders and bomber crews – and the general public – from the 'killing' aspect of the bombing policies they undertook.

In the decades following the Second World War, the distances involved in the delivery of air power – especially air-to-ground attacks – continued to increase. In parallel, aircraft got faster and bombing runs took correspondingly less time. By 2003, the RAF had acquired the Storm Shadow stand-off cruise missile for use in Operation Telic. It could be fired from more than 500km away, typically against command and control

centres, airfields, communications hubs, ammunition storage and other key targets.²⁷ The Storm Shadow would officially enter RAF service in 2004, increasing the distance between aircrew and target – its ‘fire and forget’ pre-programmed capability providing parallel psychological distance from targets for those involved. At the same time, the US Predator remotely piloted aircraft programme was rapidly expanding – with embedded RAF personnel involved – placing aircrew thousands of miles away from not only their targets but from their aircraft as well. Then in 2007, the RAF re-formed 39 Squadron with the MQ-9A Reaper, officially joining the era of remotely piloted air operations.²⁸ The distance between shooter and target would appear to have reached new levels.

REAPER AND THE DISTANCE PARADOX



A sensor operator at a Reaper work station. © Crown copyright.

A number of now-familiar tropes emerged in the 2000s in popular and academic critiques of military drones like the Reaper. The ‘Playstation mentality’ meme is probably the best known of those representations of Reaper crews, with the claim that ‘geographical and psychological distance between the drone operator and the target lowers the threshold in regard to launching an attack...Operators, rather than seeing human beings, perceive mere blips on a screen’.²⁹ Singer, similarly, argued that drone crews are ‘disconnected’ from the wars in which they conduct air operations.³⁰ Further, Olsthoorn referred to both the psychological and physical distance from their targets, as though the two are directly linked,³¹ while Medea perpetuated the assumption that killing by drone strike from afar was somehow ‘easier’ than

conventional military killing.³² These authors all appear to have assumed that the historical link between physical and psychological distance continued with US and UK remotely piloted air operations using the Predator and the Reaper. Further, limited primary research restricted authors' understanding of the acuity of the images that could be seen on the screens, and hence the mentally immersive nature of such operations. In contrast, in 2014, a report by the House of Commons Defence Committee acknowledged the All Party Parliamentary Group on Drones' concerns about the 'limited consideration of the psychological impact of drones *on operators* and those living in affected areas'.³³ However, public focus, and academic and media enquiry, concentrated on policy surrounding RPAS use and on those in affected areas, rather than on the operators.³⁴

However, over that same period, the impact of remote operations – especially killing – on the crews who carry them out, has quietly but steadily grown as an area of interest and enquiry. In 2013, American former Predator pilot Brandon Bryant publicly shared his diagnosis of PTSD, becoming something of a *cause célèbre* in describing multiple kills – with apparent scant regard for the deaths of civilians – and the extremes of behaviour that he experienced outside the Ground Control Station.³⁵ More recently, USAF Imagery Analysts have been reported as experiencing varying degrees of mental trauma, and 'nearly one in five had witnessed a rape within the past year. Some airmen reported witnessing more than 100 incidents of rape or torture' according to USAF Wing Surgeon Lieutenant Colonel Cameron Thurman.³⁶ Then on 13 June 2018, the New York Times published a major investigative piece on the mental trauma experienced by US drone crews, asking whether some or all of these individuals could be suffering from 'moral injury'?³⁷ 'Moral injury' will be discussed below but an initial sense of this contested term is found in Nash et al's definition, which refers to '...changes in biological, psychological, social, or spiritual functioning resulting from witnessing or perpetrating acts or failures to act that transgress deeply held, communally shared moral beliefs and expectations'.³⁸

Against this backdrop, the distance paradox experienced by Reaper personnel emerged right away in my research interviews, in their descriptions of events they had witnessed on the ground via the sensor suite on the aircraft. They were physically located at either Creech Air Force Base in Nevada or at RAF Waddington in Lincolnshire. Aircraft crews had never been so geographically far away from their targets, yet they witnessed and experienced events on the ground in great detail. In addition, those events were juxtaposed with the banalities of day-to-day family life:

I am a parent governor for my local school and every year I volunteer to go away with the teaching staff and help the kids enjoy the great outdoors. It's only three days away but the kids get to abseil, canoe, pot-hole and do many other fun things. One year, I had a great time and thoroughly enjoyed the company of the

children and the staff. Eighteen hours after I got back I was in work, watching a prisoner having his head cut off and being powerless to do anything about it. Oh how my life had changed – and not for the better – in such a short period of time! (Simmo – Sensor Operator)³⁹

Comments like this and many others made it clear, subsequently reinforced over time, that the incidents which had the greatest impact on the Reaper crew members – not surprisingly – revolved around killing or serious physical harm. These either involved their own use of weapons and killing (or seriously harming) enemies on the ground, or having to watch as atrocities (including beheadings or other executions) were perpetrated, while powerless to intervene. At maximum camera resolution, the view the Reaper crews have of these events is now not much different to the 100 yards or so distance between aerial combatants in the First World War described previously. More significant is that First World War aircrew who shot down enemy aircraft were visually further away when the target aircraft crashed on the ground than are observers of a Reaper Full Motion Video (FMV) feed today.

Blair and House say of this phenomenon in remote air operations: ‘We hold that the operative distance is not physical distance, but cognitive distance. For remote warriors, *Cognitive Combat Intimacy (CCI) is a relational attachment to a human target mediated by sensor resolution and dwell time, or duration of observation.*’⁴⁰ This concept of Cognitive Combat Injury has both advantages and disadvantages. Positively, it recognises the mental engagement of the Reaper pilot, sensor operator and mission intelligence coordinator. It also encapsulates the cognitive intimacy of the authorising officer and senior mission intelligence coordinator, imagery analysts in intelligence agencies, and commanders with a live video feed. Potentially more negatively, that intimacy is somewhat removed from the constant distance-intimacy paradox at the heart of remote warfare. The paradox itself is a factor in creating, for some, a cognitive dissonance between the physical distance and safety enjoyed by the Reaper crew, and the emotional intimacy and psychological threat. In the example of ‘Simmo’ above, his physical distance from a war zone enabled him to pursue relaxing educational and family activities as a school governor, while on his return to work the Reaper Full Motion Video feed brought him great visual and psychological intimacy with a beheading victim.

Grossman observes that ‘During strategic bombing [in the Second World War] the pilots and bombardiers were protected by distance and could deny to themselves that they were attempting to kill any specific individual’.⁴¹ Geographical distance and the security of a Ground Control Station provide the ultimate physical protection for Reaper crew members. However, the clarity and persistence of the close-up views they see do not afford them the denial and psychological protection that Grossman argues the bomber crews experienced in the Second World War. Crucially, significant time and effort goes

into ensuring that *specific, identified individuals* are killed. Days, weeks and even months have gone into observing particular High Value Targets in Afghanistan, Iraq and Syria.

Historically, an important means of enabling the killing of enemies is through psychological distancing and dehumanisation, and there is an extensive literature on the phenomenon. At the extreme end of this 'dehumanising' spectrum are atrocities against the Jews in the Second World War, which 'originates from the delegitimization of the Jews by the Nazi regime',⁴² and the Cambodian genocide in the 1970s. Mass killing of innocents – or non-combatants, to use a less loaded term – requires a high degree of dehumanisation which strips the victim of self-hood, identity, culture and intrinsic value.⁴³

In his use of language, McCudden's words (quoted earlier in this paper) conform to a pattern of behaviour and use of language in relation to killing in war. Bandura states: 'By camouflaging pernicious activities in innocent or sanitizing parlance, the activities lose much of their repugnancy. Soldiers "waste" people rather than kill them'.⁴⁴ Hence, a century ago McCudden described watching the German L.V.G. aircraft going into a spin and crashing, rather than write about killing the crew. Further, 'Self-censure for cruel conduct can be disengaged by stripping people of human qualities... They are portrayed as mindless "savages," "gooks," and other despicable wretches'.⁴⁵ Or, in McCudden's case – consistent with the language and attitudes in that particular war at that time – he shot down 'the Hun'.

If it is even partially correct that combatants have previously dehumanised their enemies in order to kill them, the approach often breaks down with the visual intimacy of killing from a Reaper. One Reaper pilot – a highly experienced former fast jet pilot – describes some of the dynamics involved in the humanising of a potential target, and the visual and psychological intimacy it entails:

[W]e may watch 'Target A' for weeks, building up a pattern of life for the individual: know exactly what time he eats his meals; drives to the Mosque; or uses the ablutions – outdoors of course! This is all-important for the guys on the ground. However, what we also see is the individual interacting with his family – playing with his kids and helping his wife around the compound. When a strike goes in, we stay on station and see the reactions of the wife and kids when the body is brought to them. You see someone fall to the floor and sob so hard their body is convulsing. A conventional aircraft often doesn't have the endurance [in the air] to witness this.⁴⁶

The level of visual detail afforded the Reaper crew, and the sustained surveillance involved in this example, does not allow the individuals involved to deny that the enemy has a family, or a fully rounded life. If part of that life is devoted to insurgency

warfare, then it is viewed in a broader context. Those involved not only see the actual killing in detail, they also see the immediate consequences: recovery of a body or body parts, family reactions, funerals, and so on. Such potentially traumatic visual stimuli is not unique to the Reaper Force but there is not the scope here to explore the similar experiences of online sex-crime police investigators, war photographers, defence intelligence analysts, or Facebook and YouTube online moderators.

POTENTIAL IMPACTS OF REMOTE WARFARE

If Bandura is correct, the visual and emotional intimacy of Reaper operations will bring its own psychological challenges because it is ‘difficult to mistreat humanized persons without suffering personal distress and self-condemnation’.⁴⁷ Before accepting his argument, however, the word ‘mistreat’ should be qualified. In the context of military operations, it may be the case that killing another human being is an appropriate operational and ethical act that can result in personal and professional satisfaction. Such a response does not preclude the possibility of sadness or regret that a child may have been left without a parent who happened to be an enemy combatant. Responses to the taking of life in war are complex and individualised. Having spent so much time with so many Reaper personnel, whose responses to conducting remote operations ranged from apparently unaffected to significantly affected – with the majority somewhere in between – a new question emerged: *Why are some crew members able to operate for five, six, even seven years consecutively, while others seem exhausted after two?* I will go as far to suggest that the answer to this question – and only the beginning of an answer is offered in this paper – will shape the human dimension of remote air operations, and therefore the culture of the RAF itself, long into the future.

The most consistent response to how long a Reaper crew member could or should operate without an extended break, came in the interviews with spouses and partners: somewhere between two-and-a-half and three years.⁴⁸ Vet 18, a former Reaper Squadron Commander, had reflected on this question for years and concluded that, although the answer would always be individualised, ‘None will *happily* make it to the end of two tours.’⁴⁹ Underpinning almost every discussion with operators and spouses/partners about longevity on the Reaper Force was fatigue: a constant tiredness that was rooted in long days on a ‘six days on, three days off’ work pattern that rarely worked out so neatly or generously. ‘He’s tired *all* the time,’ says Partner 20, a phrase that is repeated so often during interviews it could be the unofficial Reaper Force motto. But in the background of the ‘fatigue’ discussions, a common link to operations and weapon use also emerged – especially where human targets were involved. Partner 19 tried to explain his wife almost collapsing, in tears, onto the floor when she got home after an extended, intense period of Reaper activity: ‘I put it partly down to exhaustion and partly down to the operation she was conducting that day.’ Partner 12 echoed those sentiments, while also explaining the reason her husband persevered: ‘the physical impact on his body, lack of sleep, constant mental exhaustion – just not getting “down

time”. That’s what I worried about most. But I don’t think he thought about doing anything else – that was just his job.’ The role itself, for the vast majority of Reaper personnel, is as professionally and personally fulfilling as it is demanding.

SHOOTING, KILLING AND PHYSICAL RESPONSE

The physiological effects of conducting lethal missile or bomb strikes is one area where the experiences of Reaper crew members consistently contradict public claims that they are somehow emotionally distant, remote game-players. Almost all crew members described adrenaline spikes – sometimes almost overwhelmingly powerful – and rapid heart-rates in the build-up to, and execution of, a weapon strike, though for some these lessened over time. In July 2016 I observed my first lethal missile strike in real time in a 39 Squadron Ground Control Station, while sitting immediately behind the sensor operator as he guided a Hellfire missile onto his human target: an ISIS fighter on a motorbike. As the missile struck, hitting and killing the target, the sensor operator – who had been holding his breath for the half-minute duration of the missile flight – exhaled with relief and exclaimed: ‘My heart’s beating out of my chest!’⁵⁰ That link between heart-rate, adrenaline spike and weapon firing is highly prevalent among crew members, and can be especially tense for those new to shooting and killing.

Jeff, an RPAS(P),⁵¹ was building up to his first missile strike, just a couple of days after he had qualified as Combat Ready: ‘My heart has never gone so fast. I’ve done a lot of silly things in my time that has raised my heart rate quite considerably, but not like this.’ However, actual weapon firing – depending on the operational environment, Rules of Engagement, and proximity of non-combatants – might only happen once for every five or six times the pilot starts the process of getting all the authorisations for a strike, or is called in for a potential strike. For most crew members, just beginning the process prompts a spike in adrenaline. Ross gives a detailed insight and adds a further dimension to the personal dynamics in a weapon strike:

[W]hen you’ve had a ‘decent’ strike event you go through a process of extreme adrenaline. It gets to a peak...you ride the crest, the strike happens, then you come down as the adrenaline subsides. The occasions when a strike doesn’t happen – maybe because there are civilians around – is what causes you issues. When you have to leave a threat out there to cause harm or kill people. You don’t get that kind of pressure release.⁵²

That fight-or-flight arousal seems counter-intuitive because the Reaper crews themselves are not in physical danger. However, it is prompted because they also know that in many situations, if they are not absolutely precise with their shots, non-combatants or allied forces on the ground, or both, will die. Compounding that pressure is the awareness that multiple audiences are watching in real time, from the Operations Room on the Squadron, to the CAOC in Qatar, to other intelligence agencies who are

gathering (or providing) information. Vet15 describes being very aware – during lethal weapon events – of the current and subsequent audience: ‘lots of people are watching what’s going on. You can’t hide things because they are visible to people who have the access to the [live video feed of the incident] you are dealing with’.⁵³

Experimental psychologists have studied – and continue to study – human performance under pressure. Beilock and Carr offer an insight into how ‘audience awareness’ might affect performance: ‘Distraction-based accounts of suboptimal performance propose that performance pressure shifts attentional focus to task-irrelevant cues—such as worries about the situation and its consequences. In essence, this shift of focus changes what was single-task performance into a dual-task situation’.⁵⁴ Knowing that under the well-intended squadron and RAF culture of learning from one another’s mistakes (or successes), and the fact that the video of your strike will be shown publicly in morning briefing, adds significant pressure to an already adrenaline-fuelled situation for some operators. Repeated high adrenaline spikes during the course of a shift, combined with pressure from continuous, intense external scrutiny, is one possible factor in the extreme fatigue some Reaper personnel experience. Grossman describes the ‘parasympathetic backlash’ that soldiers experience after the fight-or-flight response activates and spikes of adrenaline are released: ‘The parasympathetic backlash occurs as soon as the danger and the excitement is over, and it takes the form of an incredibly powerful weariness and sleepiness on the part of the soldier’.⁵⁵ This qualitative research indicates a variation of response across Reaper personnel when it comes to both adrenaline response and parasympathetic backlash, which is – in turn – influenced by training, experience, psychological conditioning over time, and individual physiological and psychological traits. Consequently, the next question for future research asks: *How can physiological and psychological states be developed to maximise human performance in remote operations?*

VISUAL INTIMACY AND ITS CONSEQUENCES

While the pilots or crews of other aircraft types like the Typhoon or Tornado will experience the same physiological responses to weapon use as Reaper crews, further related areas for future research are prompted in remotely piloted operations: the greater degree of image acuity and sustained visual intimacy; the potential for visual trauma; and the extent to which visual and mental proximity to targets influences the dynamic of killing. In addition, as well as describing the physical, extreme adrenal response to a weapon strike, Ross (see above) also introduced another important factor in individual and collective Reaper culture and identity – that of ‘protector’ or ‘guardian’.⁵⁶ Self-identification with a protective role can be in either the immediate and specific sense of direct intervention as a self-defence action (i.e. defence of non-combatants or ‘friendlies’ on the ground), or in a more general sense of protecting societies in Syria/Iraq from the ideology and behaviour of ISIS and its fighters. The protective role has a strong ethical basis and is a powerful motivator for Reaper

personnel. It also opens up the possibility of either psychological harm or moral injury if individuals feel that they have failed to protect those that they feel responsible for.

A 2014 King's College London study of mental health in UK Armed Forces found 'no evidence of a tidal wave of deployment related mental health problems'.⁵⁷ There was no specific focus on Reaper operators in that study, which found:

There is no evidence that the length of a single tour, or number of tours, has had an adverse effect on Service personnel's mental health, provided that Harmony Guidelines are followed. When the actual tour length exceeds the expected length, it has a substantial adverse impact on mental health and also alcohol misuse.⁵⁸

Experiences of individuals with multiple, continuous Reaper operational tours may prompt new findings in a follow-up study. However, with PTSD rates for personnel deployed on the ground in Afghanistan between 2007-9 reported at 6.9%, anecdotal evidence from my Reaper research interviews do not suggest much variation from that level. This, in turn, does not – yet, anyway – diverge from levels of PTSD in civilian populations, with Norris and Slone, concluding: 'It is clear that only a fraction of people who are exposed to trauma develop the full syndrome of PTSD. Thus, despite the high prevalence of trauma exposure around the world, the lifetime prevalence of PTSD is no more than 7%'.⁵⁹

On the Reaper Force, like any diverse population, a range of responses to traumatic incidents has emerged. At one end of the spectrum, a small number of cases of PTSD have been reported. Towards that end of the spectrum, Toby, a former sensor operator, presented himself at the mental health unit of a Ministry of Defence Hospital Unit (MDHU). He has a traumatic memory that affects him but 'I don't have enough ticks in the boxes for it to be full PTSD... I still have the odd dream where I wake up with the 'bang' of a particular explosion'.⁶⁰ Rory, another sensor operator, encapsulates the mixed feelings of many crew members, who live with extreme tiredness, regularly witness horrific events, and yet see these as a 'normal' part of life on the Reaper Force. He observes, of himself and others:

If anybody on the Reaper fleet says it doesn't affect them, then they're lying. It does. It has to. But I really enjoy what I do and I don't think I would change anything about the last five years with the Reaper. Five years is more than enough in one go. I am well aware that I am probably six to twelve months overdue a rest – just physically and psychologically.⁶¹

Many others have echoed that sentiment: there are effects, but these are bearable for most of the people, most of the time. However, over time the number of traumatic, or potentially traumatic, events accumulate: sights that cannot be unseen, incidents that

stick in the mind. To add to the complexity of individual experiences on the Reaper Force, there are a small number of those who are apparently unaffected, or just minimally affected, by their experiences. Ken is no longer flying the Reaper but the influence of his experience persists:

If I ever watch a TV programme such as Traffic Cop with camera footage from a helicopter, I immediately feel my heart rate start to increase and my mind will start to plan how best to conduct a weapon engagement on whatever person or vehicle is being tracked. Having spent several years looking at the world from, quite literally, a different angle, that perspective is, evidently, ingrained within my psyche and without hesitation is a skill-set that I am subconsciously eager to continue to employ. In all honesty I perversely miss the satisfaction and thrill of thinking on my feet, then planning and conducting a successful engagement; I'm content to say I actually enjoyed it.⁶²

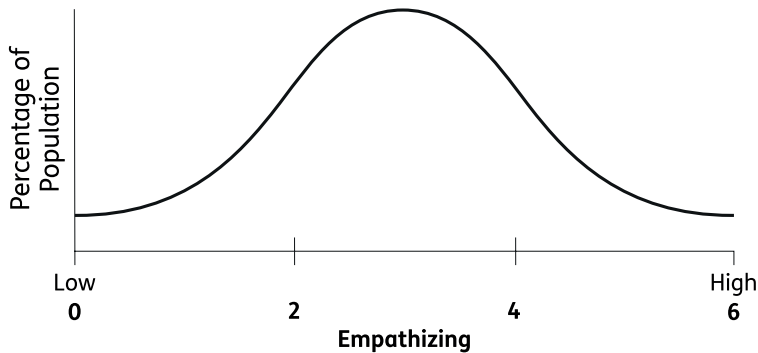
In a separate interview, Ken's wife reinforced what he had said: that he seemed relatively unaffected, given his experiences, and that he had enjoyed his time on 39 Squadron. Only a very small number of former Reaper personnel were as adamant as this about their enjoyment levels and the lack of impact upon them.

One of the difficulties, then, in making sense of individual reactions across the Reaper squadrons is that there is no common pattern of behaviour or response. It would appear that those with a fast jet background – who had been trained to use, or actually used, weapons – were generally well equipped to cope with the reality of killing and viewing traumatic incidents. They will have had the advantage of a lengthy fast jet training over several years where, from the outset, they would know that shooting and killing would be part of their future. Inculcation into Harrier or Tornado culture and operations would include that life and death dimension, which would not be found in the same way on maritime patrol, transport, or most helicopter fleets (except Apache). However, and contradicting that generalisation, others have come from non-kinetic backgrounds – and without the years of psychological conditioning that comes with it – and excelled on the Reaper, both in technical proficiency and in psychological endurance. Trying to make sense of this inconsistency prompts another question for future research: *To what extent can individuals be socialised and conditioned to conduct lethal operations or observe traumatic events from Reaper, and to what extent do inherent levels of empathy shape individual responses?* From all of the interviews and collective engagement with Reaper personnel and spouses/partners, I would suggest that individuals' inherent capacity for empathy is part of the mental wellbeing equation.

EMPATHY AND LETHAL OPERATIONS: COSTS AND BENEFITS

The vast majority of people experience empathy: 'Affective or emotional empathy is when you feel along with the other person'.⁶³ McGregor summarises the work of Baron-

Cohen in both the Empathy Bell Curve (shown here), and his 6-point Empathy Spectrum (below):⁶⁴



Empathy Spectrum:

- Point 0 No empathy and hurting others means nothing to them
- Point 1 Capable of hurting other people but feels some regret if they do so
- Point 2 Has enough empathy to inhibit them from acts of physical aggression
- Point 3 Compensates for lack of empathy by covering it up
- Point 4 Low to average empathy
- Point 5 Slightly higher than average empathy
- Point 6 Very focused on the feelings of others. An almost unstoppable drive to empathize.⁶⁵

As the Empathy Bell Curve and Empathy Spectrum suggest, there is typically a small number of people in a population who experience an overwhelming degree of empathy with others (Point 6 on the spectrum). Two interviewees shared how they had each, independently, reached a point where they could no longer kill a human target, even when that person was positively identified as an enemy fighter, a legal target, and the strike was correctly authorised. Jake described his thought process in choosing which of two people to strike, in a shot that his crew was legally authorised to take but which could not hit both targets with the same missile or bomb: ‘What right do I have to decide which one of you is going to live for another sixty years, have children and grandchildren, and which one of you is going to have your life ended right now? Do I have the right to make that decision?’⁶⁶ His language and tone indicated a strong capacity for empathy – putting himself in their places – which influenced his thinking and actions.

Meanwhile, at Point 0 or 1 on the spectrum there are a small number who react the opposite way, with little or no empathy (or the capacity to somehow disengage it), and are able to kill with little or no personal approbation. Consider the self-description from a Special Forces soldier: ‘In a fight, physical or verbal, it felt like I was detached. It was almost like I was watching myself in slow motion and thinking clearly about

what needed to be done and how I was going to do it. There was no fear, no emotional connection to what was happening'.⁶⁷ On two occasions, almost identical descriptions of being 'in the zone' before and during a Reaper weapon strike have been shared with me. In February 2018, one very experienced crew member⁶⁸ described being 'absolutely cold' and his heart-rate 'barely moving' when striking a human target (while also confirming that he complied with ROE). Was that Reaper crew member congenitally predisposed and lacking empathy, or conditioned over time and through experience? Or a combination of those factors?

The previous two examples appear to be rare, with the overwhelming majority having a capacity for empathy somewhere between the extremes that not only allowed them to conduct Reaper operations but helped them to do so. Empathy can play a number of roles in day-to-day squadron life and the conduct of operations. Empathy can be a powerful motivator, especially in a protective role, in providing personal and professional fulfilment on the Reaper Force. It can also lead to powerful self-questioning if that protective instinct is violated. For Jamie, a mission intelligence coordinator, protecting allies on the ground in Afghanistan was a strong motivator, rooted in his own prior experience out on the ground. His first weapon event was against a Taliban vehicle that was transporting explosives, but resulted in several civilian deaths, which he observed in detail.⁶⁹ His thoughts at the time capture both his desire to make a positive difference through his work, and the immediate impact upon him when his aims and expectations were violated: 'How did I find myself in this situation? I joined the Reaper Force to make a positive difference after the shit I experienced on the ground in Afghanistan. How did my first weapon event turn into a nightmare, an awful nightmare?'⁷⁰ As well as watching the initial impact, Jamie and the crew also continued observing the area for hours afterwards and watched the bodies being removed from the destroyed vehicle.

More research will be needed to more fully understand the extent and role of empathy in enabling or limiting individual ability to conduct lethal, remote air operations. Lawrence *et al* set out to measure empathy, with some success. However, they caution that 'it is important to tease out the different kinds of emotional reactivity and distinguish between empathic and other types of emotional responses'.⁷¹ Separately, Head explores the costs of empathy in the international political arena with the aim of demonstrating 'how it is frequently costly for those who make the ethical-political choice to engage in empathy in situations of conflict and political violence'.⁷² This cost will vary according to the degree of empathy of the individual concerned and, potentially, the degree to which an incident also reflects or violates personal ethics. Every situation has the potential for great complexity. For example, a Reaper pilot might have a high capacity for empathy and be strongly affected by witnessing a public beheading that (s)he was unable to disrupt. As well as the potential for visually-mediated mental trauma [note: trauma is not assured], core ethical principles may be violated, thereby inducing a dissonant state. It is such a violation

of personal ethics or core beliefs that prompt the final consideration in this paper: the possibility of moral injury among Reaper personnel.

MORAL INJURY

The term ‘moral injury’ (Nash *et al*’s definition having been set out earlier in the paper) has gained significant public and academic profile in the twenty-first century. Edgar Jones points out that ‘there is no agreed definition of moral injury’, which makes the subject difficult to explain and explore from the outset.⁷³ In an extensive and growing literature, Drescher *et al* suggest: ‘The term that has been used to describe the impact of various acts of omission or commission in war that produces inner conflict is *moral injury*’.⁷⁴ Meanwhile, Frankfurt *et al* refer to it as ‘a transdiagnostic syndrome that describes the uniquely deleterious impact of committing or failing to prevent acts during warfare that involve violations, transgressions, or betrayals, of commonly accepted boundaries of behavior’.⁷⁵ All of these definitions presuppose a moral dimension to war, usually with each side claiming moral superiority over the other,⁷⁶ and each morality offering the possibility of violation.

The moral context for RAF Reaper operations is bounded by *jus in bello* in the operational domain and by the UK government’s *jus ad bellum* justification for deploying air power against anti-government forces such as the Taliban in Afghanistan, ISIS in Iraq and Syria, and against the Syrian government in response to the use of chemical weapons.⁷⁷ While air strikes have had some public support, it has not been overwhelming. For example, in December 2015 Prime Minister David Cameron proposed extending attacks against IS from Iraq to Syria.⁷⁸ While 48% of respondents in one poll supported the action, with 30% opposed, there was not a clear majority in favour.⁷⁹ Moral injury becomes possible, according to Drescher, Frankfurt and others if social norms and the moral framework of a combatant is violated, either by an action, or lack of action, on their part. It also becomes possible if they witness acts that breach personal morality, such as the witnessing of atrocities like executions, rape or murder that the combatant cannot prevent.

Numerous variables are associated with moral injury: PTSD symptoms, self-injury, demoralization and self-handicapping.⁸⁰ Further, and more obviously linked to the term ‘moral injury’, Maguen and Litz suggest ‘an act of serious transgression that leads to serious inner conflict because the experience is at odds with core ethical and moral beliefs’.⁸¹ Other factors that are linked to moral injury include: shame, guilt, transgression of spiritual or religious beliefs, self-condemnation, social problems, trust issues, spiritual/ existential issues.⁸² This very brief summary highlights the possibility that the concept of moral injury is in danger of being extended so far as to be too vague to be of practical or explanatory use. However, for the purpose of meaningful application to members of the Reaper Force I suggest that ‘moral injury’ is most likely to be applicable in the following situations: powerless witnessing (unable to intervene

to stop a heinous act); observations that grievously violate the watcher's social norms and core beliefs (for example, beheadings); and unintended ethical transgression (such as unintentional harming of a non-combatant). Consider three examples that could *potentially* contribute to moral injury, so defined.⁸³

First, where individuals have witnessed in close detail the deaths of, or physical harm to, allied combatants or non-combatants for whom they feel a protective responsibility, but were powerless to intervene because of legal constraints (ROE), potential secondary threats to yet other allies or non-combatants, or because they could not see or anticipate the threat to life.

That flash on the screen [as their vehicle exploded], and the feeling of impotence, just stayed with us. Our job was to provide overwatch on these guys, to protect them. We had been staring, looking for anything that might be a threat. But there was a big puddle over the junction, and the soldiers with their hand-held detectors couldn't see [the IED] underneath. That whole incident has stuck with me. I'm not saying I have PTSD, but I'm saying that I get how some people are affected that way.⁸⁴ (Johnny, Pilot)

Second, the violation of social norms. Sensor operator Jake struggled with the idea of taking life, but also struggles with the fact that he eventually adapted to it. Despite being able to make the logical, intellectual calculation of the relative moral benefit in killing jihadists who would otherwise inflict harm on others, the taking of life left a deep impression on him: 'I hate the fact that I've killed people. I hate the fact that I've taken life in a very calculating manner. But I also hate the fact that I seem to be able to live with it now'.⁸⁵

Then, third, there is unintended ethical transgression – even where all of the legal and operational checks and approvals have been correctly observed. Jamie, mentioned above, and his crew had acted on the best available intelligence when they destroyed the Taliban vehicle full of explosives, yet still had to live with the unintended civilian deaths:

I wanted to continue because for me it was always for some greater good. And degrading the enemy's capability was the primary role. Certainly not to injure or kill anybody that wasn't the enemy, and certainly not women and children, that's for sure. I never knew how I'd feel if that would happen, and again it's difficult to explain. You never forget. You never want to forget.⁸⁶

Much work continues to be done on 'moral injury', and it is offered here as a potential explanation of some responses by Reaper personnel to experiences while conducting remote air operations. This paper argues that the immersive visual, emotional and

psychological aspects of Reaper operations plays a part in individualised responses to surveillance activities and weapon events in recent counter-insurgency actions. In relation to the foregoing sections and arguments, two factors relating to moral injury are suggested here for further future study. They emerged during data gathering by the author with several members of the Reaper Force, and assume that individualised capacity for empathy is an important consideration. First, that moral injury may be caused to more empathetic members of the Force by the way that less empathetic individuals speak about the enemy and killing. And second, for highly empathetic individuals (see empathy bell curve), ethics education is important in order for them to make sense of their actions in an operational-ethical context. For less- or non-empathetic individuals, ethics education may be even more essential, so that they can appreciate – intellectually if not emotionally – how they can negatively impact upon their colleagues. Such research may well provide insights and understanding that translates to other situations where visually traumatic events are encountered, from military imagery analysis to civilian website content moderators.

CONCLUSION

There have been enormous technological advances in the delivery of air power since the First World War days of the Royal Flying Corps, the Royal Naval Air Service and the advent of the RAF. Despite the technical developments that enable the Reaper to be operated across continents, war and air operations remain essentially human activities. This paper has focused on that human dimension, identifying emotional, psychological and moral complexities that emerge from the distance-intimacy paradox of remote air warfare. Yet even though much has changed, much remains the same. In March 1917, James McCudden reflected, in a language and tone that is now often parodied: ‘sometimes one sits and thinks, “Oh, this damned war and its cursed tragedies.”’⁸⁷ Yet a year later and not long before his own death he shot down an enemy German aircraft and recorded: ‘As I looked at the machine I saw the enemy gunner fall away from the Hannover fuselage. I had no feeling for him for I knew he was dead’.⁸⁸ Even in the culturally coded language of the early twentieth century, the change in character and mental condition over time can be detected.

The close-up views afforded to Reaper personnel as they conduct ISR and strike operations makes the act of taking human life more visually intimate and therefore more psychologically and emotionally involving than it has ever been before for aircrew in the history of the RAF. It is important not to assume that psychological harms are either inevitable or long-lasting for everyone involved: they are not. However, it is equally important to recognise that a new dynamic has been introduced to the delivery of air power that can negatively impact on remote operators – on some more than others, and for reasons we do not yet fully understand. As the RAF enters its second century, the distance paradox brought about by the advent of the Reaper should not be underestimated, especially if remotely piloted aircraft are set to outnumber manned

counterparts in the coming years. The potential jeopardy of manned air operations is replaced by increased psychological and emotional jeopardy in remotely piloted air operations. This could be dangerous in an organisation that has, throughout its history, deliberately downplayed emotional and psychological risks and reactions almost to the point of parody. *Per ardua ad astra*, states the motto of the RAF: 'through adversity to the stars'. For RAF remote aircrew in the next hundred years, adversity – and achievement – will take place on the ground. Supporting and developing those remote operators is the next great challenge.

NOTES

¹ I would like to thank Alfie Macadam for his assistance in literature searching during his research placement week with me in June 2018.

² House of Commons Defence Committee, 'Remote Control: Remotely Piloted Air Systems – current and future UK use: Government Response to the Committee's Tenth Report of Session 2013–14', 20 July 2014, p. 14, <https://publications.parliament.uk/pa/cm201415/cmselect/cmdfence/611/611.pdf>, accessed 28 May 2018.

³ Ben Farmer, 'RAF Reaper drone interrupts Islamic State public execution', *The Telegraph*, 16 May 2017, <https://www.telegraph.co.uk/news/2017/05/16/raf-reaper-drone-interrupts-islamic-state-public-execution/>, accessed 12 May 2018; BBC, 'Syria war: MOD admits civilian died in RAF strike on Islamic State', <https://www.bbc.co.uk/news/uk-43977394>, accessed 3 May 2018.

⁴ HC 772 Defence Committee, 'Written evidence from the Royal Aeronautical Society', 15 September 2013, para. 24, <https://publications.parliament.uk/pa/cm201314/cmselect/cmdfence/772/772vw13.htm>, accessed 20 May 2018.

⁵ House of Commons Defence Committee, 'Remote Control' p. 15.

⁶ Ministry of Defence, 'New investment in counter terrorism for UK Armed Forces', 4 October 2015, <https://www.gov.uk/government/news/new-investment-in-counter-terrorism-for-uk-armed-forces>, accessed 8 May 2018.

⁷ 'Royal Air Force Reaper: 21st Century Air Warfare from the Operators' Perspective', University of Portsmouth Research Ethics Committee Protocol E365, approved 21 October 2015, Ministry of Defence Research Ethics Committee Protocol 707/MODREC/15, approved 1 July 2016.

⁸ Peter Lee, *Reaper Force: Inside Britain's Drone Wars* (London: John Blake Publishing, 2018).

⁹ 90 interviews were conducted as follows: 45 current crew members (at the time of interview); 21 former crew members from both squadrons; 24 spouses and partners. The military participants included both women and men and ranged in non-commissioned officer rank from Corporal to Warrant Officer, and in officer rank from Flight Lieutenant to Wing Commander.

¹⁰ A good starting point for further study is Dave Grossman, *On Killing: The Psychological Cost of Learning to Kill in War and Society*, revised edition, (New York: Bay Back Books, 2009).

¹¹ Damian Killeen and David Jordan, 'RPAS: Future Force or Force Multiplier? An Analysis of Manned/Unmanned Platforms and Force Balancing', *Air Power Review*, Vol. 16, No. 3 (2013) pp. 22-23.

¹² Albert Bandura, 'Disengaging morality from robotic war', *The Psychologist*, Vol. 30 (February 2017) p. 39.

¹³ Ibid., p. 41.

¹⁴ Grossman, *On Killing*.

¹⁵ Ibid., p. 4.

¹⁶ Ibid., p. 91.

¹⁷ James B. McCudden, *Flying Fury* (Poland: Amazon Fulfilment, 2009) p. 219.

¹⁸ Ibid.

¹⁹ Ibid., p. 224.

²⁰ Leonard Cheshire, *Bomber Pilot* (London: HarperCollins, 1975) p. 135.

²¹ Charles Webster and Noble Frankland, *The Strategic Air Offensive Against Germany 1939-1945 Vol. IV* (London: Her Majesty's Stationery Office, 1961), Directive on 14 February 1942, p. 144.

²² Stephen A. Garrett, *Ethics and Airpower in World War II: The British Bombing of German Cities* (New York: St. Martin's Press, 1993) p. 32.

²³ Ibid., 1993, p. 32-3.

²⁴ W. Hays Parks, 'Precision' and 'area' bombing: Who did which, and when?' *Journal of Strategic Studies*, Vol. 18, No. 1 (1995) p. 146-7.

²⁵ Ibid., p. 148.

²⁶ I have written elsewhere about the ethics of the German city bombings and explored the nuances of 'intention', unintended consequences, and so on. There is not the scope here to reprise those arguments. See Peter Lee, 'Return from the Wilderness: An Assessment of Arthur Harris's Moral Responsibility for the German City Bombings', *Air Power Review*, Vol. 16, No. 1 (Spring 2013) pp. 70-90; Peter Lee and Colin McHattie, 'Churchill and the bombing of German cities 1940 - 1945', *Global War Studies* Vol. 13, No. 1 (2016) pp. 47-69.

²⁷ Gerald Wright, 'The Storm Shadow Cruise Missile', *UK Defence Journal*, 20 October 2015, <https://ukdefencejournal.org.uk/the-storm-shadow-cruise-missile/>, accessed 8 June 2018.

²⁸ MQ-9A Reaper, *Royal Air Force*, <https://www.raf.mod.uk/aircraft/mq-9a-reaper/>, accessed 15 June 2018.

²⁹ Chris Cole, Mary Dobbing and Amy Hailwood, *Convenient Killing: Armed Drones and the 'Playstation' Mentality* (Fellowship of Reconciliation: Oxford, 2010) p. 4.

³⁰ Peter W. Singer, *Wired for War* (New York: Penguin, 2009) p. 332.

³¹ Peter Olsthoorn, *Military Ethics and Virtues: An interdisciplinary approach for the 21st century* (New York: Routledge, 2011) p. 126.

³² Medea Benjamin, *Drone Warfare: Killing by Remote Control* (New York and London: OR Books, 2012).

³³ House of Commons Defence Committee, 'Remote Control: Remotely Piloted Air

Systems – current and future UK use’, Vol. 1, 25 March, (London: The Stationery Office Limited, 2014) p. 42 (*italics added for emphasis*).

³⁴ International Human Rights and Conflict Resolution Clinic (Stanford Law School) and the Global Justice Clinic (NYU School of Law), *Living Under Drones: Death, Injury and Trauma to Civilians from US Drone Practices in Pakistan* (September 2012) <https://chrgj.org/wp-content/uploads/2016/09/Living-Under-Drones.pdf>, accessed 5 June 2018.

³⁵ Matthew Power, ‘Confessions of a Drone Warrior’, *GQ*, <https://www.gq.com/story/drone-uav-pilot-assassination?currentPage=4>, accessed 1 June 2018.

³⁶ Sarah McCammon, ‘The Warfare May Be Remote But The Trauma Is Real’, *NPR*, 24 April 2017, <https://www.npr.org/2017/04/24/525413427/for-drone-pilots-warfare-may-be-remote-but-the-trauma-is-real>, accessed 7 June 2018.

³⁷ Eyal Press, ‘The Wounds of the Drone Warrior’, *New York Times*, 13 June 2018, <https://www.nytimes.com/2018/06/13/magazine/veterans-ptsd-drone-warrior-wounds.html>, accessed 14 June 2018.

³⁸ Nash, W. P., Vasterling, J., Ewing-Cobbs, L., Horn, S., Gaskin, T., Golden, J., et al., ‘Consensus recommendations for common data elements for operational stress research and surveillance: Report of a federal interagency working group’, *Archives of Physical Medicine and Rehabilitation*, Vol. 91, No. 11 (2010) p. 1677.

³⁹ Lee, *Reaper Force*, p. 266-7. Pseudonyms are used throughout in accordance with my Research Ethics protocol. Ranks are omitted unless relevant to the point being made, and no participants asked for their gender to be obscured or anonymized.

⁴⁰ Dave Blair and Karen House, ‘Avengers in Wrath: Moral Agency and Trauma Prevention for Remote Warriors’, 12 November 2017, *Lawfare*, <https://www.lawfareblog.com/avengers-wrath-moral-agency-and-trauma-prevention-remote-warriors>, accessed 20 June 2018. This paper is highly recommended reading for the detail of its psychological insights which are not addressed here.

⁴¹ Grossman, *On Killing*, p. 78.

⁴² Chiara Volpato and Alberta Contarello, ‘Towards a social psychology of extreme situations: Primo Levi’s If This is a Man and social identity theory’, *European Journal of Social Psychology*, Vol. 29 (1999) p. 252.

⁴³ Herbert G. Kelman, ‘Violence without moral restraint: Reflections on the dehumanization of victims and victimizers’, *Journal of Social Issues*, Vol. 29, No. 4 (Fall 1973) pp. 25-61.

⁴⁴ Albert Bandura, ‘Moral Disengagement in the Perpetration of Inhumanities’, *Personality and Social Psychology Review*, Vol. 3, No. 3 (1999) p. 195.

⁴⁵ *Ibid.*, p. 200.

⁴⁶ Lee, *Reaper Force*, p. 170.

⁴⁷ *Ibid.*

⁴⁸ Methodology note: these were consistent but *qualitative* observations made in interviews with 24 spouses and partners, and not rigorous, quantitative measures.

⁴⁹ About 5 years in total.

⁵⁰ Lee, *Reaper Force*, p. 59.

⁵¹ RPAS(P) – an individual who was recruited to the Reaper Force and trained specifically as a Reaper pilot, as opposed to a pilot of another aircraft type who transferred across.

⁵² Lee, *Reaper Force*, p. 111.

⁵³ Interviewee Vet 15 is a veteran of the Reaper Force.

⁵⁴ Sian L. Beilock and Thomas H. Carr, 'On the Fragility of Skilled Performance: What Governs Choking Under Pressure', *Journal of Experimental Psychology*, Vol. 130, No. 4 (2001) p. 714.

⁵⁵ Grossman, *On Killing*, p. 69. There is not the scope in this paper for a full study of this phenomenon.

⁵⁶ At a research feedback session with 13 Squadron on 14 November 2017, in response to my observation of the importance of the 'protector' role for Reaper and its personnel, a Royal Marine attached to the Squadron suggested 'Guardian' as his alternative, preferred way of conceptualising the Reaper role.

⁵⁷ King's Centre for Military Health Research and Academic Department for Military Mental Health, 'The Mental Health of the UK Armed Forces', October 2014, p. 2, <https://www.kcl.ac.uk/kcmhr/publications/Reports/Files/mentalhealthsummary.pdf>, accessed 25 June 2018.

⁵⁸ Ibid.

⁵⁹ Fran H. Norris and Laurie B. Slone, 'Understanding Research on the Epidemiology of Trauma and PTSD', *PTSD Research Quarterly*, Vol. 24, No. 2-3 (2013) p. 4.

⁶⁰ Lee, *Reaper Force*, p. 296-7.

⁶¹ Ibid., p. 299.

⁶² Ibid., p. 294.

⁶³ Simon Baron-Cohen, *The Science of Evil: On Empathy and the Origins of Cruelty* (Philadelphia: Basic Books, 2012) cited in Jane McGregor, 'The Highly Empathetic', *The Society for Research into Empathy, Cruelty & Sociopathy*, May 2018, <http://www.sorecs.org/blog/>, accessed 20 June 2018.

⁶⁴ Ibid.

⁶⁵ Ibid.

⁶⁶ Lee, *Reaper Force*, p. 165-6.

⁶⁷ Kevin Dutton and Andy McNab, *The Good Psychopath's Guide to Success* (London: Bantam Press, 2014) p. 18.

⁶⁸ Research visit to squadron. For anonymity I will not even give his crew position.

⁶⁹ The 2011 CIVCAS incident was acknowledged by the RAF and MOD. It is described in full from Jamie's perspective in the chapter, 'CIVCAS', Lee, *Reaper Force*.

⁷⁰ Ibid., p. 107.

⁷¹ E. J. Lawrence, P. Shaw, D. Baker, S. Baron-Cohen and A. S. David, 'Measuring empathy: reliability and validity of the Empathy Quotient', *Psychological Medicine*, No. 34 (2004) p. 919.

⁷² Naomi Head, 'Costly encounters of the empathic kind: a typology', *International Theory* Vol. 8, No. 1 (2016) p. 176.

⁷³ Edgar Jones, 'Moral injury in time of war', *The Lancet*, Vol. 391, 5 May 2018, p. 1767, www.thelancet.com.

⁷⁴ Kent D. Drescher, David W. Foy, Caroline Kelly, Anna Leshner, Kerrie Schutz, and Brett Litz, 'An Exploration of the Viability and Usefulness of the Construct of Moral Injury in War Veterans', *Traumatology*, Vol. 17, No. 1 (2011) p. 8.

⁷⁵ Sheila B. Frankfurt, Patricia Frazier, and Brian Engdahl, 'Indirect Relations Between Transgressive Acts and General Combat Exposure and Moral Injury', *Military Medicine*, Vol. 182 (Nov/ Dec 2017) e. 1950.

⁷⁶ An example of contested moral superiority can be found in Tom Smith, Peter Lee, Sameera Khalfey, and Vladimir Rauta, 'Understanding the Syria Babel: Moral Perspectives on the Syrian Conflict from Just War to Jihad', *Studies in Conflict and Terrorism*, forthcoming 2018. Cited by permission of author.

⁷⁷ Ethical challenges faced by RAF Reaper operations are explored in Peter Lee, 'Rights, Wrongs and Drones: Remote Warfare, Ethics and the Challenge of Just War Reasoning', *Air Power Review*, Vol. 16, No. 3 (Autumn/Winter 2013) pp. 30-49.

⁷⁸ IS [Islamic State] previously called ISIS – Islamic State in Iraq and Syria.

⁷⁹ Ben Glaze, David Cameron fails to convince public to back strikes against ISIS in Syria, *Daily Mirror/Survation* poll, 2 December 2018, https://www.mirror.co.uk/news/uk-news/david-cameron-fails-convince-public-6914446?ICID=FB_mirror_main, accessed 10 October 2018.

⁸⁰ Litz BT, Stein N, Delaney E, et al, 'Moral injury and moral repair in war veterans: a preliminary model and intervention strategy', *Clin Psychol Rev* 2009; 29(8): 695–706.

⁸¹ Shira Maguen and Brett Litz, 'Moral Injury in Veterans of War', *PTSD Research Quarterly*, Vol. 23, No. 1 (2012) p. 1.

⁸² *Ibid.*, p. 1-2.

⁸³ To reiterate, these examples are illustrative and not definitive. There are too many complicating factors that would have to be excluded for moral injury to be confirmed.

⁸⁴ Lee, *Reaper Force*, p. 75-6.

⁸⁵ *Ibid.*, p. 172.

⁸⁶ *Ibid.*, p. 111-12.

⁸⁷ James B. McCudden, *Flying Fury* (Poland: Amazon Fulfilment, 2009) p. 130.

⁸⁸ *Ibid.*, p. 239.

INTEGRATING CYBER WITH AIR POWER IN THE SECOND CENTURY OF THE ROYAL AIR FORCE

By Wing Commander Paul Withers

Biography: Wing Commander Paul Withers is an Engineer Officer, currently serving at the NATO Combined Air Operations Centre at Uedem in Germany. Previously an Officer Career Manager, he also has significant professional experience as a cyber operations planner. As a CAS Fellow, he completed an MA with King's College London and is currently researching for his dissertation for an MSc in Cyberspace Operations.

Abstract: Rapid technological development has been a feature of air power from its inception. More recently, there has been growing recognition that air power is increasingly dependent on the cyber domain. As we try to make sense of the implications of cyberspace, various concepts have been proposed, with United Kingdom Air Power Doctrine developing the principles of Air-Cyber Integration. This article examines Air-Cyber Integration, with an explanation of some general concepts and a study of both defensive and offensive cyber operations and their relationship with air power. It considers technology and process, but most importantly, it reflects upon the need for airmen and women who can operate effectively in both the air and cyberspace domains.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor.

I think most people today understand that cyber clearly underpins the full spectrum of military operations, including planning, employment, monitoring, and assessment capabilities. I can't think of a single military operation that is not enabled by cyber. Every major military weapon system, command and control system, communications path, intelligence sensor, processing and dissemination functions—they all have critical cyber components.

General William L. Shelton, former Commander, US Air Force Space Command¹

INTRODUCTION

The ubiquity of cyberspace described by General Shelton is perhaps obvious; its implications are arguably less so. As the Royal Air Force (RAF) enters its second century, it will bring its most complex and capable air system into front-line operational service: the fifth-generation F-35B Lightning. This fifth-generation air system comprises not just the air platform itself but an interconnected 'system-of-systems' that is dependent upon cyberspace. Implicit in the delivery of the F-35B Lightning is the requirement for the RAF to adapt more broadly to become a 'fifth-generation air force'. Increased reliance on cyberspace raises questions over the extent to which air operations are resilient in a contested cyberspace. In addition to the direct dependence of air systems on cyberspace, there is increasing interdependence with the other domains for the conduct of operations. This has led to the development of the concept of Air-Cyber Integration² which, whilst a relatively recent addition to the lexicon, has in reality been part of warfare since at least the 1990s.³

Cyberspace has taken its place as the fifth domain⁴ of warfare, a domain⁵ that is rapidly changing from a niche area to one which underpins all defence capability. In order for its potential to be realised, the UK Armed Forces must confront the challenges presented by technology and, in doing so, develop the right people and appropriate processes to operate in the cyber domain. The 2016 UK National Cyber Security Strategy makes commitments to defend against cyber threats and to deter aggression in cyberspace.⁶ In realising the military elements of this strategy, there are clear roles for UK Defence and the RAF specifically in defending military platforms and capabilities, but also in integrating cyber effects into operations. However, as with any area of military endeavour, hardware and infrastructure have little value on their own; military cyberspace capability relies upon trained personnel, under effective leadership, using tried and tested doctrine and tactics to deliver operational effect.

This article will consider some of the cyberspace challenges for air power. It will take a broad view of people, process, and technology from the perspectives of both threats to air power through cyberspace, and the opportunities that the integration of air and cyber presents to joint operations. The article will be presented in five parts. First, to set the scene for the remainder of the article, it will consider some of the terminology associated with attack through cyberspace. Second, it will discuss some of the

implications of becoming a fifth-generation air force and argue why cyberspace matters for the delivery of air power. In doing so, it will look beyond the threat to networks and platforms and consider air power capabilities as part of interrelated systems, which require a more holistic approach to cyber defence. Third, it will consider the opportunities for offensive Air-Cyber Integration, based on some historical examples since the 1990s. The specifics of offensive cyber operations tend to be closely guarded, but the general principles can be established from past examples that have come into the public domain. Fourth, the article will consider what is arguably the most important part of UK Defence's cyber capability: the skilled and experienced personnel who can defend and attack in cyberspace, and integrate cyber with the other domains. It will consider the challenges of developing and retaining sufficient airmen and women as credible and effective operators in cyberspace. It will argue that there are three types of cyber operator: *all military personnel* who operate information technology and weapon systems; the *cyber specialists* who carry out offensive and defensive cyber operations; and *commanders and staff officers* who plan and integrate cyber effects. Finally, it will conclude that effective Air-Cyber Integration requires a holistic view of defending air platforms and their associated supporting systems, whilst leveraging the ability to exploit weaknesses in those of the adversary. It will argue that the second century of air power, like the first will be characterised by pushing the boundaries of technology; moreover, pushing those boundaries to achieve effective Air-Cyber Integration will continue to rely on the skill, innovation, and character of human operators.

TERMINOLOGY - CYBER VULNERABILITIES AND EXPLOITS

There have been numerous attempts to define cyberspace, with subtle nuances of definition often due to the evolution in understanding of the cyber domain and the particular perspective of the definition. The Development, Concepts and Doctrine Centre (DCDC) Cyber Primer defines cyberspace as consisting of:

The interdependent network of digital technology infrastructures (including platforms, the Internet, telecommunications networks, computer systems, as well as embedded processors and controllers), and the data therein spanning the physical, virtual and cognitive domains.⁷

This particular definition includes some important elements that should influence the manner in which airmen think about cyberspace. First, its scope is significantly greater than the public Internet; in particular for air power, we should consider that modern air platforms exist not just in the physical air domain, but also in cyberspace, and they should be visualised in both domains. Second, it is important to consider the implications of embedded processors and controllers. Increasingly, the systems that support all of our air platforms are controlled through cyberspace. Consequently, any assessment of the resilience of air operations must consider cyber vulnerabilities. Third, cyberspace spans the 'physical, virtual and cognitive.' Often cyberspace is seen

as a purely technical challenge, the realm of Information Technology (IT) professionals, but the threats and opportunities presented by cyberspace have as much to do with human cognition as they do technology. The challenges of cyberspace, therefore, call for a multi-disciplinary approach, building diverse teams of cyber operators.

In order to establish the basic principles of attacking and defending in cyberspace, this section will consider some relevant terminology. Attacks through cyberspace occur as a result of a *threat actor* exploiting a *vulnerability*. A threat actor is a person or group possessing the intent, capability and opportunity to mount an attack.⁸ In this paper the terms threat actor and attacker are used interchangeably. Vulnerabilities can be broadly categorised as *flaws*, *features* or *user error*.⁹ Flaws come about as a result of errors in the development of a system, primarily software code, and are *unintended*. Features are *intended* functionality that can be misused and exploited by an attacker. Even where design flaws and features have been addressed through good configuration and effective management of measures such as applying software updates, systems can still be vulnerable through user error. User error can be as simple as leaving a computer unattended or choosing a weak password. Some of the most effective cyber attacks come about as a result of users being tricked, or socially engineered, into giving away information to an attacker, or by unwittingly installing malicious software (malware).

In order to deliver an effect, the attacker needs to be able to exploit a vulnerability. To do so, the attacker may use a range of tools and techniques. The UK National Cyber Security Centre categorises these tools and techniques as ‘commodity’ and ‘bespoke’ capabilities.¹⁰ Commodity capabilities are available on the Internet and are often easy to operate, whereas, bespoke capabilities are tailored for a particular target and require a much greater degree of skill. Commodity capabilities are generally effective only when cyber security measures have not been implemented effectively. Effective cyber defence would defeat most commodity capabilities, making the exploitation of a system much more difficult for all but the most capable and determined attackers.

Bespoke capabilities tend to be tailored for a specific purpose, and therefore may only be effective against a specific target in a particular configuration. Bespoke capabilities will sometimes take advantage of vulnerabilities that are not yet known to software vendors, carrying out what is known as a ‘zero-day’ attack.¹¹ The cyber threat intelligence company, *FireEye* defines zero-day attacks as ‘software or hardware vulnerabilities that have been exploited by an attacker where there is no prior knowledge of the flaw in the general information security community, and, therefore, no vendor fix or software patch available for it.’¹² Zero-days are the ‘hacking world’s prized possession’, because initially they cannot be detected by antivirus software, and the absence of software patches makes it very difficult to defend against them.¹³ They are highly valued, as once they are known, measures to detect and defeat them are often developed rapidly. Cyber security researchers will often publish their discovery of a new vulnerability and the means of

exploiting it, enabling the antivirus and software companies to release updates and patches in a matter of days.

However, for military offensive cyber operations, governments may choose to retain the knowledge of exploits for future use, rather than reveal them to the cyber security industry.¹⁴ This is extremely controversial, but arguably necessary, if states wish to develop effects in cyberspace that can breach the defences of another state in time of conflict. This implies a responsibility on the state to use the capability responsibly and in accordance with the norms of International Law. In the US, the controversy surrounding government use of zero-days led to a Presidential Directive forcing the US National Security Agency (NSA) to disclose vulnerabilities that it discovers, unless it can demonstrate ‘a clear national security or law enforcement need’.¹⁵ Some cyber techniques have been categorised as weapons and are therefore subject to the Wassenaar Agreement which governs the export of conventional armaments.¹⁶ It is of course possible that non-state actors could develop similar knowledge and capabilities, without being subject to the constraints of national or International Law.

The possession of suitable exploit code does not in itself give the attacker the ability to deliver an effect through cyberspace. The attacker needs to develop a process to understand the target and its vulnerabilities, gain access, deploy the exploit and then have the desired effect. A number of models have been developed to describe this process; one popular model is the Lockheed Martin Cyber Kill Chain.¹⁷ This model describes a seven-step process, which is instructive in describing how a cyber attack may occur. Initially, the attacker carries out *reconnaissance* on his target, which may involve online research for basic information about the target organisation or people, and the use of tools to scan for vulnerabilities. During the next stage, known as *weaponization*, the attacker will obtain or develop an exploit and couple it with a means of access. Lockheed Martin refer to the means of access as a ‘back door’, which could be enabled through technical means or through deceiving a human into granting access. Third, the attacker will *deliver* the weaponized code. Delivery may, for example, take the form of access through a vulnerable web application, through an unwitting user clicking on a link in an email, or through plugging in removable media, such as a USB device. Stage four is *exploiting* a vulnerability on the target system, with stage five being the *installation* of the malware. In the sixth stage, the attacker establishes a *Command and Control (C2)* channel to control the deployed malware. Finally, having established a means of C2, the attacker carries out his ‘*actions on objectives*’, or the execution of his desired effect. It should be noted that the first six stages might be similar if the intent was the exfiltration of data, by espionage, for instance; or if the intent was to disrupt, degrade or destroy the target system. For a military cyber operation, stages one to six might occur well in advance of any requirement to deliver an effect, with the final stage synchronised with action in one or more of the physical domains, such as a pre-planned air operation.

In principle, cyber defence consists of a range of measures aimed at breaking the kill chain. Having established the basic terminology related to attacks in and through cyberspace, the article will turn to the consideration of cyberspace in the context of the second century of air power and some of the implications for a ‘fifth-generation’ air force.

DEFENSIVE AIR-CYBER INTEGRATION AND THE FIFTH-GENERATION AIR FORCE

Analysis of the 1991 Persian Gulf War led to heated debate about whether a Revolution in Military Affairs (RMA) had occurred. This contributed to a conceptual change in Western air forces, based on a desire to harness ‘the quality of the information that can be collected, and its virtually instantaneous transmission, combined with the speed and precision with which force can then be applied.’¹⁸ The RMA concepts evolved and shaped the development of military technology and strategy. The marriage of advanced aircraft and weapon design, with sensor and information processing technology, has led to a step change in capability through the development of a fifth generation of combat air systems. The introduction of the F-35B Lightning presents a transformational challenge for the RAF in integrating the capability into operations. This article will not consider the capabilities of, or means of employing, this highly capable fifth-generation air system, but will focus on some of its broader implications, specifically in cyberspace.

The Australian Air Force Chief defines a *Fifth-Generation Air Force* as ‘a fully networked, integrated air force whose systems share battlespace awareness from multiple nodes to increase situational awareness and targeting fidelity to maximise whole force effect’.¹⁹ The implications of fifth-generation capabilities, therefore, extend far beyond the air platform and its associated systems. The RAF Strategy recognises that along with the opportunities afforded by technology, Control of the Air in the future will be challenged in ways that will seek to overcome the advantage of modern platforms:

*Control of the air and space will remain essential to joint operational success. Our enemies will challenge us for that control, with widely available and highly capable air-defence systems, by exploiting easily accessible commercial off-the-shelf technology, and through an improving offensive cyber capability.*²⁰

It is entirely rational that potential adversaries would seek to weaken the advantages of fifth-generation technology, and the RAF Strategy notes that adversaries are likely to aim to lessen the RAF’s combat power through exploiting vulnerabilities on the ground.²¹ This approach is conceptually as old as air power itself, and Douhet’s ‘eggs in the nest’ analogy retains its validity in the second century of air power: ‘...in the air his planes may escape; but, like the birds whose nests and eggs have been destroyed, those planes which were still out would have no bases at which to alight when they returned.’²² Whilst Douhet had physical degradation or destruction of air bases in mind, the reliance of modern air systems on cyberspace offers the adversary opportunities to

deliver a wide range of effects, potentially short-lived and reversible, but with the ability to significantly disrupt operations.

All modern air platforms and systems are reliant on cyberspace to some degree, but the F-35B Lightning aircraft can be visualised as sitting at the centre of a 'system-of-systems', reliant upon people, processes and a wide range of technology, as shown in Figure 1.

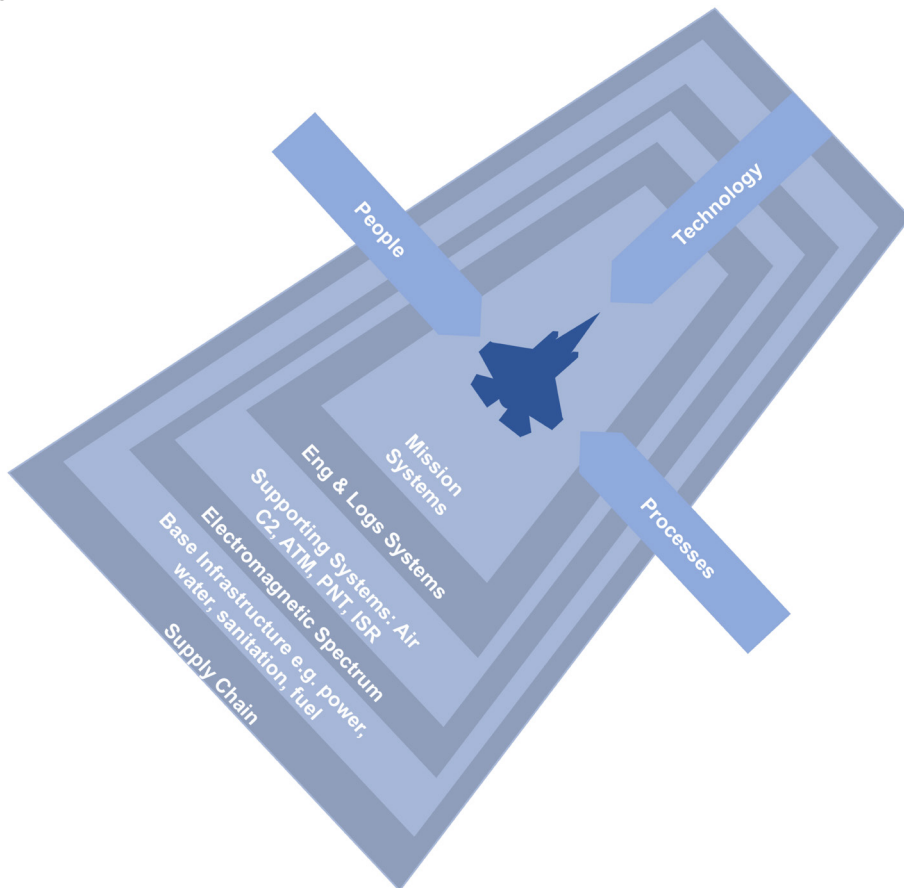


Figure 1-*The F-35B Lightning as part of a system-of-systems*

This discussion focusses on the *potential* for vulnerability and does not consider any specific threat. At any given time, a threat actor with capability, intent and opportunity, may wish to attack air power capabilities through cyberspace; however, this paper makes no assumption about any specific actor, nor the level of capability required.

At the core of the system is the complex air platform itself, with an array of interconnected aircraft and mission systems. For the F-35B Lightning, the term 'mission

system' refers to the air platform's 'operating software, avionics, integrated electronic sensors, displays and communications systems that collect and share data with the pilot and other friendly aircraft, providing unmatched situational awareness.'²³ The increased cyber threat to air platforms comes about as a result of their increased complexity. Cyber security analyst and former RAF fast jet pilot, Pete Cooper, points out that 'aircraft are now digitized and contain millions of lines of code; writing, verifying, and securing it is an increasingly difficult and complex task.'²⁴ Each generation of combat aircraft brought into service with the RAF has brought with it increased capability, but also complexity, with the manufacturer of the F-35B Lightning stating that 'underpinning the F-35's capabilities is more than 8 million lines of software code.'²⁵ This level of complexity increases the likelihood that the software code includes vulnerabilities that could potentially be exploited by an adversary. In the commercial IT sector, vendors have developed a level of responsiveness that allows patches to be developed and deployed quickly when software vulnerabilities are discovered. However, in safety-critical aircraft software code, the process is slower and more complex, and 'modifying one line of safety critical software on board an aircraft is currently estimated to take a year and cost around \$1 million.'²⁶ For the F-35B Lightning, potential cyber vulnerabilities and platform airworthiness are inextricably linked.



Post-flight checks on an F-35B Lightning at RAF Marham. © Crown copyright.

Potential vulnerabilities are not limited to the air platform but include the entire 'ecosystem' of which the platform is a component. The F-35B Lightning's mission, engineering, and logistics are supported by the Autonomic Logistics Information System (ALIS), which is 'integral to maintaining and operating F-35s.'²⁷ ALIS provides

the F-35 fleet with a single management tool that integrates maintenance activity with the supply chain.²⁸ This system connects the air platform with a global network of support agencies and commercial vendors. Cyber defence of this system is obviously vital; if any cyber vulnerabilities were present, they could be exploited in a manner that could theoretically disrupt the entire Lightning fleet, not just of the UK but of all the allies in the programme. Measures to protect ALIS are as important as protecting the aircraft mission system, as mission support systems *may* provide a bridge for malware to jump from the public Internet to the aircraft platform. *The Times* newspaper reported on speculation that ALIS was indeed vulnerable to cyber attack.²⁹ This led to an examination by the House of Commons Defence Committee, who acknowledged that the F-35B Lightning had a greater reliance on software than any other defence programme and noted that ‘ALIS is of particular importance.’³⁰ The Committee heard evidence from the Ministry of Defence (MoD) and Lockheed Martin that there had been ‘rigorous cyber-testing of ALIS and that software bugs [had] mostly been rectified.’³¹ The use of the word ‘mostly’ implies that perhaps not all known bugs have been resolved, which is perhaps a reflection of the difficulties of assuring air system software. The level of importance attached to the cyber security of ALIS, and the associated parliamentary scrutiny, is commensurate with its level of importance to the overall security and operational effectiveness of the Lightning programme.

In 2009, systems worldwide, including some within the RAF, were hit by a *worm*, a self-propagating piece of malware, known as ‘Conficker’. Despite the availability of patches that could have been implemented to prevent the infection, Conficker spread widely. Although it had no specific operational impact beyond the investment of resource to remove it, Conficker ‘underlined the potential disruption that could result from even the most simple of infections.’³² Nearly a decade later, air power’s dependence on cyberspace means that there could be significant consequences for operations if malware were to penetrate a system such as ALIS.

Beyond the F-35B Lightning and the systems that directly support it, air operations rely upon Air Traffic Management, Positioning, Navigation and Timing (PNT) and Air Command and Control (C2) systems. Air missions are also routinely supported by a range of Intelligence, Surveillance and Reconnaissance (ISR) platforms and systems. These supporting systems are themselves reliant on space, cyberspace and the electromagnetic spectrum. The importance of the electromagnetic environment and its interdependence with the cyber domain, has seen a doctrinal and organisational shift in the UK Armed Forces towards the synchronisation and coordination of Cyber and Electromagnetic Activity (CEMA).³³

Air operations also depend upon the fixed infrastructure at Main and Deployed Operating Bases. This includes electrical power, water, sanitation, fuel and other logistics, and the provision of aircraft life support systems such as liquid oxygen.³⁴

Increasingly infrastructure systems and processes are managed and controlled by computerised Industrial Control Systems (ICS). If an adversary wished to degrade the combat effectiveness of the air system, he might choose to do so indirectly, through the ICS of one of its service support systems. The ICS sector has spawned its own subset of the cyber security industry. The automation of process control has come about through the use of Programmable Logic Controllers (PLC), which started in the 1960s. PLCs were connected to systems with the intent that processes could easily be updated through remotely changing software code in the PLC. To facilitate maintenance access, they tended to be connected to centralised computer systems, often with remote access via a modem, or other means of indirect connection to the Internet. PLCs came into use at a time before computer hacking became widespread, and even when security started to become a concern, the fact that ICS tended to be isolated from other networks and used arcane proprietary software, was often seen as effective risk mitigation.³⁵ The threat to ICS was brought to the fore as a result of one of the most high-profile cyber attacks to date, known as Stuxnet. This was an attack on an Iranian nuclear fuel processing plant at Natanz, which has been widely attributed to the US and Israel.³⁶ Stuxnet was significant for a number of reasons but notably, it provided a 'proof of concept' that a software code-generated attack could be used to disrupt *physical* processes and destroy not only data but also physical components.³⁷ The attack was able to physically destroy the centrifuges used for uranium enrichment, whilst the system continued to report its status as 'normal' to the operators. The ability to remotely affect, for example, the electrical power of an airbase, or briefly disrupt the function of a number of navigation aids, if synchronised with other effects, might give an adversary an advantage that temporarily undermined the capability advantage of a fifth-generation system.

The F-35 programme consists of a large and immensely complex supply chain network, with 14,000 US suppliers³⁸ and 300,000 components sourced from 1,500 international suppliers.³⁹ Whilst the programme provides significant economic benefit for the F-35 partner nations, the level of complexity of the supply chain presents a potential cyber security risk. Collaboration between supply chain partners is a central tenet of supply chain operations, but without effective controls, exploit code could be inserted in the supply chain that could compromise the air system.⁴⁰

This generic system-of-systems model of the F-35B Lightning aims to simply illustrate the potential for system vulnerability in the fifth-generation air force. Detailed vulnerability analysis for each platform and weapons system is now a routine activity in the UK,⁴¹ and is used to inform senior risk owners to enable risk mitigation activity. However, the complex interconnected nature of systems makes effective holistic cyber defence a significant challenge for the fifth-generation air force. Accepting this complexity, there is a need to move on conceptually from the current approaches to cyber defence with a basis in information assurance, to an approach that embraces the concept of

mission assurance. Brad Bigelow highlights that rather than focussing entirely on cyber protection, there is a requirement to be able to still operate effectively in the absence of some cyber capabilities.⁴² He notes the difference between ‘cyber security, which strives to protect all information systems and assets’, versus mission assurance, which ‘seeks to ensure that the mission can be carried out even if some systems have failed.’⁴³ This echoes the view of Air Chief Marshal Sir Andrew Pulford, the former Chief of the Air Staff, who contended that ‘we must have sufficient resilience to defend against its use by adversaries and develop our own measures to exploit cyber for gains in the Air environment.’⁴⁴ The implications of a ‘day without space’ have been widely debated⁴⁵, and the implications of a day without cyber attracts increasing attention from senior commanders.⁴⁶

The post-1991 RMA debate precipitated a change to Western concepts of warfare, seeking to take advantage of advanced technologies. With a mix of highly capable platforms and systems, modern air forces employ this advantage when fighting against a wide range of adversaries up to and including those that may be considered ‘near-peers’. However, the dependence upon space and cyberspace brings a level of risk to mission execution.⁴⁷ This necessitates a requirement to train and exercise based on the assumption that cyberspace will be contested, that the systems that contribute to our mission advantage may become unavailable at any point.⁴⁸ Exercising reversionary modes of operation in all aspects of air power delivery and Air C2 are vital to maintaining advantage, as noted in the RAF strategy, ‘aircraft and systems will need to be able to operate in this increasingly contested and degraded environment and we must combat our adversaries’ information and command and control systems.’⁴⁹

OFFENSIVE AIR-CYBER INTEGRATION – HISTORICAL LESSONS

The former Chief of the Air Staff, Air Chief Marshal Sir Andrew Pulford, argued that ‘the military importance of cyber, like that of the Air environment just over 100 years ago, is still relatively new and immature, with actors slow to grasp its offensive capability.’⁵⁰ The previous section discussed the importance of Air-Cyber Integration from the perspective of defensive cyber operations, but cyberspace also offers opportunities to exploit the vulnerabilities of adversaries through offensive cyber operations. For most nations that declare an offensive cyber capability, the details of that capability remain particularly sensitive. Unlike with conventional weapons technology, exposure of a state’s cyber capabilities risks them becoming obsolete almost immediately. Whilst an adversary will always try to develop countermeasures to a kinetic weapon, the difference with specific knowledge of a cyber weapon is that it may allow the immediate nullification of its effects. For example, the adversary may close off network access, reconfigure the system or rapidly develop and deploy a software patch to overcome the vulnerability, thereby countering the capability and opportunity of the threat actor, and breaking the cyber kill chain. Despite the sensitivities around cyber capabilities, historical examples are instructive in understanding how cyber effects

might be employed. Effects delivered through cyberspace are often felt outside of the domain, most notably by impacting on the humans that use technology. However, in general, unlike kinetic effects, cyber effects do not directly have the potential to be violent.⁵¹ Therefore they are likely to be supporting effects, rather than the main effort and may be temporary, be subtle in their impact on the adversary and be reversible.

The integration of cyber operations with air power is often debated conceptually, but there are a number of 'real world' examples that can be studied, with some of the earliest being during the 1999 Kosovo campaign, Operation Allied Force. Often cited as an example where air power was able to bring about victory independently,⁵² author Fred Kaplan argues that cyber operations also played their small part in supporting the NATO air campaign.⁵³ At the strategic level, the US Department of Defense included a cyber line of operations in countering the Serbian strategic communications campaign. They were able to place remotely controlled devices in Serbian television transmitters and then switch off the transmitter and therefore interrupt transmissions at a time of their choosing. The devices were used to impair the ability of Serbian local television news channels to broadcast propaganda aimed at getting Serbian viewers to participate in anti-NATO demonstrations.⁵⁴ Kaplan's account does not offer sufficient detail to determine the means of attack with any degree of certainty. It is possible that this operation may have been an example of Electronic Warfare (EW), rather than cyber attack, but this in itself is edifying, in highlighting the conceptual and practical blurring between cyber operations and EW.

Perhaps of more direct relevance to the tactical air campaign was the ability to attack the Serbian air defence system by feeding false track information. This was synchronised specifically on occasions when planned sorties were operating at heights within the range of Serbian ground-based air defences. Kaplan argues that the 'deception had to be subtle, the radar had to be just a bit off, enough to make Serbian officers blame the miss on a mechanical flaw but not enough for them to suspect sabotage.'⁵⁵ If the effect had been too obvious there was a risk that the Serbs would switch from 'automatic guidance to manual control.'⁵⁶ It is unlikely that malicious code was inserted directly into the Serbian Surface to Air Missile (SAM) systems; the target was more likely to have been computers in the interconnected C2 systems.⁵⁷ Nor was it likely that the cyber effects employed were decisive in their own right, given the concomitant high levels of expenditure of anti-radiation missiles against early warning radars and SA-3 and SA-6 batteries.⁵⁸ However, it stands as an instructive early example of synchronising a cyber attack with an air attack. It also highlights the importance of understanding adversary systems in great detail in order to understand potential vulnerabilities. In this case, a detailed knowledge of the interconnectivity of the Ground Based Air Defence System needed to be accompanied by knowledge of enemy doctrine and techniques, tactics and procedures to ensure that likely response of the adversary could be assessed.

Kosovo also contributed a great example of a tactical air operation being combined and synchronised with a cyber-enabled information operation, designed to drive a wedge between the regular Yugoslav military, *Vojaska Jugoslavije* (VJ), and the Ministry of Internal Affairs militia, *Ministarstvo Unutrasnjih Poslova* (MUP). Kaplan suggests that US intelligence agencies had obtained telephone and fax numbers for the headquarters of both organisations. Immediately prior to simultaneous air attacks on the VJ and MUP headquarters, whilst the aircraft were in flight, messages were sent to the VJ, warning them of the imminent attack. After both buildings were destroyed, the surviving MUP had heard that VJ officers had evacuated their HQ ahead of the attack and ‘so began to suspect that VJ was collaborating with NATO.’⁵⁹ Whilst this simple example employed very basic cyber technology and techniques, it offers lessons that are particularly relevant to current operations. The ability to directly influence individuals and groups through cyberspace offers a potential supporting effect for air operations. Even if the adversary’s C2 systems are difficult to penetrate, cyberspace offers the means to directly target decision makers through their personal online presence that could sow fear, uncertainty, or confusion at a critical moment.

Cyber operations during the Kosovo campaign were not all one-way traffic. Whilst the US was conducting attacks against Serbia, the Serbians were attacking the NATO HQ web and email servers.⁶⁰ NATO was subjected to the kind of Distributed Denial of Service (DDoS) attack that has become almost commonplace in more recent times but was relatively novel in 1999. Overall, Kosovo demonstrated the early use of nascent cyber capabilities, with the US European Commander stating ‘we did more information warfare in this conflict than we have ever done before, and we proved the potential of it.’⁶¹ It should be noted that US concepts and doctrine have evolved significantly since the late 1990s. During this period, the US used the terms ‘information attack’ to describe what might now be described as cyber attack. Conceptually, Information Warfare included: psychological operations; physical destruction; military deception; information attack; security measures; and electronic warfare.⁶²

When the Israeli Air Force was tasked to destroy a nuclear processing plant under construction at Al Kibar, in Deir-ez-Zor, Syria in 2007, it faced the challenge of safely eluding the highly capable Syrian Integrated Air Defence System. The mission, known as Operation Orchard, was ostensibly a complete success for the Israelis, and despite a heightened level of surveillance by the Syrian air defence system, the attacking aircraft were not observed.⁶³ The success of the Israelis was reportedly due to the synchronisation of the air operation with both conventional electronic warfare jamming and a cyber operation that ‘disrupted the data link connecting the radar with the screens of the radar operators.’⁶⁴ The supporting cyber elements of the operations purportedly included ‘air-to-ground electronic attack,’⁶⁵ using Israeli capabilities ‘similar to [a] network invasion capability that was developed by the US.’⁶⁶ Additionally, Fulghum

et al reported that ‘there also were some higher-level, non-tactical penetrations, either direct or as diversions and spoofs, of the Syrian command-and-control capability, done through network attack.’⁶⁷

Recent Russian military campaigns offer further examples of cyber effects being synchronised with a broader joint campaign. Jeffrey Carr argued that during the 2008 Russian campaign in Georgia, military action was coordinated with large numbers of ‘patriotic hackers’. These hacktivists were coordinated through online forums that gave advice and guidance on how to download and use tools to carry out DDoS attacks. Hacktivists were given direction on target lists through the same forums, allegedly from members of groups with close ties to the Russian government.⁶⁸ He also highlighted differing levels of skill and sophistication within the hacktivist groups:

*Those forum members who pinpointed application-level vulnerabilities and published target lists seemed to have moderate/high technical skill sets, whereas those carrying out the actual attacks appeared to have low/medium technical sophistication.*⁶⁹

More recently Carr has argued that things have changed within Russia since 2008. There has been investment in cyber forces and whilst the Russian government could still call upon proxies for action in cyberspace, ‘it has invested large sums of money to give its military and security services capabilities that are far beyond what they had in 2008.’⁷⁰ Since the crisis over Ukraine started in 2014, those studying the Russian approach have observed that Russia views cyberspace operations as part of a wider concept of Information Warfare, and Russian doctrine does not view cyberspace as a separate domain.⁷¹ Giles notes that rather than cyberspace, Russia refers to ‘information space’ and ‘includes in this space both computer and human information processing, in effect the cognitive domain.’⁷² Russian doctrine embraces computer network operations alongside psychological operations and ‘intelligence, counterintelligence, maskirovka, disinformation, electronic warfare, debilitation of communications, degradation of navigation support, psychological pressure, and destruction of enemy computer capabilities.’⁷³ Whilst Western doctrine on cyberspace includes human cognition, it is not central to cyberspace operations in the way it appears to be in Russia. Western doctrine on cyberspace such as Air-Cyber Integration aims to create greater convergence between cyberspace and ‘traditional’ warfighting. Giles argues that Russia is not faced with the challenge of convergence ‘because – thanks to the holistic and integrated approach to information warfare – they never went through a process of divergence in the first place.’⁷⁴

More broadly in the West, integrating cyber effects with other lines of operation has become almost commonplace. Cyber effects have reportedly been employed in Counter Insurgency Operations in Afghanistan, with one US General claiming that:

I was able to use my cyber operations against my adversary with great impact... I was able to get inside his nets, infect his command-and-control, and in fact defend myself against his almost constant incursions to get inside my wire, to affect my operations.⁷⁵

The case studies cited above provide instructive lessons on some of the issues in integrating cyber operations with those in the other domains. They demonstrate the close cooperation and synchronisation required between those planning and executing the cyber lines of operation, with those responsible for air or joint operations. Cyber operations and Electromagnetic Activity (EMA) have a degree of mutual dependence that means they must be planned jointly and closely synchronised. They also form an integral part of Joint Action and can contribute as alternatives to kinetic action, as part of a sequence of actions, or as a combination of actions against a complex target.⁷⁶ Planning the integration of cyber effects is in many ways similar to planning air or joint operations, but comes with specific challenges and nuances. Identifying and refining a target in cyberspace requires a similar approach to target systems analysis for employment of a kinetic weapon, although once the generic target set is identified, its refinement may require the support of specialist cyber operators, using a process similar to the generic 'Cyber Kill Chain' process described above. British and NATO targeting methodologies are centred upon the achievement of effects and require that assessment criteria are established as part of the planning process.⁷⁷ Assessment requires Measures of Performance (MoP) and Measures of Effectiveness (MoE) to be established as part of the criteria for targeting. For example, MoP might assess whether all the intended targets had been struck at their desired points of impact; a related MoE might be the extent to which striking those targets degraded the enemy's C2 capability. If it is not possible to measure the effectiveness of a particular attack, and its contribution to the Commander's overall objectives, there may be no value in attacking the target and expending resources or exposing crews to risk. The need for MoP and MoE is equally apposite in cyberspace, but arguably the achievement of meaningful measurement can be particularly challenging.⁷⁸ Whilst kinetic MoE is normally supported by a range of different sources of intelligence, the primary source is often post-strike imagery, which can give the Commander a reasonable degree of assurance of functional destruction or degradation of an enemy capability, which contributes to his assessment of success criteria. However, the use of imagery is generally meaningless for a cyber target, so other means of supporting assessment are required. In some cases, the process of the 'Cyber Kill Chain' described above might be required to establish both the means of attack and separately, the means of MoE.

The example of Stuxnet, discussed above, highlights another issue of cyber targeting, that of unintended consequences. The possibility of unintended consequences is important in targeting across all the domains, equally so in cyberspace. Stuxnet was aimed at a very specific target and only became known because it spread beyond the

intended target and infected systems around the world.⁷⁹ This presents a different collateral damage challenge to that experienced in kinetic targeting, but one that requires careful consideration. A cyber capability whose effects cannot be controlled or contained might risk infecting friendly and neutral systems, as well as those of the enemy. As a consequence, their use might not be acceptable from a legal or policy perspective.

Effects delivered in and through cyberspace may be reversible and ephemeral in nature, although in some case, the resulting outcomes may not be.⁸⁰ It may be that a piece of exploit code can be overcome by a system reboot, or as described above, through the application of a patch to remove a vulnerability. In any given set of circumstances this may be an advantage or a disadvantage. The use of a kinetic effect may be preferred if the requirement is to put a target beyond use for a longer period, but a cyber option may be selected if the requirement is for short term disruption, or where there is a desire to avoid physical destruction, such as when collateral damage estimates indicate the likelihood of unacceptable non-combatant casualties.

Debate around attacks in and through cyberspace often turns to the problem of attribution. The degree to which the source of an attack can be attributed may determine the threshold of any response. Considerations of attribution apply equally to both offensive and defensive cyber operations. The ability to determine where a cyber effect comes from, through positive identification of the threat actor, is often seen as a purely technical problem, and one that is both difficult and 'binary' in that it 'can either be solved, or not be solved.'⁸¹ However, Rid and Buchanan argue for a much more nuanced approach that suggests that technical evidence is only one element of the attribution puzzle, which requires interrelated analysis at the technical (or tactical) level and the operational and strategic context of an attack.⁸² They also argue that 'attribution is what states make of it.'⁸³ In some cases during an ongoing conflict, even without technical evidence, attribution may be obvious, although there is clearly scope for intentional deception. However, the strategy of an attacker may be specifically aimed at avoiding attribution and blurring the evidence at the technical, operational and strategic levels. It has been argued that this is a feature of 'hybrid warfare', as seen through the 'unavowed nature of Russian military intervention in Ukraine.'⁸⁴ Plausible deniability has the potential to offer an asymmetric advantage; if, for example, an attack on a NATO member might invoke an Article V response, the inability to achieve agreement on attribution may cause discord between NATO members.⁸⁵

Whilst the specific means of conducting offensive cyber operations are likely to remain closely protected, historical examples are instructive in aiding the understanding of how they might be integrated with air power. The article now turns to perhaps the most important element of cyberspace operations and Air-Cyber

Integration, which is that of having sufficient skilled cyber operators to lead, plan and execute cyber operations.

CYBERSPACE OPERATORS

The discussion of Air-Cyber Integration in this article highlights the need for people who can operate credibly and effectively in both the air and cyberspace domains. Despite the fact that cyberspace is associated with technology, successfully integrating it with the other domains is very much a human challenge.

The RAF has always been justifiably proud of its heritage as the most technical of the Services. Lord Trenchard's vision for the RAF was underpinned by detailed technical and operational knowledge and skills imparted in his Cranwell Cadets and Halton Apprentices. In setting out his initial vision for the Independent Air Force in 1919, Trenchard stressed that the future success of the RAF would depend upon recognising the 'extreme importance of training.'⁸⁶ He insisted that the officers of the new Service should 'be required to select the particular technical subject they will make their special study during their subsequent career.'⁸⁷ Trenchard's legacy of a highly-skilled and technical Service has endured into the RAF's second century, and the need for tactical and operational acumen underpinned by technical expertise extends to cyberspace. Since 2010, the senior leadership of the RAF has recognised that in its second century, the RAF requires 'a highly professional team, staffed by airmen and airwomen who have a deeply specialist expertise in the complexity of the air, space and cyber domains.'⁸⁸ Air-Cyber Integration requires a combination of specialist cyber operators along with commanders and staff officers who have a detailed understanding of, and experience of operating within, both the air and the cyberspace domains.

Skilled and experienced cyber operators are required, both to assure the delivery of air power, and to contribute to a range of cyber missions under the Joint Commander. There are arguably three distinct groups of 'cyber operator'. At the most basic level, *all military personnel* operate within the cyber domain, from using networked weapon systems, command and control and information systems, network enabled logistics systems and most forms of communication. Increasingly, all personnel routinely engage with advanced military technology that is vulnerable through cyberspace; however, potential adversaries are subject to similar vulnerabilities, offering a range of potential opportunities in and through cyberspace. All military personnel need an awareness of cyberspace and in particular how their actions can create vulnerabilities that may be exploited by an adversary. Cyberspace also enables information to flow with a speed and reach that was previously unimaginable. The implications are that actions online at an organisational and individual level play a key role in establishing and maintaining the 'strategic narrative'. Small incidents that would have been insignificant in the past can have a strategic effect. Even within their personal lives, military personnel interact

with cyberspace through a range of tools, including social media, opening them up to a range of cyber vulnerabilities. As a consequence, military training and education must include core cyber-specific skills and behaviours throughout the military career. For personnel delivering all aspects of air power, cyber skills are increasingly becoming core military skills.

The second group of ‘cyber operator’ comprises the *cyber specialists*. Cyberspace has been acknowledged as a domain in its own right and just like in the Maritime, Land and Air domains, but there is clearly not just one ‘cyber skill set’. UK doctrine acknowledges four specific cyber operations roles: offensive cyber operations (OCO); defensive cyber operations (DCO) (including active defence); cyber intelligence, surveillance and reconnaissance (cyber ISR); and cyber operational preparation of the environment (cyber OPE).⁸⁹ Cyber specialists execute missions across these four roles and are cyber domain experts with skills that are underpinned by deep technical knowledge of the domain, coupled with operational expertise. Cyber ISR specialists can carry out analysis of cyber target systems, or the cyber aspects of a physical system. They may also be responsible for producing cyber threat intelligence to allow assessment of adversary capability and intent in cyberspace. DCO cyber specialists are responsible for operating Security Information and Event Management (SIEM) systems, and carrying out vulnerability analysis, penetration testing, and malware analysis. These operators are required to respond to adversary cyber action and deliver a range of measures to assure the delivery of air power. Additionally, OCO specialists employ capabilities to generate a range of effects, that can be integrated with missions and effects from the Maritime, Land and Air domains. Specialist cyber operators predominately have a technical and/or intelligence analysis background, as the entry level into most specialist cyber roles requires a deep understanding of how the domain functions. However, as specialist cyber operators in both offensive and defensive roles, their development must be focussed on operations; there is a clear distinction between cyber operations and the provision of IT services, even though they are synergistic roles and both might require a detailed fundamental knowledge of cyberspace. The skills of the specialist cadre are highly sought after in the civilian market, adding to the challenges involved in recruitment and retention.

Cyber specialists not only need to operate capabilities that disrupt, degrade, or destroy the physical component of enemy fighting power, but also those that impact upon the moral component. The skills required to attack a network differ from those required for online engagement. It is likely that engaging with target audiences online may become as important as Information Operations through print, radio broadcast and face-to-face Key Leader Engagement. It is as yet unclear if there is a specific mission for airmen in this area of operations, with the mission currently falling predominantly to the Land component in the UK.⁹⁰ However, there may be a role for

airmen in planning and synchronising this type of non-kinetic activity with Air effects within the Air Tasking Order (ATO) cycle. In practice, the close interdependence between cyber operations, Information Operations, Psychological Operations, and kinetic operations, requires close synchronisation.⁹¹ In examining the specific information threat to the UK and NATO from Russia, the House of Commons Defence Committee expressed concern over the lack of a UK strategy to counter Russian disinformation.⁹² The Committee argued that the weight of effort and resource that Russia applies to its information operations requires a much greater response from the UK and NATO.

The third group of ‘cyber operators’ are the *commanders and staff officers* that are suitably qualified and experienced to plan and lead cyberspace operations as part of joint operations, and to develop cyber capability, doctrine, and tactics. This group needs an intuitive understanding of the domain and the types of capabilities that could potentially be at the senior commander’s disposal. As their careers progress, they need to develop cyber-domain breadth, whilst retaining a degree of depth. Bringing air domain tactical expertise to cyber operations is vital for integration, as is the need for detailed understanding of the cyber domain. If cyber specialist officers are to be successfully employed in the planning and synchronisation of cyber effects as part of a joint operation, they must first possess a knowledge of doctrine and experience of planning at the component and joint level.⁹³

Singer and Friedman identify a knowledge gap between the specialists and the commanders that must be bridged due to its significant implications.⁹⁴ They highlight that a US General described ‘how “understanding cyber is now a command responsibility,” as it affects almost every part of modern war.’⁹⁵ This view is supported by a former US Cyber Command J3 (Director of Operations), Major General Brett Williams, an F-15C pilot by background, who argues that ‘there is too much at stake for our senior leaders not to understand cyberspace operations in the same way they understand operations in the other domains.’⁹⁶ In order for airmen and airwomen to enhance their understanding of cyberspace, there is a fundamental requirement to develop a ‘feel’ for the domain. To dismiss the importance of the technical detail in cyberspace risks those in cyber roles lacking both credibility and effectiveness. Senior Air commanders are no longer the ‘tactical experts’ that they were in their early careers, but they grow and retain an intuitive understanding of the air domain, capabilities and limitations of air power as an instrument in the joint campaign. Poirier and Lotspeich argue that the same must be true with cyberspace:

*Just as a pilot must have knowledge of aerodynamic fundamentals to understand the performance and limitations of his weapon system, so must cyber warriors possess a foundational grasp of the cyber domain to employ cyber weapon systems properly.*⁹⁷

Developing this domain expertise is crucial in realising the aim that ‘cyber must be “mainstreamed” so that commanders, as well as specialists, understand instinctively how to conduct offensive and defensive cyber at both the strategic and tactical levels.’⁹⁸ However, the process of ‘mainstreaming’ is a conceptual challenge as much as a practical one. It requires an operational mind-set and an ability to understand, but crucially, think *above* the technical details of networks. Williams, argues that ‘we have a pressing need to develop cyberspace operators who are credible and effective in the J3 (operations) and J5 (strategic plans and policy)’⁹⁹ functional areas. This view is reinforced by the Commanding General of US Army Cyber, who acknowledges the requirement to develop personnel with ‘credible backgrounds with degrees in cyber related fields’, but also that ‘it’s just not about being a great computer expert or hacker, this is about your ability to organize these capabilities in time and space against a very specific mission set that is actually in support of the armed forces... and the conduct of their larger mission.’¹⁰⁰

Developing the appropriate level of expertise takes time and experience and Williams argues that ‘cyberspace officers should spend their first 10 years becoming tactically proficient in all aspects of cyberspace operations.’¹⁰¹ This, however, presents a different challenge in that those tactically proficient cyber operators do not then develop the same level of tactical proficiency in the other domains, such as Air. Arguably, the requirement is a suitable blend of both officers that are deep experts in cyber but retain an underpinning knowledge of air operations, and tactical air power specialists who are also exposed to cyber operations throughout their careers. Developing expertise in airmen, particularly future commanders, requires a combination of relevant Professional Military Education (PME), exposure to cyberspace planning during exercises and in some cases, full tours in cyber roles. Conversely, for those who specialise in cyberspace, the air power aspects of PME, and ongoing exposure to air operations are a necessary part of their development.

The UK National Cyber Security Strategy stresses the need for cyber specialists to work in partnership across government. This is underpinned by financial and organisational investment in the National Offensive Cyber Programme ‘the partnership between the Ministry of Defence and GCHQ that is harnessing the skills and talents of both organisations to deliver the tools, techniques and tradecraft required.’¹⁰² This Strategy therefore requires all three of the Armed Services to provide personnel with the attributes to be effective cyber operators, planners and commanders. Fundamentally, the value of cyberspace operations lies in their integration with operations in the other domains through delivering objectives as part of a joint campaign.¹⁰³ As a consequence, bringing operational experience of Land, Sea, Air, or Space to Cyberspace is a significant advantage. Although not solely a challenge for airmen, they have their part to play, as a former Chief of the Air Staff, Air Chief Marshal Sir Stephen Dalton highlighted: ‘the technological focus and dependency of the RAF

has placed us squarely in the forefront of conceptual as well as technical development for both space and cyberspace arenas.’¹⁰⁴

Developing sufficient cyber specialists and appropriately skilled cyber leaders, poses a particular challenge. The need to recruit, train, and retain personnel in military cyberspace roles sits in a context of a global cyber security workforce shortage that is predicted to reach 1.8 million by 2022.¹⁰⁵ In mitigating the competition from the civilian cyber security market, the MoD has acknowledged that its cadre of cyber professionals must include reservists.¹⁰⁶ This is consistent with a broader drive to ensure that reductions in regular force numbers are offset by an appropriate mix of the ‘Whole Force’, regular military, reservist, civil servant and contractor.¹⁰⁷ In generating a sustainable number of cyber professionals, traditional approaches must be adapted, with a need to ‘be imaginative in recruiting, managing and retaining the Defence cyber cadre.’¹⁰⁸ Being ‘imaginative’ arguably requires the application of a range of measures to attract and retain talent. Military cyber operators are often motivated by the challenge, interest and operational relevance of a cyber career and generally have a strong desire to remain in cyber specialist employment.¹⁰⁹ Other nations face similar challenges, with the US Army encouraging transfers from other branches, primarily from those with Science, Technology, Engineering and Maths (STEM) education backgrounds.¹¹⁰ An issue identified within the US military is that developing deep cyber experience may impose a career disadvantage on individuals in a culture that eschews technical competence in favour of more mainstream attributes. Conti and Surdu cite several examples of this and argue that ‘some cyberwarfare soldiers, sailors, and airmen who seek to make a career of the military go to great lengths to mask their technical expertise and assignments from promotion boards by making their personnel evaluations appear as mainstream as possible.’¹¹¹ It is clear that appropriately rewarding career development and progression is an important factor in retention, particularly when external opportunities in the civilian employment market abound.

When the UK Secretary of State for Defence made a public announcement regarding the creation of a Joint Cyber Reserves Unit in 2013, there was significant media discussion regarding whether this new Cyber Reserve organisation would include ‘convicted hackers’ or those that were unable to meet the physical fitness standards of the Armed Forces.¹¹² This might include recruiting those who have the specific skills required for cyber specialist roles but are limited in the scope of their employment, if for example they suffer from an illness or injury that prevents them carrying out a full range of military duties. The former head of the Defence Cyber Security Programme, General Jonathan Shaw argued for the extensive use of reserves in UK cyber roles:

*We need a cyber reserve and that reserve should be largely civilian... Don't think camouflage, short-back-and-sides and weapons training. It's ponytails, earrings and thick spectacles – that's what we need.*¹¹³

Although part of the requirement may be satisfied by civilians and those that do not conform to military norms, there is a danger that this type of pronouncement from a senior officer perpetuates stereotypes that are often more myth than fact. Skill and aptitude for cyber operations and military bearing and ethos are not mutually exclusive. The armed forces attract people with diverse backgrounds and personality types, but the basic requirements beyond technical aptitude remain teamwork and discipline. Some cyber operators, like those from other specialisations, need to deploy on operations and need the underpinning military skills to do so. Despite popular myth, not all cyberspace targets can be reached from ‘darkened rooms’ in the UK by the stereotypical ‘hacker in a hoodie’; integrating and delivering cyber operations will often require a forward presence in the area of operations.¹¹⁴ There is therefore a requirement for military and civilian, regular and reserve to fill a wide range of cyber roles. Estonia has recruited a Cyber Unit as part of its National Defence League, which provides a reservist force that aims to defend the nation from attack in cyberspace.¹¹⁵ This reliance on Reserves is arguably an effective way to generate the mass of personnel required in an affordable and achievable manner.

Furthermore, the idea of employing convicted hackers based on their purported advanced technical skill alone is also questionable; trust and reliability are fundamental requirements, as is the requirement to achieve and maintain a security clearance. The US Army Cyber Commander ‘views people as the centerpiece [*sic*] to cyberspace characterized by high degrees of competence *and character*’ (emphasis added).¹¹⁶ Whilst some former offenders may be rehabilitated, the recruits likely to be most effective in cyber roles across the Whole Force are arguably those with a strong technical aptitude, coupled with the traditional military attributes of discipline, teamwork, integrity and service.

CONCLUSION

In conclusion, this article has considered some general people, process and technology issues related to the integration of cyberspace with air power. Explanations of the terminology related to attacks in cyberspace enabled the discussion of both defensive and offensive cyber operations. Just as the study and practice of air power has produced a distinct lexicon, so too has cyberspace. For airmen to be credible commanders of cyber operations, and for staff to enable Air-Cyber Integration, they must be equipped to understand the principles of cyberspace, as well as they understand their native air domain.

The twenty-first century is likely to be characterised by a contested cyber domain. The paper uses the cyber defence of the Lightning merely as an example of where threats might arise, beyond the platform, in the interconnected system-of-systems related to its operation and support. The complexity of systems in the twenty-first century requires a holistic examination of cyberspace threats and commensurate

mitigation, with a focus on assuring the delivery of the air mission. However, cyberspace is not solely a domain filled with new threats for air power; it offers the potential to give the commander additional options for delivering effects. By integrating cyber effects with air power, the range of options available to the commander increases, where close synchronisation can enhance air power effects and provide options that may be ephemeral and reversible.

The success of the RAF in capitalising on the opportunities of Air-Cyber Integration is highly dependent upon the skill of its people. Air power missions are underpinned by cyberspace, therefore being competent in operating effectively in cyberspace is a core requirement for all airmen and women. The RAF also has a need to develop and retain sufficient numbers of specialist cyber operators to contribute to Air-Cyber Integration, and to provide a contribution to a range of cyber missions under the Joint Commander. Senior commanders and their staff already have a requirement and a responsibility to be comfortable and competent operating in the cyber domain, therefore developing their successors requires that they gain experience in cyberspace as well as the physical domains. The first century of air power was characterised by pushing the physical and technological boundaries of the air domain. This is likely to continue in its second century, with the added complexity of dependence upon cyberspace. The success of air power at the start of its second hundred years is closely linked to achieving success in the cyber domain.

NOTES

¹ William J Poirier and James Lotspeich, “Air Force Cyber Warfare: Now and the Future,” *Air and Space Power Journal* 27, no. 5 (2013): 92.

² DCDC, *Joint Doctrine Publication 0-30: UK Air and Space Power*, 2nd Ed. (Shrivenham: Development, Concepts and Doctrine Centre (DCDC), 2017), 54, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/668710/doctrine_uk_air_space_power_jdp_0_30.pdf.

³ Ronald R Fogleman, “Cornerstones of Information Warfare” (Washington, DC: US Air Force, 1997).

⁴ UK Ministry of Defence, “Joint Concept Note 1/17: Future Force Concept,” 2017, 19.

⁵ The UK has undergone some conceptual debate regarding the use of the term ‘Domain’ and ‘Environment’. Joint Concept Note 1/14 referred to maritime, land, air, space and cyber as ‘environments’, not ‘domains’. Joint Concept Note 1/17 returns to the use of ‘maritime, land, air, space and cyber domains’, underpinned by the information environment, and is consistent with current terminology in Allied concepts and doctrine.

⁶ HM Government, “National Cyber Security Strategy 2016-2021,” 2016, 15, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/567242/national_cyber_security_strategy_2016.pdf.

⁷ DCDC, *Cyber Primer*, 2nd ed. (Shrivenham: Development, Concepts and Doctrine Centre

(DCDC), 2016), 1, <https://www.gov.uk/government/publications/cyber-primer>.

⁸ Ibid., 20.

⁹ NCSC, “Common Cyber Attacks: Reducing The Impact” (London, 2016), 6, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/400106/Common_Cyber_Attacks-Reducing_The_Impact.pdf.

¹⁰ Ibid., 3.

¹¹ P.W. Singer and Allan Friedman, *Cybersecurity and Cyberwar: What Everyone Needs to Know* (New York: Oxford University Press, 2014), 115.

¹² Zheng Bu, “Zero-Day Attacks Are Not the Same as Zero-Day Vulnerabilities,” FireEye Inc, 2014, <https://www.fireeye.com/blog/executive-perspective/2014/04/zero-day-attacks-are-not-the-same-as-zero-day-vulnerabilities.html>.

¹³ Kim Zetter, “Countdown to Zero Day: STUXNET and the Launch of the World’s First Digital Weapon” (New York, NY: Crown Publishing, 2014), 6.

¹⁴ Ibid., 221–22.

¹⁵ David E Sanger, “Obama Lets N.S.A. Exploit Some Internet Flaws, Officials Say,” New York Times, 2014, <https://www.nytimes.com/2014/04/13/us/politics/obama-lets-nsa-exploit-some-internet-flaws-officials-say.html>.

¹⁶ Wassenaar Arrangement Secretariat, “Public Statement 2013 Plenary Meeting of The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies” (Vienna, Austria, 2013), <http://www.wassenaar.org>.

¹⁷ Lockheed Martin, “Cyber Kill Chain® · Lockheed Martin,” 2018, <https://www.lockheedmartin.com/us/what-we-do/aerospace-defense/cyber/cyber-kill-chain.html>.

¹⁸ Lawrence Freedman, “War Designed for One,” *The World Today* 53, no. 8/9 (1997): 217.

¹⁹ Leo Davies, *A Fifth-Generation Air Force: Alliance Structures and Networked Capabilities from an Australian Perspective* (Washington, DC: Center for Strategic & International Studies, 2017), <https://www.csis.org/events/fifth-generation-air-force-alliance-structures-and-networked-capabilities-australian>.

²⁰ Royal Air Force, “Royal Air Force Strategy: Delivering a World-Class Air Force” (High Wycombe: Headquarters Air Command, 2017), 28.

²¹ Ibid.

²² Giulio Douhet, *Command of the Air*, ed. Trans. Dino Ferrari (Office of Air Force History, 1983), 34.

²³ Lockheed Martin, “F-35 Mission Systems | F-35 Lightning II,” 2017, <https://www.f35.com/about/capabilities/missionsystems>.

²⁴ Pete Cooper, *Aviation Cybersecurity - Finding Lift, Minimizing Drag* (Washington, DC: Atlantic Council, 2017), 23.

²⁵ Lockheed Martin, “F-35 Software Development,” 2017, <https://www.f35.com/about/life-cycle/software>.

²⁶ Cooper, *Aviation Cybersecurity - Finding Lift, Minimizing Drag*, 23.

²⁷ Lockheed Martin, “Autonomic Logistics Information System,” 2017, <http://www.lockheedmartin.co.uk/us/products/ALIS.html>.

²⁸ Ibid.

²⁹ Alexi Mostrous and Deborah Haynes, “F-35 Investigation: Jets Are Overbudget, Unreliable and Vulnerable to Cyberattacks,” *The Times*, 2017, <https://www.thetimes.co.uk/article/jets-are-overbudget-unreliable-and-vulnerable-to-cyberattacks-v3gt8dcbb>.

³⁰ HM Government, “Defence Committee Unclear for Take-off? F-35 Procurement” (London, 2017), 18, <https://publications.parliament.uk/pa/cm201719/cmselect/cmdfence/326/326.pdf>.

³¹ Ibid.

³² Shaun Harvey, “Unglamorous Awakenings: How the UK Developed Its Approach to Cyber,” in *A Fierce Domain: Conflict in Cyberspace 1986 to 2012*, ed. Jason Healey (Washington, DC: Atlantic Books, 2013), 260.

³³ DCDC, “Joint Doctrine Note 1/18: Cyber and Electromagnetic Activities” (Shrivenham: Development, Concepts and Doctrine Centre (DCDC), 2018), 19, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/682859/doctrine_uk_cyber_and_electromagnetic_activities_jdn_1_18.pdf.

³⁴ PCI Gases, “On-Site LOX/LIN Generator,” 2018, https://www.pcigases.com/wp-content/uploads/2015/11/GAMMA_LOX_product_LowRes-0613.pdf.

³⁵ Zetter, “Countdown to Zero Day: STUXNET and the Launch of the World’s First Digital Weapon,” 134.

³⁶ Ibid., 332–33.

³⁷ Ibid., 164.

³⁸ Lockheed Martin, “F-35 Economic Impact,” 2017, <https://www.f35.com/about/economic-impact>.

³⁹ Lockheed Martin, “F-35 Fast Facts,” 2017, <https://www.f35.com/about/fast-facts>.

⁴⁰ G. E. Smith et al., “A Critical Balance: Collaboration and Security in the IT-Enabled Supply Chain,” *International Journal of Production Research* 45, no. 11 (2007): 2597, <https://doi.org/10.1080/00207540601020544>.

⁴¹ DCDC, *Joint Doctrine Publication 0-30: UK Air and Space Power*, 2nd Ed (Shrivenham: Development, Concepts and Doctrine Centre (DCDC), 2017), 54, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/668710/doctrine_uk_air_space_power_jdp_0_30.pdf.

⁴² Brad Bigelow, “Mission Assurance: Shifting the Focus of Cyber Defence,” in *Defending the Core: 2017 9th International Conference on Cyber Conflict*, ed. H. Rõigas et al. (Tallinn: NATO CCD COE, 2017).

⁴³ Ibid., 48.

⁴⁴ Andrew Pulford, “Two Decades at the Chuo Keiba,” *Air Commanders’ Dialogue Japan*, 2014, 9.

⁴⁵ Ed Morris et al., “A Day Without Space: Economic and National Security Ramifications,” 2008, <http://marshall.org/wp-content/uploads/2013/08/Day-without-Space-Oct-16-2008.pdf>.

⁴⁶ US Department of Defense, “A Day Without Space And Cyber On The Battlefield,

Operating In Today's Multi Domain Environment" (The Joint Forces Channel, 2016), https://www.youtube.com/watch?v=0eI_KyO8Vt4.

⁴⁷ For an excellent fictional account underpinned by a detailed understanding of technology and strategic thinking see Singer, P.W. and Cole, A. (2015) *Ghost Fleet: A Novel of the Next World War*, Kindle Edi. Beaconsfield: Canelo Digital Publishing.

⁴⁸ Bigelow, "Mission Assurance: Shifting the Focus of Cyber Defence," 49.

⁴⁹ Royal Air Force, "Royal Air Force Strategy: Delivering a World-Class Air Force," 28.

⁵⁰ Pulford, "Two Decades at the Chuo Keiba," 8.

⁵¹ Thomas Rid, *Cyber War Will Not Take Place* (London: Hurst, 2013), 19–21.

⁵² Benjamin S. Lambeth, "NATO's Air War for Kosovo," 2001, 220, https://www.rand.org/pubs/monograph_reports/MR1365.html.

⁵³ Fred Kaplan, *Dark Territory: The Secret History of Cyber War* (New York, NY: Simon & Schuster, 2016), 107–118.

⁵⁴ Ibid., 111–12.

⁵⁵ Ibid., 114.

⁵⁶ Ibid.

⁵⁷ Lambeth, "NATO's Air War for Kosovo," 112.

⁵⁸ Ibid., 110.

⁵⁹ Kaplan, *Dark Territory: The Secret History of Cyber War*, 114.

⁶⁰ Dan Verton, "Serbs Launch Cyberattack on NATO," FCW, 1999, <https://fcw.com/articles/1999/04/04/serbs-launch-cyberattack-on-nato.aspx>.

⁶¹ Lambeth, "NATO's Air War for Kosovo," 112.

⁶² Fogleman, "Cornerstones of Information Warfare," 4.

⁶³ Kaplan, *Dark Territory: The Secret History of Cyber War*, 160–61.

⁶⁴ Ibid., 161.

⁶⁵ Zetter, "Countdown to Zero Day: STUXNET and the Launch of the World's First Digital Weapon," 218.

⁶⁶ David A. Fulghum, Robert Wall, and Amy Butler, "Israel Shows Electronic Prowess," Aviation Week, 2007, <https://warsclerotic.com/2010/09/28/israel-shows-electronic-prowess/>.

⁶⁷ Fulghum, Wall and Butler (2007)

⁶⁸ Jeffrey Carr, *Inside Cyber Warfare*, First (Sebastopol, CA: O'Reilly Media, 2010), 17.

⁶⁹ Ibid., 16.

⁷⁰ Jeffrey Carr, "Digital Dao: Russian Cyber Warfare Capabilities in 2014 (We Aren't in Georgia Anymore)," accessed May 31, 2015, <http://jeffreycarr.blogspot.co.uk/2014/03/russian-cyber-warfare-capabilities-in.html>.

⁷¹ Keir Giles, "Handbook of Russian Information Warfare," *NATO Defence College NDC Fellowship Monograph Series 9* (2016): 6–7.

⁷² Ibid., 9.

⁷³ Ibid., 6.

⁷⁴ Ibid., 69.

⁷⁵ Associated Press, "U.S. General: We Hacked the Enemy in Afghanistan," Politico, 2012,

<https://www.politico.com/story/2012/08/us-general-we-hacked-the-enemy-in-afghanistan-080098>.

⁷⁶ DCDC, "Joint Doctrine Note 1/18: Cyber and Electromagnetic Activities," 43–44.

⁷⁷ NATO, "AJP-3.3: Allied Joint Doctrine Publication for Air and Space Operations" (Brussels: NATO Standardization Office (NSO), 2016), 4–8, <https://www.japcc.org/wp-content/uploads/AJP-3.3-EDB-V1-E.pdf>.

⁷⁸ Steven J Anderson, *Airpower Lessons for an Air Force Cyberpower Targeting Theory*, 2016, 120, <https://www.hsd.org/?view&did=797492>.

⁷⁹ Ibid.

⁸⁰ Pulford, "Two Decades at the Chuo Keiba," 14.

⁸¹ Thomas Rid and Ben Buchanan, "Attributing Cyber Attacks," *The Journal of Strategic Studies* 38, no. 1–2 (2014): 6, <https://doi.org/10.1080/01402390.2014.977382>.

⁸² Ibid., 9.

⁸³ Ibid., 7.

⁸⁴ Keir Giles, "Russia's 'New' Tools for Confronting the West: Continuity and Innovation in Moscow's Exercise of Power" (London, 2016), 49, <https://www.chathamhouse.org/sites/files/chathamhouse/publications/2016-03-russia-new-tools-giles.pdf>.

⁸⁵ Ibid.

⁸⁶ Hugh Trenchard, "Memorandum by the Chief of the Air Staff," *Air Power Review, 95th Anniversary Special Edition 2013* (1919), 261, <http://airpowerstudies.co.uk/sitebuildercontent/sitebuilderfiles/apr-95th-anniversary.pdf>.

⁸⁷ Ibid., 263.

⁸⁸ Stephen Dalton, "Meeting the Challenge," Air Power Conference 2010, 2010, https://www.raf.mod.uk/rafcms/mediafiles/5E9564D6_5056_A318_A8236B2CB11CCFA4.doc.

⁸⁹ DCDC, "Joint Doctrine Note 1/18: Cyber and Electromagnetic Activities," 15.

⁹⁰ HM Government, "Russia: Implications for UK Defence and Security" (London, 2016), 36–37, <https://publications.parliament.uk/pa/cm201617/cmselect/cmdfence/107/107.pdf>.

⁹¹ DCDC, "Joint Doctrine Note 1/18: Cyber and Electromagnetic Activities," 16.

⁹² HM Government, "Russia: Implications for UK Defence and Security," 37.

⁹³ Jason M Bender, "The Cyberspace Operations Planner," *Small Wars Journal*, 2013, <http://smallwarsjournal.com/jrnl/art/the-cyberspace-operations-planner>.

⁹⁴ Singer and Friedman, *Cybersecurity and Cyberwar: What Everyone Needs to Know*, 4–6.

⁹⁵ Ibid., 6.

⁹⁶ Brett T. Williams, "The Joint Force Commander's Guide to Cyberspace Operations," *Joint Forces Quarterly* 73 (2014): 13.

⁹⁷ Poirier and Lotspeich (2013, p.92)

⁹⁸ DCDC, *Joint Concept Note 1/14: Defence Joint Operating Concept* (Shrivenham: Development, Concepts and Doctrine Centre (DCDC), 2014), 4–13, http://xtlearn.net/Files/Users/ceri/WO/20140319-dcdc_jcn_1_14_djoc-U.pdf?zoom=80%2525.

⁹⁹ Williams, "The Joint Force Commander's Guide to Cyberspace Operations," 14.

- ¹⁰⁰ Pomerleau, "Army Cyber Chief Outlines Key Challenges, Goals."
- ¹⁰¹ Williams, "The Joint Force Commander's Guide to Cyberspace Operations," 13.
- ¹⁰² HM Government, "National Cyber Security Strategy 2016-2021," 51.
- ¹⁰³ Williams, "The Joint Force Commander's Guide to Cyberspace Operations," 13.
- ¹⁰⁴ Stephen Dalton, "Air Power in Ages of Austerity," Wilbur & Orville Wright lecture to the Royal Aeronautical Society, 2009, http://www.raf.mod.uk/rafcms/mediafiles/EA27D125_5056_A318_A8289A46DF0DCB91.pdf.
- ¹⁰⁵ Frost & Sullivan, "2017 Global Information Security Workforce Study: Benchmarking Workforce Capacity and Response to Cyber Risk," 2017, 2, <https://iamcybersafe.org/gisws/>.
- ¹⁰⁶ Sophie Curtis, "UK to Create 'cyber Strike Force' - Telegraph," The Telegraph, 2013, <http://www.telegraph.co.uk/technology/internet-security/10343652/UK-to-create-cyber-strike-force.html>.
- ¹⁰⁷ John Louth and Trevor Taylor, "Beyond the Whole Force," *RUSI*, 2015, 14-16, https://rusi.org/sites/default/files/201510_op_beyond_the_whole_force.pdf.
- ¹⁰⁸ DCDC, *Joint Concept Note 1/14: Defence Joint Operating Concept*, 4-13.
- ¹⁰⁹ Paul Withers, "How Can the Royal Air Force Sustain and Grow Its Cadre of Cyber Professionals?" (Shrivenham, 2017). (Unpublished study as partial fulfilment of the requirements of the MSc Cyberspace Operations, Cranfield University).
- ¹¹⁰ Jim Tice, "Attention Officers: Sign up Soon for Cyber Transfers," *Army Times*, 2015, <https://www.armytimes.com/news/your-army/2015/04/16/attention-officers-sign-up-soon-for-cyber-transfers/>.
- ¹¹¹ Gregory Conti and John Surdu, "Army, Navy, Air Force, and Cyber — Is It Time for a Cyberwarfare Branch of Military?," *IA Newsletter* 12, no. 1 (2009): 16, <http://iac.dtic.mil/iatac>.
- ¹¹² BBC, "UK Cyber Defence Unit 'May Include Convicted Hackers,'" 2013, <http://www.bbc.co.uk/news/technology-24613376>.
- ¹¹³ David Blair, "Estonia Recruits Volunteer Army of 'Cyber Warriors,'" The Telegraph, 2015, <http://www.telegraph.co.uk/news/worldnews/europe/estonia/11564163/Estonia-recruits-volunteer-army-of-cyber-warriors.html>.
- ¹¹⁴ Nicole Gallucci, "We Need to Talk about All These Absurd Stock Photos of Hackers," Mashable, 2017, https://mashable.com/2017/05/15/horrible-hacker-stock-photos/#3cI_KI_Mcmq0.
- ¹¹⁵ Sharon L. Cardash, Frank J. Cilluffo, and Rain Ottis, "Estonia's Cyber Defence League: A Model for the United States?," *Studies in Conflict & Terrorism* 36, no. 9 (September 2013): 777-87, <https://doi.org/10.1080/1057610X.2013.813273>.
- ¹¹⁶ Pomerleau, "Army Cyber Chief Outlines Key Challenges, Goals."

Viewpoint

TWENTY-FIRST CENTURY AIR POWER: FUTURE CHALLENGES AND OPPORTUNITIES

By Lieutenant General David A Deptula USAF (Retired)

Biography: Lieutenant General David A Deptula (Retired) is Dean of the Mitchell Institute for Aerospace Studies and a world-renowned thought leader on strategy and defence. His distinguished USAF career spanned 34 years and included extensive experience in combat and command in several major joint contingency operations, serving on two congressional commissions charged with outlining America's future defence posture and culminated as the USAF's senior official of the intelligence community.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor.

INTRODUCTION

Change with respect to the military in general, and air power¹ in particular, involves four principal factors—advanced technologies, new concepts of operation, organizational transformation, and the human dimension. Here is how they all relate in forming the future: *advanced technologies* and the new capabilities they yield, enable and demand *new concepts of operation* that produce order-of-magnitude increases in our ability to achieve desired military effects. *Organizational* transformation codifies changes and enhances our ability to execute our respective national security strategies. The final and essential element to progress is the *human dimension*. People are fundamental to everything air forces do, especially when it comes to planning for and executing combat operations. Accordingly, I've outlined this paper generally in these four broad areas. However, before addressing them let me provide a short assessment of the security environment we face in the remainder of the twenty-first century.

TWENTY-FIRST CENTURY SECURITY ENVIRONMENT

First, in this the twenty-first century, our defence strategies must contend with non-state and transnational actors; a rising economic and military powerhouse in China; a resurgent Russia; declining states—some with nuclear weapons; the increasing likelihood of nuclear weapons proliferation; evil actors of the most despicable nature; and a dynamic web of global terrorism.

Second, the pace and tenor of our lives has been irrevocably altered by the acceleration of change. Global trade, travel, and telecommunications have produced major shifts in the way we live. Such developments are not isolated. Speed and complexity have merged, and now *permeate* the conduct of warfare. Consequently, one implication for future warfare is that military forces *must* be able to respond rapidly and decisively anywhere on the globe at any time. Key security events can now unfold in a matter of hours and days, not only over months or years. The window to influence such circumstances is increasingly fleeting, and rapid response—lethal and/or non-kinetic—anywhere in the world is a primary characteristic of air power. This cannot be said of land or sea forces, both of which are subject to the tyranny of time and distance.

Third, we have to contend with increasing personnel and procurement costs at a time when defence budgets are decreasing. Therefore, *the provision of flexibility of response across a wide spectrum of circumstances* should be foremost among the decision criteria we apply to our future military. This too is an air power strength.

Fourth, moving into the future we must acknowledge that deploying large numbers of ground forces onto foreign soil to 'win hearts and minds' vice accomplishing a defined mission and then leaving has become counter-productive to securing desired strategic outcomes. That approach resulted in decades-long wars that slowly but inexorably drained our blood and treasure while undermining our political will and standing in the

world. Strategies centred upon occupation expose coalition force vulnerabilities, result in anti-occupation force national backlash, domestic disapproval, and create destabilizing effects within the very state or region they are intended to secure.

Fifth, we must actively pursue and invest in options we can use to counter the increasingly advanced access denial strategies and technologies our adversaries are developing. Precision weapons and stealth projected incredible effects at the end of the Cold War. Those capabilities proliferated, and our adversaries are now equipping themselves with precision weapons and stealth.

Sixth, and particularly important, we need to challenge our adversaries' domination of public perception. We have to learn how to use the application of accurate, compelling information as a core element of our security apparatus. We are woefully inept at strategic communications and too often put ourselves in a reactionary versus proactive position in struggling to gain domestic and international public support.

Finally, information's value also extends past the media. Just as wireless connectivity, personal computing devices, and cloud-based applications are revolutionizing life in the civilian sector, these trends are also altering how our military forces project power. Faster and more capable networks and computing capabilities are turning information into the dominant factor in modern warfare. We need to understand that fifth generation aircraft like the F-22 and F-35 are information systems far above and beyond being fighters that shoot missiles and drop bombs—they are sensor-shooter-effectors.² Given this reality, we must now acknowledge that information and its management are just as important today as the traditional tools of military power—airplanes, satellites, infantry, warships. Information is the force evolving all weapon systems from isolated instruments of power into a highly integrated enterprise where the exchange of information and data will determine military success or failure in the twenty-first century.

The factors identified in this short assessment of the security environment we face have major implications throughout the military enterprise, shaping key areas like doctrine, organization, training, acquisition, sustainment, along with command and control. Top leaders in the policy community must adjust to the new realities of information age combat operations. Cold War, occupation-based, and counterinsurgency paradigms fall woefully short when applying military power in the twenty-first century.

These trends provide a starting point for anticipating the future with which we will have to contend. Bluntly stated, all the services, ministries of defence, and the other elements of our collective national security architectures have been slow to recognize the emerging new security environment. Their focus has remained on traditional weapons platforms. We still have institutions and processes that were designed in the middle of the last century to accommodate what we now view—in retrospect—as a

rather simple world of kinetics and traditional domains that characterized the Cold War. I suggest that we need to supplement our traditional focus on combined arms warfare with a broader ‘lens’ that exploits non-kinetic tools, the cyber domain, the rapid translation of information into knowledge, and air power as a means of rapidly imposing these capabilities into desired effects.

The proliferation of technology, information flow, and the associated empowerment of nation-states, organizations, as well as individuals, presents one of the most daunting challenges our militaries have ever faced. How will air power fare in this rapidly evolving security environment of the future?

FUTURE TECHNOLOGICAL POTENTIAL APPLIED TO AIR POWER

Today we can identify progression in some technological developments that hold great potential for the advancement of air power in the future. Here are the ones that I believe will result in significant new air power capabilities that will shape its future:

Uninhabited aerial vehicles

The acceleration of the use of remotely piloted aircraft (RPA) — or better known by their flawed media label as ‘drones.’ RPA will quickly transition to a much more autonomous ability to assist airmen in the accomplishment of their mission tasks across the spectrum of air power operations. The future will see remotely piloted aircraft increasingly replaced by aircraft flying autonomously. At the same time a human will be ‘on the loop’ controlling the effects of these autonomous aircraft. The term RPA was introduced in 2009 to ensure it was understood that humans were in control of uninhabited aerial vehicles. I suggest that we consider a descriptor along the lines of *Coordinated Autonomously Piloted Aircraft*, or CAPA, to distinguish the use of aircraft flying autonomously vice those actually remotely piloted.

Fast space

This concept explores whether and how air forces can form private sector partnerships to create a virtuous cycle of launch cost reductions of between three and ten times lower than today’s costs. Doing so could enable completely new approaches for Allied air forces to defend our coalitions, protect our interests, and enhance opportunities to exploit the unique global advantages of the ultimate high ground of space.

A ‘Fast Space’ architecture envisions an ecosystem of capabilities that makes *speed* the defining attribute of advantage in space. In this approach, speed describes both the supply and demand sides of the space market. On the supply side, Fast Space envisions sortie-on-demand launch capability, made possible through economically viable business cases, high launch rates, sustainably lower costs, rapid turn-around, and higher reliability. On the demand side, Fast Space enables users at all levels of conflict, from tactical to strategic, to harvest new advantages in and through space.

Hypersonics

Flight at five times the speed of sound and above promises to revolutionize military affairs in the same fashion that the combination of stealth and precision did a generation ago. Hypersonic air weapons offer advantage in four broad areas. They counter the tyranny of distance and increasingly sophisticated defences; they compress the shooter-to-target window, and open new engagement opportunities; they rise to the challenge of addressing numerous types of targets; and they enhance future joint and combined operations. Within each of these themes are other advantages which, taken together, redefine air power projection in the face of an increasingly unstable and dangerous world.

Artificial intelligence (AI)

Many years ago, as the Chief of US Air Force Intelligence, Surveillance, and Reconnaissance, I coined a phrase to try to get the point across to the US Department of Defense that we needed to get a grip on the massive amounts of data we were collecting from aerospace sensors: the phrase was, 'we are swimming in sensors, so we need to avoid drowning in data'. Today, on a daily basis, we only process about one to two per cent of the data our sensors collect!

The solution to that challenge was, and still is, the application of artificial intelligence to data analysis. An example is what has been going on in the US military with Project Maven, using AI to accomplish change detection in analysing Full Motion Video.³ But its application goes far beyond that as AI will enable a variety of new military concepts of operation. One that is currently being researched is the 'loyal wingman' idea, which allows for automated control of uninhabited aircraft in a variety of roles dramatically expanding the capability and capacity of aircraft. The more complicated the battlespace, the greater the demand will be for those 'wingmen' to have algorithms that allow them to respond in cases where the coordinating human controller cannot directly guide them. Swarms of aircraft will similarly require AI for coordination.

Most importantly, AI is the key that will allow its wisest application to be executing our observe, orient, decide, act (or OODA) loop faster than an enemy can execute theirs.

Directed energy

Today, with modern air power operating inside the atmosphere, we can impose kinetic effects at the speed of sound. With the maturing of hypersonic weapons, we will be able to do that at multiples of the speed of sound. However, imagine the ability to impose kinetic effects at the speed of light. The realization of the routine employment of directed energy weapons will truly be game-changing for our air forces. If the long-awaited and often promised but, as yet, not materialized maturation of directed energy weapons becomes a reality, these weapons will eliminate the distinctions between fighters, bombers, and every other anachronistic characterization of military

aircraft that possess effective directed energy weapons, as they will be able to conduct both offensive and defensive missions regardless of the character of the aircraft hosting them.

Now consider the application of directed energy weapons to spacecraft and their potential to impose kinetic effects inside the earth's atmosphere—both to vehicles on the surface and in the air. Using directed energy from spacecraft to achieve kinetic effects against other objects in space will probably be realized before directed energy is militarily effective inside the atmosphere. That day is rapidly approaching. It is likely a matter of years not decades before such weapons are in place and ready to be used by one or more powers capable of creating them.

Even before the maturation of directed energy *weapons*, powering uninhabited aircraft via laser beams could very soon increase endurance and allow larger payloads, with high-bandwidth data sent back over the same beam.

The ubiquitous and seamless sharing of information

Any assessment of the likely landscape of future conflict must recognize that no matter what type of engagement, the outcome will increasingly be determined by which side is better equipped and organized to gather, process, disseminate, and control information. Desired military effects will increasingly be attained through the interaction of multiple systems, each one sharing information and empowering one another for a common purpose. It is a concept that can be envisioned as a 'Combat Cloud'—an operating paradigm where information, data management, connectivity, and command and control are core mission priorities.

This vision represents an evolution whereby individually networked platforms transform into a broader system-of-systems enterprise integrated through domain- and mission-agnostic information linkages. This approach will not only change the way we define new requirements, but more importantly, the way we think, command, control, and operate those systems. This is the essence of the Combat Cloud: it is not just the network, it is the entire enterprise of sensors, shooters, and connectors all part of a cohesive, coherent whole, and while it will extend across all operating domains, air and spacecraft will be the centrepieces of this architecture.

Cyber operations and electronic warfare

The intersection of cyber operations and electronic warfare will grow and in doing so will play an increasing role in contributing to the capabilities of the Combat Cloud. Desired effects achievable with offensive cyber operations are fundamentally challenging the traditional model of combined arms warfare and indicate the need to shift to a combined effects approach.⁴ The combined effects construct puts cyber operations and electronic warfare on the same level as operations in the natural domains, treating

them as principal means of warfare, not simply supporting elements as they are under the old combined arms construct.

There are other promising technologies that we are yet to imagine but are sure to hold breakthroughs just as dramatic as was supersonic flight, operations in space, precision weapons, low observability, and others.

The major challenges of deploying, employing, and sustaining expeditionary forces across the globe are two-fold. First there is the fundamental difference in the nature of air and surface forces. Air forces can be rapidly deployed and employed anywhere in the world in a matter of hours, even from thousands of miles away. Surface forces—of both land and sea—unless pre-deployed to the specific area of concern, take weeks or months to deploy depending on the size of the force elements required. Second, as I mentioned earlier, the explosive growth in the ease and speed at which strategy, ideas and technologies are created and spread around the world has yielded new, more unpredictable threat environments. Rapid advancements in the capabilities of our potential adversaries all present unique challenges and expose vulnerabilities. Our ability to deploy, employ, and sustain forces to areas needed for deterring or countering malicious actors or adversaries is becoming ever more contested.

The spread of advanced technologies, enhanced by rapid advances in computing power, places increasingly sophisticated capabilities in the hands of potential adversaries as well as ourselves. The range and scale of possible effects with these new capabilities present a new military problem set that threatens the Allied expeditionary warfare model of power projection, freedom of action, and manoeuvre, and as a result begs for new operational concepts and doctrine to exploit advancing technologies in a fashion to deter and, if necessary, defeat future adversaries. So, let's take a look at just what those new operational concepts and doctrine might be.

OPERATIONAL CONCEPTS AND DOCTRINE

One of the most significant changes in the evolution of modern warfare is the result of the impact of the combination of three technological changes: 1) modern Intelligence, Surveillance and Reconnaissance (ISR) yielding persistent multi-spectral ISR; 2) the normalization of the use of precision weapons; and 3) the dramatic improvement of system survivability (stealth). This combination has resulted in the reversal of the traditional paradigm of the use of air and surface forces to defeat adversaries.

The traditional warfighting paradigm of surface forces leading the fight while supported by air forces has been supplanted by a construct where air forces supported by surface forces is often a much more responsive, effective, efficient, and less costly—in terms of both lives and dollars—manner in which to conduct warfare.⁵ Validating this observation, a platoon leader during Operation Iraqi Freedom in 2003, at the leading edge of the

push to Baghdad by the 1st Marine Expeditionary Force, wrote: 'For the next hundred miles, all the way to the gates of Baghdad, every palm grove hid Iraqi armor, every field an artillery battery, and every alley an anti-aircraft gun or surface-to-air missile launcher. But we never fired a shot. We saw the full effect of air power. Every one of those fearsome weapons was a blackened hulk'.⁶

In the context of this paper, the point of raising this realization is not to start a doctrinal roles and functions fight between armies and air forces, but rather to highlight the fact that capabilities change over time and the fundamental causes should be exploited to peace-loving allies' warfighting advantage. This is particularly true in an era where adversaries are working hard to negate the warfighting advantages we have exhibited over the past quarter of a century.

To best meet the challenges of future-peer and near-peer adversaries we must continue to exploit modern ISR, routine precision strike, improvements in survivability, and manoeuvre by focusing on two key essential actions. First, unshackle the surface-centric organizational paradigms of the past and embrace more functional joint and combined organizational constructs that can be achieved by greater integration of service components. Second, rapidly capitalize on the capabilities of the information age to actualize the ubiquitous and seamless sharing of information across systems in every domain as a vision of our collective militaries.

We are at a critical juncture in history. We are at the centre of an 'Information in War Revolution' where the speed of information, advance of technology, and designs of organizations are merging to change the way we operate. This change has dramatically shortened decision and reaction times and reduced the number of weapon systems needed to achieve desired effects. In World War Two it took months of time, thousands of airmen, and hundreds of aircraft to neutralize a single target. Today we can find, fix, and successfully engage multiple targets with a single aircraft within minutes.

Since the introduction of mechanized technology in the early twentieth century, the scale and scope of combat has been governed by industrial means of power projection. Advances in aircraft, ships, and ground vehicles increased speed, reach, and precision, but 'mass' remained an essential aspect of force application. In the twenty-first century, we face another technology-driven inflection point that will fundamentally reshape what it means to project power. *Advancements in computing and network capabilities are empowering information's ascent as a dominant factor in warfare.* No longer will it be sufficient to focus on simply managing the physical elements of a conflict—planes, satellites in space, tanks, amphibious elements or ships at sea.

These individual platforms have evolved from a stove-piped, parochial service alignment to a loosely federated 'joint and combined' construct today. To be effective in the future,

these same forces must become a highly integrated enterprise collaboratively leveraged through the broad exchange of information. Said another way, desired effects of military operations will increasingly be attained through the interaction of multiple systems, each one sharing information and empowering one-another for a common purpose—the Combat Cloud.

While mechanical technology will continue to serve as a key factor in future military operations, the information empowering these systems will stand as the backbone maximizing their potential. As the Combat Cloud is developed, it promises to afford an expansive, highly redundant defence complex with radically enhanced data gathering, processing, and dissemination capabilities. These attributes will offer actors at every level of war, and in every service component, dramatically enhanced situational awareness by transforming masses of disparate data into decision-quality knowledge.

This approach will not only change the way we define new requirements, but also more importantly, the way we think about operations, intelligence, command and control, and support. A distributed, self-forming, all-domain Combat Cloud that is difficult to attack and self-healing when attacked significantly complicates an enemy's planning and will compel enemies to dedicate more resources toward their defence and offense. In its ultimate instantiation, Combat Cloud will: 1) be strategically dislocating to any challenger; 2) provide conventional deterrence to a degree heretofore only achieved by nuclear weapons; and 3) enable operational dominance in multiple domains.

Turning this vision into reality will require a significant effort. While many militaries are evolving toward informationized forces, the integration and assimilation of related capabilities is incomplete. Forces are still predominantly organized, trained and equipped to fight a mechanized war—one in which information integration is a secondary support function. Most bureaucratic organizations and current programs of record reflect the linear extrapolation of the combined arms warfare construct developed in the industrial age of warfare. Program oversight efforts within our respective ministries of defence are also lagging—with antiquated industrial-age governance impeding information-age endeavours. Furthermore, with budget austerity as the new normal, our militaries need to devise more effective and efficient means to secure desired effects with existing capabilities. The Combat Cloud concept is a paradigm that allows us to do this.

If we are going to win the next great war, we need to gain persistent access to data networks while denying this same capability to any adversary. To be serious about this effort, military services need to embrace doctrinal and concept changes to how their forces are organized, trained, and equipped. The concept of the Combat Cloud stands as a framework to empower this vision.

Commanders must change the way they view networks and information systems. Rather than value only the weapons and platforms that launch them, commanders need to recognize the value of the effects they can create based on the seamless sharing of information. This shift in perspective will involve much more than simply material changes involving technology. Indeed, this is a completely different way of thinking about how we will use weapon systems in the future.

We need to think beyond the constraints that traditional military culture imposes on new technology. For example, fifth generation aircraft such as the F-22 and F-35 are termed ‘fighters,’ but technologically, they’re not just ‘fighters’—they are F-, B-, A-, E-, EA-, RC-, AWACS-22s and 35s. Similarly, the new ‘long-range strike bomber, or ‘B-21’, will possess capabilities much greater than the ‘bombers’ of the past. These new aircraft are actually more properly described as flying ‘sensor-shooter-effectors’ that will allow us to conduct information age warfare inside contested battlespace whenever we desire—if we fully exploit their ‘non-traditional’ capabilities to the degree that those capabilities become accepted as the new ‘traditional.’

Modern sensor-shooter-effector air and spacecraft are the key elements and will become the nucleus of the Combat Cloud because of their rapid reach and global perspective that only air power affords. However, this is not merely a recycled vision of net-centric warfare applied to air and spacecraft. It is a concept where every friendly force object and person is a component, router, and node in a real-time information-based constellation with low latency to enable accurate desired effects against priority targets.

The Combat Cloud as an operating paradigm will require an entirely different methodology for the command and control of air power along with the weapons and forces operating in the other domains. Command and control must keep up with the changes imposed by three major interrelated trends: emerging threats, new technologies, and the increasing velocity of information. The changes in these three areas since the design and establishment of our current Air and Space Operations Centers have been dramatic.

So much so that as a result of modern telecommunications, and the ability to rapidly transmit information to, from, and between various levels of command, there are many examples of ‘information age’ operations where tactical level decisions were usurped by commanders at the operational and even strategic levels. In fact, post-Desert Storm, most air power engagement decisions that involve lethal force have been pushed to the highest levels of command. This has occurred for a variety of reasons and is worthy of a book, but I’ll get to the point.

This devolution of the air power command and control tenet of centralized control—*decentralized* execution, to one of *centralized* control—*centralized* execution, has

caused reduced effectiveness in accomplishing air power mission objectives. Recall that this was the *Soviet* construct of command and control, and while it might work in permissive airspace in small scale operations, in contested airspace in large-scale operations it is sure to fail—we demonstrated that in Desert Storm when Iraq employed that doctrine. Commanders must discipline themselves to operate at their respective command levels if air power is to realize its potential in the future.

The challenges of emerging threats, information velocity, and advanced technologies demand more than a mere evolution of current command and control paradigms, but rather a new approach that capitalizes on the opportunities inherent in those same challenges. We cannot expect to achieve future success through incremental enhancements to current command and control structures—that method evokes an industrial-age approach that has lost its currency and much of its meaning. The requirements of information age warfare demand not ‘spiral development’, but modular, distributed technological maximization that permits and optimizes operational agility. That kind of agility will not be achieved without dramatic changes to our current air power command and control concepts of operations.

In order to capitalize on the advantages of moving to the distributed paradigm of the Combat Cloud, we must move toward *distributed* command and control, and shift to an evolved version of the ‘centralized control/decentralized execution’ model to one of ‘centralized *command*; *distributed* control; and decentralized execution.’ I will leave the details for another paper but suffice it to say that command and control of air power is fundamental to its success, and it must be adapted to become more agile and rapid if the Combat Cloud is to be optimized to its fullest potential.

With respect to Allied interoperability, partners around the world are modernizing their armed forces with new military capabilities that have the potential to enhance the effectiveness of a Combat Cloud-enabled force. Specific systems include F-35, Typhoon, Rafale, Aegis-equipped ships, P-8, Wedgetail, Eurohawk, the new Tempest combat aircraft, and others. Transforming these individual weapon systems into collaborative elements of an interdependent operational enterprise is what the Combat Cloud is all about. Whether discussing technical standards, common training standards, or established operational tactics, the potential afforded by individual Allied systems will only be realized if they are harnessed in an organized, deliberate fashion.

In the future we must possess an agile operational framework that enables the integrated employment of joint and Allied military power. It means taking the next step in shifting away from a structure of segregated land, air, and sea warfare approaches to truly integrated operations. The central idea is cross-domain synergy. The complementary employment of capabilities in different domains, instead of merely

additive employment, is the goal—such that each capability enhances the effectiveness of the whole and compensates for the vulnerabilities of other assets.

Transitioning from industrial age, platform-centric methods of force employment to a combined-effects approach of interconnected, information-driven actions involves numerous challenges. It will require a review of, and appropriate changes to doctrine, organization, training, material, leadership, personnel and education, facilities, and policy to define a ‘template’ to guide the following: modernization policy, acquisition and concepts of operation; seeking collaborative solutions among the services; moving from measures of merit that replace cost per-unit to cost per-desired effect; eliminating stove-piping of kinetic and non-kinetic options; developing reliable, robust, and anti-jam means of communication and data transfer; creating sufficient diversity of employment approaches to avoid single points of failure; and realizing automated multi-level security to ensure coalition participation.

The Combat Cloud inverts the paradigm of combined arms warfare—making *information* the focal point, not the domains in which the military operates. This concept represents an evolution where individually-networked platforms—in any domain—transform into a ‘system-of-systems’ enterprise, integrated by domain and mission-agnostic linkages.

That said, air power has already evolved to become the indispensable force in modern warfare, and it will only grow in capability and criticality in offering options for the solution to the wicked security challenges that lie ahead. In the future we should not be bound by the historical limitations of surface warfare-based doctrines of air power supporting ground forces, but rather need to advocate and articulate the tactical, operational, and strategic advantages of engagement options where air power is the key force supported by surface forces. Dr Phil Meilinger succinctly highlighted this point in his recently published book on air power, asymmetrics, and a new strategic paradigm where he states: ‘We must constantly search for new ways of fighting, and not merely using new weapons to fight in the old ways’.⁷

Given the entrenched position of the predominance of surface warfare officers in command of militaries around the world—particularly noticeable in the US military over the last 17 years—will the security options and capabilities that air power yield—even as they expand in scope and scale—be recognized and considered by national leaderships with the responsibility for military engagement?

AIR POWER ADVOCACY AND EDUCATION

In the early 1900s, pioneers of aviation sought freedom from many of the restrictions which burdened their peers. They slipped the surly bonds of earth to introduce to the world a new power—air power. In April 2018 we celebrated the 100th anniversary of the

Royal Air Force (RAF). Last year we celebrated the US Air Force's 70th anniversary as a Service proper, and it was also the 110th anniversary of US military air power—it was in August of 1907 that the first US military organization was formed with a specific focus on air power. That organization was the Aeronautical Division of the US Army Signal Corps. It was the precursor of today's US Air Force, and at that time it had exactly 10 balloons that were used to conduct reconnaissance—the equivalent of modern-day ISR you might say.

In 1908 they acquired their first dirigible and a trial aeroplane, and in 1909 the US Army purchased an improved Wright Flyer that was formally inducted into service—they named it 'Airplane Number 1.' This is the kind of creativity the US Army is still known for today. Joking aside, it is impressive to note that it was only four years after the first documented flight of a manned aircraft *in 1903*, that air power's military potential was formally recognized with the establishment of that first flying unit in 1907. That is the kind of forward thinking, of pushing the envelope, and of advancing established boundaries, that has been the hallmark of military air power, and of airmen, ever since. It occurred because pioneers with a vision for the potential of air power that was yet within reach strongly advocated for and successfully articulated those theories—theories of air power that far preceded its actual capabilities.

Today air power technology has caught up with—and to a degree, bypassed—early air power theory and the potential exists to dramatically expand the effects of air power as a means to achieve security goals and objectives. To do that, however, will require the same degree of boldness and courage of the pioneers of air power to initiate, develop, articulate, and to effectively advocate for those air power capabilities.

We have a complex series of security challenges facing us today. We are not going to buy our way out of these challenges—the money isn't there—nor are there any silver bullet solutions. We are not going to blast our way out of these problems with overwhelming force, as we no longer have the force structure we enjoyed in the past. We are going to have to *think* our way out of these problems and to succeed we need to exploit one of our greatest asymmetric advantages—the brains of airmen.

Our respective nations' airmen need to expand their vision, understanding, and knowledge of all things air force, but most importantly, to completely understand the fundamentals of why air forces exist as independent services, educate others as to the potential that air power offers, fight for a seat at the table where force employment options are decided, and strongly advocate for air power options where they are most appropriate. Unfortunately, the record of the last two decades is not positive with respect to any of these four elements. The reasons are complex and beyond the scope of this paper, but here are a few to consider.

First, an incorrect understanding and application of ‘jointness’ (or ‘jointery’, depending on which side of the Atlantic you reside). Since the 1986 passage of the Goldwater-Nichols Act in the United States, a joint approach was to move contingency organizations and operations from independent, de-conflicted, service-oriented approaches to sustained interoperability. Other nations adopted this approach. How well militaries have done that, where we are today, and where we ought to be heading, could and should be the subject of a thesis, but suffice it to say, the degree of jointness exhibited since 1986 has ebbed and flowed based on the commanders in charge, and the degree—or lack thereof—that senior-most military leadership encouraged joint organization and execution. The rationale and purpose of jointness is well-intentioned and optimizes the use of service component forces *if* properly understood and defined.

Jointness means that among our separate services, a distinctly developed and highly specialized array of capabilities is provided through service or functional components to a joint or combined force commander—his or her job is to assemble a plan from among this ‘menu’ of capabilities, applying the appropriate ones for the contingency at hand, and each contingency will be different. It does not mean separate services deploy to a fight and simply align under a single commander. Nor does jointness mean everybody necessarily gets an equal share of the action. Jointness is recognizing that to be joint we require separate services, and that it is an *imperative* that service members understand how to best exploit the advantages of operating in their domains. Articulating the virtues and values of your service *is being joint*.

Jointness is not homogeneity—it is not ‘going along to get along’. It *is* recognizing that to be joint we require *separate* and distinct services, and that it is crucial that leadership understands how to best exploit the advantages of operating in those domains. The reason joint or combined force operations create synergies is because this approach capitalizes on each services’ core functions—functions that require much time, effort, and focus to develop the competencies required to exploit operations in their respective domains. There are many leaders out there that don’t understand that to have jointness, the separateness of the services is a requirement. It takes 25 years to hone the expertise to be a great division commander on the ground, a battle group commander at sea, or a joint force air component commander. The construct of joint operations requires that we have strong and competent armies, navies, and air forces.

However, to capitalize on the potential of the true value of jointness, air forces need to have a seat at the table in option development, planning, and execution of joint operations—and command of forces and organizations where most appropriate. These conditions have suffered over the past quarter of a century—at least in the United States—and they need to be corrected.

To understand the state of affairs in this regard, there was a lack of real joint organization in Iraq and Afghanistan. More often than not a 'J' was simply put in front of an Army organization and that was it. Joint Task Force (JTF) Mountain in Afghanistan only had Army personnel assigned; there was a multi-national *CORPS* Iraq, but no JTF-Iraq; in Afghanistan there was an International Security Assistance Force, and US Forces-AFG, but there was never a JTF-Afghanistan, with associated service components.

This absence of real 'jointness' in the first decade of the twenty-first century has continued into the second and manifested itself in the current organizational structure of Operation Inherent Resolve. When operations against the Islamic State started in 2014, the President of the United States clearly stated that there would be no US ground forces involved in combat operations in Syria or Iraq. The only US force involved in combat operations—with the exception of a small number of special operations forces—was air power. However, the commander of Joint Task Force Operation Inherent Resolve has been an Army *corps* commander for four iterations to date. The Army CENTCOM commander would not put an Army Division commander in charge of a Navy aircraft carrier battle group but yet has no problem with putting an Armor Corps commander in charge of an air campaign.

Perhaps if there was an airman in charge, the air operations against the Islamic State would have been designed as an air campaign against a state, rather than as a continuation of the counterinsurgency campaigns of Operation Iraqi Freedom and Operation Enduring Freedom that were the experience of the Army commanders in charge. Perhaps then the Islamic State would have been nullified in four months instead of taking four years. Completing that operation rapidly we would not have given the Islamic State the gift of time—over four years to perpetuate their ideology of evil and spread it to over 30 additional countries; or time to migrate terrorists out of Syria; or time to commit the slaughter of innocent men, women, and children in the region.

The Army-dominated CENTCOM leadership is on the record many times saying this would be a long-term endeavour. That is how armies think because they generally move at the speed of infantry—single digit miles per hour. It takes a division commander in the Army 25 years to master the terrain that a lieutenant in the Air Force flies over in 90 seconds—think about that and its implications for operational approaches to campaign design.

Every service component leader has a moral obligation to think of the best way they can achieve desired effects in support of desired national or coalition aims. Top leaders can assess which option is favourable. When a service surrenders their voice in this process, they may be putting the nation or coalition at risk, and putting lives unnecessarily in danger if their approach, which may have never gotten to the senior decision-makers, was actually a better option that could secure objectives and save coalition lives. Back in

1930 Billy Mitchell succinctly stated: ‘The advent of air power which can go straight to the vital centers and entirely neutralize or destroy them has put a completely new complexion on the old system of making war’.⁸

Who is speaking like this in the air ranks today? Who offered the alternative of rapidly terminating the Islamic State’s ability to effectively function by rapidly crushing them in Syria as a first priority as opposed to rebuilding the Iraqi Army and then assisting it in regaining lost ground in Iraq? I posit that in Operation Inherent Resolve the latter could have been accomplished much quicker if an air-based strategy against the Islamic State in Syria was selected over the ground-based strategy applied that treated air power as simply aerial artillery.

In the interwar years of the 1920s and 1930s, airmen pioneered aviation technology, then devised concepts of operation around the potential of that technology and followed that up with associated air power doctrine. The value of this progression of technology, concepts, and doctrine was seen in the post-Second World War Strategic Bombing Survey assessment, which concluded that the air campaign was a ‘decisive’ factor in securing the Allies’ victory over Germany. Thank goodness airmen of the time articulated and fought for that option. Where and who are those airmen today?

We should all be very mindful that a generation of occupation-based, ground-centric strategies seeking to win hearts and minds that have different perspectives, and trying to turn sixteenth century tribes into modern democracies, has created a dearth of articulate air power practitioners and advocates in the ranks of our armed services. Airmen of the past two decades have been lured into a mould of compliance and silence. Compounding that compliance in the United States, was when US Air Force leaders in the first decade of the twenty-first century did advocate for a strong air force they were promptly removed from office.

The failure at the strategic level of the last nearly two decades of Army doctrine in multiple iterations should have lit a fire in the air power community—airmen should have been striving to seek optimal alternatives. However, airmen articulating alternative options have been missing. I believe that can be attributed to a fundamental misunderstanding of jointness as I described above.

As a service, the US Air Force went for nearly four years between 2006 and 2010 with not one Air Force officer in ANY of the top 11 positions in the Pentagon. Four years. The Chairman, the Vice Chairman, the Director of the Joint Staff, nor the J1, 2, 3, 4, 5, 6, 7 or 8. Since the establishment of *regional* Combatant Commands in the US—the warfighting commands—there have been a total of 107 commanders. Only seven have been Air Force officers. That is less than seven per cent of the regional Combatant Commanders in the *entire* history of the Department of Defense who have been from

the Air Force (and five of those seven were put in place within the last seven years, which is a result of a concerted effort on the part of several recent Air Force Chiefs of Staff to assist the Department of Defense to become more joint).

The family of US joint doctrine publications has a volume on petroleum and water distribution (Joint Publication 4-03), but none on strategic attack. Why is that? Because the other services are threatened by the thought of air power used in a fashion other than in support of surface warfare. And the most egregious recent example is that the most qualified, experienced, and knowledgeable senior officer in the entire US military in the Pacific area of operations was not nominated as the next Commander of Indo-Pacific Command in 2018, simply because he was an Air Force officer. Of course, a Navy Admiral got the nomination—never mind he only had one tour as a junior officer in that theatre.

These are but a few examples of symptoms that are a result of a lack of advocacy, articulation, and engagement by airmen since 9/11, and a lack of proper understanding of jointness. If we are going to optimally exploit the virtues and values of air power to meet the challenges of the future, our security establishments need a proper understanding of why independent air forces exist, a proper grasp of jointness, and a sense of air-mindedness that all air force members should embrace as a foundation of their being.

These examples bring to mind a quote that seems appropriate: ‘If you’re not at the table, then you are on the menu’. It is well past time for air forces around the world to get off the menu and start talking turkey—not being the turkey. Airmen need to think like architects—not bricklayers. They need to relate to bringing vigilance, reach, and power to whatever task they are given, not just offer solutions of weapon system a, b, or c. Air Force members today need to fully appreciate that they are *all* ‘airmen’ first with a connection to an enterprise much larger than their particular specialties. This connection is inherent in the unique way in which we *think*, more than it depends on the particular job we first learn entering the air force. Early proponents of air power called it ‘air-mindedness.’

Air power is based on the characteristics of technology—but the invention, development, and application of those instruments flow from human imagination, and knowledge. Air forces seize on the virtues of air and space *to project power without projecting vulnerability*, and as a result it can provide our nations with strategic alternatives simply not available any other way. But to do so we need to create a culture and environment that *encourages* disruptive thinking instead of *discouraging* it. Our air forces were founded as a result of disruptive thinking, but at the beginning of the twenty-first century, our air forces may have fallen into complacency in that regard as a result of the pressure of what I call ‘joint political correctness.’

We are not going to meet the budget challenges of the future by simply buying less of what we already have—we need to embrace and invest in innovation, creativity, and change. But is the military today walking that walk, or not? Have we become too risk-averse? How would Hugh Trenchard, Clément Ader, Hugh Dowding, Billy Mitchell, or Bernie Schriever act today if they were still alive? I think they would be trying to change our current surface-centric military culture to one that embraces the advantages of operating in the third dimension of aerospace as a *primary* means of securing our objectives, not simply one of supporting another medium of operations.

Air power options shape, deter, and dissuade so we can attain fundamental interests while minimizing the need for combat operations. When combat *is* necessary, aerospace capabilities yield a variety of strategic, operational, and tactical effects that provide disproportionate advantages.

In some nations, each of their services possess air *arms*—the Army, Navy, and Marine Corps. Those air arms exist to facilitate their parent services' core functions—their mastery of operations on the ground, at sea, or in a littoral environment. However, nations have only one Air Force. It is not just another air arm; its *reason for being* is to exploit the advantages of operating in the third dimension of air and space to *directly* achieve their nation's security objectives. It is this unique and specific focus that makes aerospace power an *asymmetric* advantage.

Airmindedness is the perspective that seeks how to best apply air power to meet nations' security objectives. It also encompasses how to effectively articulate those capabilities so our military and national political leadership incorporate them as alternatives of choice.

CONCLUSION

The challenge before us is to transform *today* to dominate an operational environment that *is rapidly evolving*, and to counter adversaries who *are rapidly advancing in capability*. In the face of disruptive innovation and cultural change, the military can maintain the status quo, or it can embrace and exploit change. I suggest that the latter is preferred.

Our services need to learn better how to rapidly adapt new technology to the innovative concepts of operation that technology enables. Our intelligence community, military, and other security institutions will suffer if their internal organizations fail to adapt to new, disruptive innovations and concepts of operation.

Just as combat tomorrow will look different than it did yesterday, so too should the military with which we prosecute it. We should take maximum advantage of the asymmetric capabilities our nations possess with their air forces operating in

conjunction with their land and maritime forces in innovative ways. A concerted focus on further developing and expanding air power capabilities and capacities would serve our Allied nations well, as they are uniquely positioned to underpin the kind of defence strategy and force structure appropriate to the future.

Airmen embrace the ability to rise above the constraints of terrain, literally, and to transcend the strictures of a horizontal perspective. As air power perspectives moved into space, a theory of the indivisibility of *aerospace* power materialized as the technologies of air and space merged in application. By the end of the twentieth century, the evolved combination of air and space technologies enabled great accuracy and assured access from aerospace systems. This combination yielded a concept of operations to achieve control over an enemy's essential systems no longer defined simply by levels of destruction. Rather, by imposing very specific effects on an adversary from means employed from air, space, and cyber, air power can effectively impose *strategic control* over the outcome of a conflict.

It is a methodology that realizes an adversary's ability to operate as desired is ultimately as important, or even more so, than the destruction of the forces it relies on for subjugation. This effects-based or outcome driven approach to warfare expands the options for the conduct of warfare beyond the attrition and annihilation-based models that define surface warfare. Air power going forward holds the potential to accelerate and amplify this approach.

General Hoyt Vandenberg, the US Air Force's second Chief of Staff, concluded his final speech to the US Air University by saying, 'You have got to go out and preach the doctrine of air power and never give an inch on it. You will be places where you are going to meet people who do not understand air power, and you are *going to have to educate*'. I cannot think of a more appropriate note upon which to close and urge you to follow General Vandenberg's counsel—not just for the benefit of our air forces, but for the benefit of our nations.

NOTES

¹ In this paper the term 'air power' is used in its larger context of including all operations that take place in the third dimension above the surface of the earth. Operations in space—and to a large part in the cyber domain—are inclusive to the term 'air power.'

² Sensor-shooter-effectors are assets which combine traditional aircraft roles (such as fighter, bomber or reconnaissance) into one airframe.

³ <https://dod.defense.gov/News/Article/Article/1254719/project-maven-to-deploy-computer-algorithms-to-war-zone-by-years-end/>.

⁴ For more information on this concept see, Rokke, Drohan, Pierce, 'Combined Effects Power,' Joint Forces Quarterly 73, 2nd Quarter 2014.

⁵ For a comprehensive treatment on this phenomenon see, *The Urgent Necessity*

to Reverse Service Air Land Roles, by Price T. Bingham, *Joint Forces Quarterly* 84, 1st Quarter 2017.

⁶ Nathaniel Fick, *One Bullet Away: The Making of a Marine Officer* (New York: Houghton Mifflin, 2005), p. 289.

⁷ Phillip S. Meilinger, *Limiting Risk in America's Wars: Airpower, Asymmetrics, and a New Strategic Paradigm* (Naval Institute Press, 2017).

⁸ William Mitchell, *Skyways: A Book on Modern Aeronautics* (Philadelphia, PA: J. B. Lippincott Company, 1930), 255.

Viewpoint

THE BLURRING OF THE AIR AND SPACE DOMAINS – PERSPECTIVES OF THE PHYSICAL, MORAL AND CONCEPTUAL IMPLICATIONS FOR THE ROYAL AIR FORCE IN ITS SECOND CENTURY

By Air Commodore Philip Lester

Biography: Air Commodore Philip Lester is Head Doctrine, Air, Space and Cyber at the Development, Concepts and Doctrine Centre. He is a graduate of the Higher Command and Staff Course as well as the Royal College of Defence Studies. He holds a MPhil from Cambridge and a MA from KCL. Last year he was employed as the Director Non-Lethal Effects within the US-led Land Component, Baghdad.

Disclaimer: The views expressed are those of the authors concerned, not necessarily the MOD. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form without prior permission in writing from the Editor.

‘The profile of the Space Domain is growing as our dependence upon it increases and the boundaries between air and space become less distinct’¹

Air Chief Marshal Sir Stephen Hillier,
Chief of the Air Staff (CAS) 2017

INTRODUCTION

The application of twenty-first century technology is increasing the blurring of the Air and Space domains, and this effect has significant implications for the Physical, Moral and Conceptual Components of Fighting Power and especially for the Royal Air Force (RAF). As Defence is exposed to effects delivered from space and dependent upon space-based capabilities, each Service needs to address the impact upon its warfighting roles. The RAF, however, has the greatest stake in this debate. Physically, the Air domain is the only conventional warfighting domain that borders space. Air and Space are therefore contiguous domains with increasing interdependencies. CAS now has the Defence lead for space operations and this gives the Service a mandate to explore multi-domain and multi-dimensional operations across the span of both domains as well as their interface. Conceptually, every airman and woman needs to understand the physical, conceptual, and moral implications of the blurring of air and space power to address the inherent challenges and maximise the opportunities for both domains in an almost seamless manner. So, in an era reminiscent of the seismic changes that occurred in air power’s infancy, the RAF should again lead the charge to understand, develop, and capitalise upon the efficiencies and practicalities of this naturally blurred environment.

This essay provides a **personal** perspective of the Air-Space context. Further analysis will be required to develop our thinking and activities. It therefore poses questions rather than delivers answers. It will use extant doctrine and conceptual thinking to illuminate a path that could be taken to facilitate the production of novel operating concepts, which could be debated and adopted as future doctrinal practice. Accordingly, this essay seeks to stimulate debate and deepen thinking across the Service. It uses the author’s deductions for air power taken from Joint Concept Note (JCN) 1/17 ‘Future Force Concept’² along with perspectives on a variety of doctrinal texts to guide the way. It will offer some insights as to how the Air and Space domains could be exploited, as conjoined entities, to the best military effect.

THE REALITY OF BLURRING AIR AND SPACE – THE DAWN OF THE AEROSPACE DOMAIN?

Boundaries. There are various approaches to qualifying the boundary between Air and Space; the most widely accepted of these is known as the Kármán Line, which sets the interface between the two domains at an altitude of 100km above sea level. However, the reality is a gradual transition from our atmosphere of air into a space devoid of air molecules.³ The blurred boundary between the Air and Space domains

is especially evident in the context of doctrine and the realities of modern practice. It would, nevertheless, also be correct to say that each represents a discrete domain from which military effects can be delivered and upon which the other conventional warfighting domains are increasingly dependent.⁴ However, following the recent announcement of CAS as the lead for Space operations, it is also correct to infer that this brings some significant challenges and, more importantly, opportunities, to deliver effects across both domains in a more consistent fashion. So doing will increase the fusion of Air and Space effects to support the delivery of outcomes below the surface, on the surface, and above the surface of the Earth from platforms and capabilities that operate in the air, from space, and across the air-space continuum. CAS' vision, aligned with the emerging National Space Strategy, is reminiscent of the vision and drive expressed by Marshal of the Royal Air Force Lord Trenchard during the formative years of the RAF. So, while all three Services may be focused on relatively geographic 'hot-spots' of activity at sea, in the air and on land, the RAF will also be put to the test simultaneously over the greatest horizontal and vertical range and more so than it has experienced in recent years. This is because of the reality that the Air and Space domains have the greatest physical horizontal and vertical spans. These domains are also increasingly vital to both our national economy and national security. While Maritime doctrine correctly identifies that a significant proportion of our national trade effort utilises the seas and the oceans, I contend that 100% of our trade is affected or enabled by either access to, or enablement from, the Air and/or the Space domains. Therefore, access to and control of both domains will undoubtedly become one of our top national security challenges. Such challenges may require us to review our current perceptions of the attributes of both Air and Space Power and adapt to the way in which these environments and any ensuing battlespace is commanded and managed. Is the RAF up for this challenge? If so, what needs to change in the way it thinks, prepares, acts, and fights over the coming decades, and in which areas does it need to focus its investment?

RAF100 – A Legacy. The legacy of the RAF's first centenary suggests to me that it is up for that challenge. The RAF is a multi-domain operator in both character and nature as its outputs transcend operations across all warfighting domains and in all dimensions.⁵ Although, as I am reminded by my Army and Royal Navy colleagues, the other Services have an important interest in cross-domain operations too, it can be argued that their multi-domain activities are generally designed to improve the outcome *within* their respective domains rather than to achieve consistent effects across the horizontal and vertical span of an operation or campaign.⁶ Their activities, while multi-domain in character, are single-domain in nature in that they invariably seek to generate effects to create advantage within their own domain or for their own component. Conversely, the characteristics of air and space power allow the RAF to reach across all domains to deliver effects across all dimensions in support of all warfighting components to the greatest horizontal and vertical reach achievable. To continue to do this requires agile

and adaptive Command and Control (C2), including multi-domain and multi-dimensional battlespace management that maximizes the combined attributes of height, speed, reach, agility and ubiquity of air power with attributes of perspective, access, persistence and versatility of space power while increasing the permanence of presence and survivability against emerging threats.⁷

CONCEPTUAL COMPONENT

Doctrine. The second edition of Joint Doctrine Publication (JDP) 0-30 'Air and Space Power' was published last year. It is the latest iteration of evolving Air doctrine and is our first attempt to merge air and space power. It also recognises, in doctrine, Space as a warfighting domain in its own right. Underpinned by policy, this doctrine outlines and reinforces the synergies between Air and Space. It also highlights the complementary attributes of both air and space power.⁸ Yet it is not surprising that each domain, despite their blurred interfaces, retains a degree of distinction. After all, Space is *space* and Air is *air* – in doctrinal terms at least. The gap between what we can do in both domains is changing, as demonstrated by the Carbonite 2 Project, and the F-35B Lightning and Protector programmes, but none of these has succeeded in rendering the distinction between Air and Space redundant. Indeed, these projects and programmes reflect a somewhat traditional view of both domains. The next Air and Space doctrinal leap must therefore close that gap, through the re-evaluation of the characteristics of both domains, possibly leading to characterisation of 'aerospace' as a future fused warfighting domain. But that requires some more conceptual thinking and some focused experimentation. Setting that strategy must be a priority for the RAF. Yet, as I write this, the DCDC is engaged in revising UK Defence Doctrine and the Defence Operating Concept. It is clear, from our research and the broad cross-Whitehall engagement that informs these publications, that 'Grand Strategy' is making a long overdue return to our doctrinal lexicon. This is partly due to the recognition that today's geopolitical context, and our known national ambition, requires a strategy that addresses the challenges of persistent competition, while the re-emergence of asymmetric, sub-threshold 'attacks', requires a broader definition of national security, national interest and, of course, our strategic goals. Thus, the security of the Air and Space domains will become an increasingly grand strategic, national security priority. Therefore, as the lead for air and space power, the RAF will have a large part to play in any such grand strategy, but this requires airmen and women to think beyond today's technologies and tactics and consider how we get to tomorrow's technologies as quickly as possible. The RAF needs a strategy to do this and airmen and women must learn to think more strategically earlier in their careers – reading Julian S Corbett's seminal book 'Principles of Maritime Strategy' is, somewhat paradoxically, a very good start: just delete 'sea' and insert 'air' or 'space'!

Concepts. This leads very nicely on to JCN 1/17 'Future Force Concept', published almost simultaneously with JDP 0-30 Air and Space Power Second Edition. Both are DCDC products and it is clear there is a high degree of synergy between the two publications.

However, I would like to have seen the Future Force Concept go further and to have been bolder in its ideas especially with the contextualization of domain and cross-domain challenges. In the meantime, I believe that the Air community should undertake a broad review of the Future Force Concept to identify, understand, and address the implications for air and space power. This work should be a joint venture between the Air Staff, Air Capability, the Air Warfare Centre, the Directorate of Defence Studies (RAF), and the DCDC, and this essay outlines some initial thoughts to stimulate such a review.

So What? The RAF of the 1920s was thrust to ever greater heights because of the legacy of the First World War, a realisation of its nascent strategic potential, as well as a shared belief in what the RAF was for, and how to optimise the Service for the future. A similar dynamic is at play today. The RAF represents an agile, forward-poised and persistently engaged, yet precise, conventional military capability, ever-ready to protect our nation and its interests. The RAF's air power credentials are well-founded and it is maturing its Space credentials at speed. The fusion of a solid air power foundation with capabilities from, through, and into space will provide the UK with an effective and efficient way of multiplying that capability and maximising its utility. This means exploiting the blurred boundary between Air and Space, drawing on CAS' vision for multi-domain C2. Our Conceptual Component must drive the development of the Physical and Moral Components, else we risk simply reverse-engineering the rationale for our capability choices and leading our people bravely to defeat.

PHYSICAL COMPONENT

Conventional Perspectives. The Physical Component is the one with which airmen and women tend to be instinctively the most comfortable. It is about the platforms, capabilities, weapons and 'stuff' that, to many, define what the RAF 'is'. This applies just as much to the Space domain as it does to the Air domain, and the best way of achieving this may be to address both domains as seamless entities. In years gone by, the reality of doing just that was limited by technology separation: what worked in space did not work in the air and *vice-versa*. But modern technology – especially with hypersonic engines, pseudo-satellites, high-resolution optics and radar technologies – makes it conceivable that, with appropriate investment choices, future military capabilities could have the potential to be employed in both domains, perhaps even within the same mission. These technological enhancements are also likely to deliver the improvements in speed, reach, persistence, coverage, survivability, and precision necessary to provide an increased range of options for military commanders and political masters alike. But to embrace this new technology will undoubtedly require us to change our preconceived ideas of air power as being delivered predominantly from manned, fixed-wing, air-breathing platforms which operate at relatively low altitude. The blurring of the Air and Space domains allows us to translate our experiences of inner-atmosphere aviation into even higher vertical limits and far greater ranges of effect. In the remaining paragraphs of this section, I will explore what I believe to be the four

greatest technological developments that will allow us to transform air and space power over the next 30 years.

Hypersonic Engines. At a glance, hypersonic engines may appear to be a ‘silver bullet’ which will unleash air and space power in the twenty-first century. This field of technology shows great promise, and much is possible within the next couple of decades providing there is investment in the emergent technology. So, what can hypersonics offer the Air environment? A good place to start would be to look at what Reaction Engines Limited (REL) has to offer with their experimental Synergetic Air-Breathing Rocket Engine, or SABRE.⁹ Initial work looks incredibly exciting and could give rise to a working platform by 2030 that is capable of Mach 5+ and offers high cadence space access as well as long range inner-atmosphere flight. Such technology also appears promising because it purportedly offers ‘speed as the new stealth’ and potentially increases the survivability against an array of current and anticipated anti-access systems. Furthermore, while the technology claims to enable space access it can also, in theory at least, provide a vehicle from which a space payload could be launched. But hypersonic technology is not limited to just platforms. It can be applied effectively to weapons: air and ground-launched, offensive and defensive. Whatever the manner of its employment, hypersonic technology has the potential to provide significant benefit to all operating domains – a true force multiplier. Thus, even at this relatively early stage in its programme, hypersonic technology represents a very strong candidate to address the physical aspects of the blurred Air and Space domains. While there are numerous hypersonic technologies under development, SABRE is novel, it is British, and therefore offers a sovereign capability with all the accordant benefits for our national prosperity agenda.

Pseudo-Satellites. This field, especially when partnered with quantum radar technology, also offers great potential, particularly for communications, Intelligence, Surveillance, and Reconnaissance (ISR), and as a novel way of producing a recognised air and space picture. Like hypersonics, there are many aerospace businesses that are exploring the potential of high-altitude pseudo-satellites (HAPS). Airbus’s ‘Zephyr’ is but one. This offers high altitude (inner atmosphere), persistent (months), loitering, and re-usable technology to enhance communications and ISR coverage. Although currently limited to a 10kg payload, this is likely to double in the next decade. This could allow the addition of a quantum radar capable of maritime sub-surface surveillance. So, Zephyr sits on the edge of space, can observe or relay communications across multiple dimensions and all warfighting domains, and offers precision and persistency over a selected area at any specified time – this is more than most current satellites can offer. It therefore hints at a capability that capitalises upon the blurred Air and Space domains to the potential benefit of all warfighting domains. It certainly looks a very strong candidate to provide persistent maritime sub-surface cover for a vulnerable carrier strike group, and then to cue appropriate responses. It can also contribute a significant amount to any recognised air, land, or maritime picture.

Quantum Technologies. Quantum science has the potential to derive multiple quantum-based technologies with very significant military applications in cryptography; communications; position, navigation and timing; radar; sensing; and imaging.¹⁰ These latter three quantum technologies could have much utility, and very disruptive effects, not only across and within the Air and Space domains but all other domains too. Imagine being able to detect contemporary stealth aircraft at will, submarines below the surface of the oceans, and activity in subterranean passages on land. Such potential means that a quantum competition for first-mover advantage is well underway. It is one that airmen and women must understand because it will impact on the way we will fight in Air and Space.

Directed Energy Weapons. The application of Directed Energy Weapons (DEW) to air and space operations is also likely to be significant. Whether the DEW is of the Radio Frequency variety (which employs electromagnetic radiation against sensitive electronic sub-systems) or a high-powered laser form (which uses electromagnetic energy to damage equipment through its thermal effects), the applications are many and varied, with technological development now so advanced that they are soon to be a reality on operations. In our blurred context, it will be technically possible to direct weaponised energy from the surface of the earth into space, and from objects in space to the surface of the earth. Most acute in the Space domain is the emergence of proximity operations between satellites, where directed energy can be used to disrupt, damage or even destroy in a very harsh operating environment where it is also very difficult to understand cause and effect, and therefore to attribute responsibility.¹¹

The Supercharged Digital Revolution. The falling costs of gaining access to space, fueled by the commercial lead in the application of digital technologies has significant implications for the so-called Fourth Industrial Revolution that is defined by data. Space-derived Big Data, and its application, has the potential to be very significant in the Air and Space domains. For the same reason it is the greatest opportunity for trade and simultaneously gives rise to a significant security challenge. Today, farmers are using this data to manage their crops, governments to manage their response to flooding crises, and tomorrow, militaries will be using it to increase their understanding of the battlespace.¹² This digital revolution is key to realising the opportunities of the blurred Air and Space domains and maximising the benefits this can offer for national security.

Next Steps. But these are technological solutions to today's and tomorrow's problems. The immediate challenge – and one to which the RAF has already risen – is the need to improve the way in which it commands and controls space operations. The recent reformation of 11 Group as a multi-domain operations group is an exciting initiative designed to bring about seamless C2 for Air and Space domains. The operation of 11 Group will, in effect, cease to see the Air and Space domains as separate warfighting entities. While much work still needs to be done to codify procedures and linkages,

it appears to me a bold and appropriate step towards taking the lead and clarifying the blurring of Air and Space and maximising operational outputs. An air and space operations centre, capable of directing, commanding, and controlling air and space activities – at home and abroad – from the UK and/or a forward deployed Air Component headquarters is a large step forward for the projection of air and space power. But to be effective it will require significant investment in the Physical, Conceptual, and Moral Components of Fighting Power, to ensure interoperability with other domains, allies and partners; resilience from the effects of potential physical and cyber-attack; but also the ability to think and act strategically while delivering tactical and operational outcomes. This is key and requires a fundamental shift in mindset from single-domain technology and tactics, to a multi-dimensional and strategic approach that synergises activity across domain boundaries.

MORAL COMPONENT

Why we Fight. The final element is the Moral Component of Fighting Power. In short, this component encapsulates ‘why we fight’. It can therefore be posited that this Component is the most subjective aspect of the trinity of fighting power. While this is undoubtedly the case, a significant objective element must prevail. That is, where leadership and identity come into play. The two are mutually-supporting and, as airmen and women, we have a natural affinity to the air above our earth and what we can achieve from it. Because the Air and Space domains are blurring, we must widen our aperture to look higher and further to explore how the characteristics of air and space power themselves need to amalgamate as the technology allows us to operate in both domains and within the same mission. While all three conventional warfighting domains will always have dependencies on, and be vulnerable to threats stemming from, space, the RAF has the strongest cultural affinity as well as an identity that is linked to the above-surface dimension, including space. CAS has already started to tackle the challenges of leading the changes necessary for the RAF to embrace space power. RAF100 is a springboard from which we can enhance our thinking towards space, and contextualise the changes required to translate why we fight from the air into why we fight from the air *and* from space. But how do we do that?

Spring-boarding. Earlier, this paper mentioned the need for airmen and women to think beyond the technologies and tactics. Thus, conceptual innovation is key, but it must come from a solid baseline assessment of what we *cannot* do today and why. We cannot afford the luxury of a perpetual innovation-change cycle without firm investment in the consolidation of capability and a rigorous lessons process that spans the tactical, operational and strategic levels. Without these we risk creating and chasing *conceptual fashion*, the result of which is somewhat vanilla and relatively short-lived thinking.¹³ We have lost the edge on this front, partly due to two decades of counter insurgency operations and also a rather passive and reactive approach to contingency and readiness (and the fiscally-driven constraints on many activities). The result is that we risk losing

our offensive spirit, and this would weaken our ability to deter – a very strong commodity in this world of persistent competition. This is not, I believe, a trend that threatens only the RAF; it applies equally to the Royal Navy and the Army. But let us not forget that the RAF is no longer responsible for the Moral Component in the Air domain alone. The addition of Space to our portfolio brings an array of new challenges not just on how we meet our own objectives and requirements but how we provide an expanded service to the Maritime and Land domains too – and all at the same time!

SO WHAT? – SOME POTENTIAL INSIGHTS

To kick start that process, I believe that the Future Force Concept highlighted the following key themes which will be critical strands of work to bring clarity to the blurring of the Air and Space domains. The list is by no means exhaustive, but the following paragraphs in this section reflect the challenges and opportunities that need to be grappled with now.¹⁴ Addressing the blurring of the Air and Space domains now will undoubtedly help us to develop better capabilities going forward.

Governance. The UK has recognised Space as a warfighting domain on a par with the Air, Land, Maritime, and Cyber domains and highlights that *‘while all domains are equal, the relative start points for integrating across the domains as a joint force are not’*.¹⁵ The inference from this statement reflects the differing needs, as well as constraints, of multi-domain and multi-dimensional operations. Thus, the push and pull of C2 will need to be more dynamic and flexible and the battlespace management architecture more complex and multifaceted. The RAF has been given the Defence lead for C2 of space operations and, as well as the provision of Space Situational Awareness and Space Control capabilities, the development of a cadre of qualified and experienced space personnel. The challenge is, intellectually at least, analogous with that faced by the RAF in its infancy. How should we do this, and what can we learn from others? There is much we can learn from the US approach, but I believe that there is a very British way forward here. In the US, there is much debate over what multi-domain operations constitute. This debate is not necessarily germane to UK Defence business. We have Joint Action as a cornerstone of our warfighting doctrine – and it works.¹⁶ Joint Action – comprising Fires (lethal and non-lethal), Manoeuvre, Information Activities and Outreach – is inherently multi-domain in construct and execution. The US have not had a comparable model that fuses the combined multi-domain capabilities in each of their Services. The US’ Multi-Domain Operations (depending on the lens through which it is viewed) is arguably little more than an endeavour to codify a domain-centric approach to Joint operations. While we have similarities with the way US military theorists think, our respective organisations are somewhat different, and our dependencies are also quite different. We should therefore continue to determine what best meets our needs rather than attempt to shoe-horn an inappropriate idea into functioning UK doctrine and practice. Thus, the application of Joint Action, executed within domains, and fused across domains by the appropriate

command and control structure, remains the best way for UK Defence to deliver a multi-domain effect.

Reliance and Resilience. The RAF (and all of UK Defence, like most Western militaries) has become wholly reliant on access to space-based services to deliver its operational outputs. This has created a single point of failure with little or no resilience. Not only have our potential adversaries noticed this but they have been actively demonstrating how they could deny this essential access. We may consider, therefore, that Space has evolved into a warfighting domain. Acceptance of this is a crucial first stage in addressing a vulnerability, but how we do this, and how we do it *quickly*, is surely a major challenge for us all. We talk of deterrence, but can we deter an adversary from denying us unfettered access to space? Not an easy question to answer as I judge that following 20 years of COIN focus we have forgotten what deterrence is and how to do it. This is the subject of a new doctrine publication but the role for Air and Space power in a deterrence strategy will require some agile thinking and some even clearer action.

Narratives – What We Are For. Since the end of the Cold War, a situation has developed in which attention is focused on what the RAF does, rather than on what the RAF is for. We have perpetuated this disconnect by our own unsophisticated descriptions of air operations. We say, for example, that we have ‘*dropped a bomb here*’ or ‘*taken a picture of that*’. Instead, we should be explaining the breadth of options that the RAF offers to our Government in pursuit of political objectives, and why the RAF has been selected for a task in preference to other military tools. Similarly, we have not clearly articulated the contribution of air power to campaigns at the Operational Level of War. Instead, we have focused the narrative on tactical actions. But this has too often relegated our contribution to the Joint Force to a subordinate, supporting role. Afghanistan was a Land-centric campaign, but it is rarely acknowledged that it was made possible by the provision of a full spectrum of Air and Space functions and capabilities. Militarily, Libya was a very successful Air-centric campaign, but that success has been obscured by subsequent political failure. The contemporary operating environment is more blurred than ever before with operations being conducted in space and cyberspace as well as below the surface, at sea, on land and in the air. All warfighting components need to be adept at multi-dimensional operations and with complicated and rapidly changing C2 arrangements. Air forces, with their inherent vertical and horizontal reach, and scope for delivering cross-domain, multi-dimensional effect, need to be most comfortable with this. CAS’ recent statement of intent for C2 to be enshrined as the fifth pillar of air power plays to this tune, but the strength we seek to exploit is the instinctive way in which we have always sought to manage the battlespace in an integrated and multi-dimensional fashion. We have taken for granted that the public can make the conceptual leap to understand the value of what we do, when instead we need to provide explanations that are both explicit and convincing.

We have not done this effectively for our primary domain, so to do better across both domains will be a considerable challenge. But, unless we do, the public will not comprehend the value for money we offer and the true extent of what we are for. Thus, in simple terms, our unique selling point of '*securing our skies*' should be expanding to become '*securing our skies and space*'. From this, we can then build the evidence and narrative to reinforce the actions and the investment. Sophisticated capabilities such as the F-35B Lightning, a fighting information system that can orchestrate much around it, challenge us to articulate their true campaign contribution, not just their tactical capabilities. At the same time, we need to advocate what can be achieved more effectively by capabilities with increased persistence and reach across the blurred Air and Space domains, such as hypersonic technology and HAPS.

The Fourth Digital Revolution. Developments in Artificial Intelligence (AI) and autonomous technologies may bring about a Revolution in Military Affairs that alters the *nature* of war itself. Our adversaries recognise this, are investing heavily, and may well dispense with the legal and political processes which govern our own approach. With Information Advantage, '*the credible advantage gained through continuous, adaptive, decisive and resilient employment of information and information systems*', likely to be important to the success of future conflict, we must embrace the technologies that enable such advantage and weave them into the way in which we command, control and manage our multi-dimensional battlespace and direct the Air and Space contribution within our Joint Action construct, across all domains and dimensions.¹⁷ Of course, we should tread carefully but cannot be too cautious. Our somewhat risk-averse culture cannot be a handbrake to rigorous and continual consolidation of capability, including experimentation. Rejuvenating our offensive spirit is also key here, and we must take the public with us on that conceptual journey or we risk a narrative dominated by those who portray AI technology as Terminator-style killing machines.

Autonomy. Our early tactical adoption of AI and autonomy is likely to be in the form of Human-Machine Teams (HMT). How do we assure each other that actions undertaken by your HMT are compatible and valid with those taken by mine if we are supporting the same mission? How do we ensure that capabilities are sufficiently interoperable? These are challenging technical questions, but if we can address them quickly then our adoption of HMTs can be a true force-multiplier and a potentially decisive capability. AI, autonomous systems, and HMT provide opportunities for, and threats to, the RAF. Encouraging innovation and accepting failure will assist in augmenting existing capabilities, but will not present us with the opportunity to leap ahead of competitors. With limited resources, how does the RAF work in parallel, augmenting existing capabilities while researching new game changers? How do we engage proactively in the public debate and counter the Terminator narrative, rather than be a spectator (as with the RPAS debate)?

Whole Force ‘By Design’ – A Risk? The UK has put its future delivery of military outputs in the hands of the Whole Force Approach (WFA), a blend of regulars, reserves, civil-servants and contractors. This approach is being developed through new conceptual work to introduce WFA ‘by design’. But what are the risks? The recent Google situation where some of its employees effectively became conscientious objectors to their employer’s involvement in supporting military analysis for fear of its algorithms being used in the targeting chain could be the start of a new, unpredictable, and worrying trend. I do not know what the best approach is to safeguard against this, but the current climate of fake news and misinformation, as well as the intentional use of information as a weapon, suggests there are inherent risks in a WFA. But I am sure that if we stick our heads in the sand and keep quiet, the potential for a contagion effect at the wrong time will increase. Notwithstanding the potential risks, the WFA is critical to maximising the advantages of fused air and space power and we need to start that journey now by looking at the wealth of knowledge and experience embedded in the aerospace industry and exploring what this can offer the Service now and into the future.

Manned-Unmanned Debates. By 2068 it is possible that there will be few, if any, manned combat platforms flown by what we label as tier-one air forces. Technically it will not be necessary – we’re not far away now. But, more importantly, tactically it would be unnecessarily self-defeating. Unmanned platforms will be optimised for performance beyond human capacity to endure. The Air domain will be a risky place to operate given threat proliferation when in a contested situation. So how will air forces define themselves without the ‘heroic’ human in the cockpit? How will ‘airmen’ be perceived by the public? And what will we use our ‘airmen’ for instead of for flying aircraft in tactical engagements? Are there lessons to be learnt from the public controversy over RPAS and ‘drones’?

Strategic Thinking. What do we want the RAF look like after the passing of its second century, and how do we get there? The origins of our first 100 years were the result of strategic thinking, rising to the emerging threats and providing alternative solutions to grand strategic problems. Conversely, the latter decades of our first century appear to be tactically-focused, inward looking, and narrowly technologically motivated.¹⁸ While much of this could be attributed to the relatively narrow problem-set facing Defence we need to reinvigorate strategic thinking in the RAF and strategic planning as a core function. Our first step to realising this could be a better assessment as to how we anticipate the evolving threats and position ourselves to remain visible and relevant in the eyes of a public squeezed by austerity. How do we develop strategic leaders for such a rapidly changing political, economic and technological landscape?

Levels of Warfare. Does the compression of warfighting through technological advancement also result in the compression of the Levels of Warfare? Hitherto, air power has been viewed by many as a largely tactical endeavour, in support of and enabling joint

operations, but with an ability to deliver a strategic effect. Space power, conversely has been a very strategic endeavour with many of its products being utilised to maximise tactical effect – from imagery to communications. Now, and very much into the future, these domains will also be blurred from the viewpoint of the levels of warfare, with structures that are normally configured for the delivery of tactical C2 effect being used to deliver greater strategic C2 effect. Similarly, it is highly possible that platforms will be capable of stretching the meaning of multi-mission to new heights with platforms undertaking exo- and inner-atmospheric tasks within a single mission. So, as we go forward, air and space power will quite literally know no bounds.

CONCLUDING REMARKS

So What? The Air and Space domains are distinct, but this essay has shown that there are many potential advantages to thinking of them as a single entity or at least as a continuum of each other. Emerging technology and changes in how we fight will provide opportunities to achieve this. It is, therefore, clear to me that opportunities await those who can embrace the blurring of air and space power. Changing national demographics, Defence governance structures, and strong organic air and space sectors provide opportunities to realise an affordable Air and Space capability that will undoubtedly serve as an efficient and effective force multiplier for Defence. But, to do so we need to improve our understanding of the risks and articulate a clear strategy to realise the potential on offer. My observations of several national space ‘startups’, who are already exploiting what has been labelled ‘new space’, is that they present an open door for cooperation and exploitation of the blurred Air and Space domains. But we need to strike now – Carbonite II is a great first step – but we need to transition from the step, to the jog (maybe with HAPS), to the run (undoubtedly with hypersonics), and where needed the sprint, very quickly if we are to capitalise upon and further develop our sovereign capabilities and maximise Defence capability. But to do so requires resources and commitment – from within the MOD, across Whitehall, and nationally – towards a clear strategy and accompanying narrative on ‘what we are for in the air and in space’. This brief, very personal perspective, was written with the intent to stimulate. We are on the launchpad of a very exciting journey to exploit the blurring of Air and Space to the maximum effect possible. Because of the nature of what has been discussed, it is impossible to be precise or predictive – there is no crystal ball! There is deliberately much in this paper that is open to challenge – and I would welcome that challenge. Because to challenge requires thought, and that thought will lead to further informed debate, which can only lead to a position of better understanding. From understanding the opportunities and challenges we will be able to exploit the advantages of the blurred Air and Space domains to the greatest effect possible. The RAF represents the best national means through which the military potential of a combined Air and Space effort can be realised. So, take this paper to be a conceptual nudge, and help those whose business is the Conceptual Component to codify, realise, and challenge some of its assertions!

NOTES

- ¹ Joint Doctrine Publication (JDP) 0-30 'UK Air and Space Power' (Development, Concepts and Doctrine Centre (DCDC): Shrivenham, 2017) Page iii.
- ² Joint Concept Note (JCN) 1/17 'Future Force Concept' (DCDC: Shrivenham, 2017).
- ³ Lucy Rogers 'Its only Rocket Science' (Springer: New York, 2008) Page 2.
- ⁴ Joint Concept Note (JCN) 1/17 'Future Force Concept' (DCDC: Shrivenham, 2017) Part 3.
- ⁵ The themes of multi-domain and multi-dimensional operations are being explored in the re-write of JDP 01 'UK Defence Capstone Doctrine'. No formal definitions are offered here as each of the compound terms, derived from the Concise Oxford English Dictionary', are suitably descriptive.
- ⁶ Implied in 'Conduct of Maritime Operations' (MWC: Fareham, 2015) Section 1.1, Page 13 and JDP 0-20 'UK Land Power' (DCDC: Shrivenham, 2017) Chapter 1 Page 3-10.
- ⁷ JDP 0-30 Pages 25, 91 and 92.
- ⁸ Ibid.
- ⁹ See www.reactionengines.co.uk.
- ¹⁰ See https://s3.amazonaws.com/files.cnas.org/documents/CNASReport-Quantum-Tech_FINAL.pdf?mtime=20180912133406 accessed 11 Oct 18.
- ¹¹ See <https://www.bbc.co.uk/news/technology-45194333> accessed 11 Oct 18.
- ¹² See <https://www.forbes.com/sites/bernardmarr/2017/10/19/why-space-data-is-the-new-big-data/#4a08755f69a1> accessed 11 Oct 18.
- ¹³ Where the need for conceptual innovation is based upon agenda, bias or opinion rather than on empirical evidence of need.
- ¹⁴ The following paragraphs on 'insights' were compiled from several discussions and email exchanges between the author and Group Captain Paul Wilkins RAF, Assistant Head Strategic Analysis in the DCDC.
- ¹⁵ JCN 1/17 page 19.
- ¹⁶ JDP 3 Campaign Execution (DCDC: Shrivenham, 2009) Chapter 3.
- ¹⁷ See JCN 2/18 'Information Advantage' (DCDC: Shrivenham, 2018).
- ¹⁸ To the support and enablement of relatively geographically fixed Counter Insurgency and Counter Terrorist operations.

Book Reviews

THE ROYAL AIR FORCE: THE FIRST ONE HUNDRED YEARS



BY JOHN BUCKLEY AND PAUL BEAVER

PUBLISHER: OXFORD UNIVERSITY PRESS (12TH JULY 2018), (ISBN-13: 9780198798033), 288 PAGES

REVIEWED BY WING COMMANDER JAMES PARKER

Biography: Wing Commander James Parker MBA BCom RAF is currently Station Commander RAF Scampton, having commissioned into the Flight Operations branch in 1999 as a University Cadet. A fluent French speaker, he recently spent four years in Paris, initially on the Advanced Command and Staff Course at the Ecole de Guerre and then as an exchange officer on the French Joint Staff.

INTRODUCTION

The centenary year of the RAF has seen the publication of several books chronicling the history of the Service. However, *The Royal Air Force: The First One Hundred Years*, stands out from the crowd. Condensing one hundred years of RAF history into a manageable volume would be a challenge for lesser authors, yet John Buckley and Paul Beaver succeed because of their skill in melding insightful strategic assessments with genuinely fascinating historical and contemporary details. This ensures a new and authoritative perspective on a story whose essentials are relatively well-known.

The author of several other notable books, including *Monty's Men: The British Army and the Liberation of Europe 1944-5*, which won the Templer Medal in 2014, Buckley is Professor of Military History at the University of Wolverhampton. His cooperation with Beaver, who spent five years as editor of *Janes Defence Weekly*, and is an Honorary Group Captain in the Royal Auxiliary Air Force, has resulted in an informative and highly readable book. Structured into twelve chapters, the book addresses the full breadth of RAF history from inception to the present day, conveying the authors' premise that the three greatest influences on the RAF have been technology; finance and resources; and the connection between air power and national strategy.

The book begins by outlining the formation of the Service, highlighting many points of interest, some of which may also amuse the reader. Many will be aware that a major driver for the formation of the RAF was the public perception that the United Kingdom was vulnerable to German aerial attacks, but it is probably less well-known that 'the damage to the economy caused by German bombing was around one per cent of [the damage] caused by rats' (page 22). The second chapter turns to 'Imperial Policing in the Interwar Era', noting that by 1920 the Service had been reduced to some 30,000 personnel and 20 operational squadrons, and that there loomed the distinct possibility of it being broken up. However, Trenchard's vision of the RAF ensuring Imperial defence through cost-effective air control and policing ultimately proved to be the Service's saving grace, despite its limitations in terms of political and human cost. The following chapter on 'The Road to War' introduces Thomas Inskip, 'a relatively unknown and colourless character in British history but [one who] was to prove critically important' (pages 51-52) as the Minister for the Coordination of Defence in 1936. In essence, despite arguments to the contrary, Inskip prioritised the production of fighters over bombers. Rightly, the better-known developments of this period are also detailed, including the development of an integrated air defence network as well as the growth of both the RAF's budget and the UK's aero-industry.

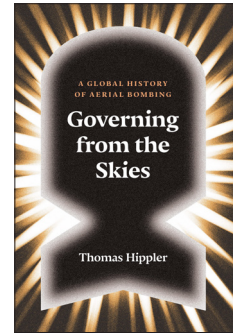
Given the authors' view that 'the RAF's role in the Second World War remains its most important and vital contribution to the survival and progress of the British nation' (page 143) it is logical that three chapters, comprising one-third of the book, are devoted to the period 1939-1945. Furthermore, they identify a number of key lessons that remain relevant today. These include the fact that both the quantity *and the quality* of aircraft available to each protagonist are important factors in assessing the likely outcome of a confrontation, as evidenced in 1940; and that air superiority is an essential prerequisite for providing ground forces with close air support, as shown by the Western Desert Air Force under Air Vice-Marshal Coningham. Most theatres of the war are well-covered, particularly the tribulations and successes of Coastal Command, though more on the use of air power in the fight against the Japanese would have made interesting reading. A standalone chapter is dedicated to 'The Bomber Offensive' against Germany. This book offers far more than a bland recounting of the official line; indeed, Beaver and Buckley acknowledge the unease surrounding the Strategic Bombing Offensive. Nevertheless, they conclude that 'actions have to be understood in the context of the war' (page 119) being one of national survival. Moreover, they recognise that in today's age of great precision it is easy to be critical of the past. As such, it is worth considering that the 1941 Butt Report highlighted that only one-third of bombs came within 5 miles of their intended target, largely due to the inefficiency of the navigation aids and bomb-aiming technologies in use at the time. Also covered in detail is Operation Chastise in May 1943, one of the most famous bombing raids ever conducted, and the Dambusters' audacious achievements are all the more impressive in terms of accuracy when set against the other operations conducted at the time.

History from 1945 to the present day is outlined in several short chapters covering the RAF's entry to the nuclear age; its role in the Cold War and post-Cold War environments; and ending with a chapter on 'War in the Gulf and Other Not So Small Wars: 1990 to the Present Day', which concludes by recounting the trilateral strikes conducted against suspected chemical weapons facilities in Syria in April 2018. Any overlap between the chapters is minor, and the authors paint a convincing picture of the RAF playing a crucial role countering the Soviet threat as well as taking part in numerous campaigns across the globe. For example, the development of the V-Bombers and other iconic jets of that period is covered with the same enthusiasm as tales of Spitfire-on-Spitfire engagements in the first Arab-Israel conflict, the strategic implications of the Blackbuck bombing raid during the Falklands War as well as the success of precision strike during the First Gulf War. The importance of allies is made clear, primarily the United States, and more recently the French through the 2010 Lancaster House Treaty. In the final chapter which considers 'Future Proofing the RAF', the authors argue that the 'RAF continues to struggle against the public perception that RPAS [Remotely Piloted Air System] is some kind of futuristic, dystopian and chilling weapon system' (page 238). More positively, they highlight that the RAF is keen to grasp the cyber and space domains, notably through a Rapid Capability Office at Headquarters Air Command that fully embraces and expedites technological change.

In conclusion, this book is extremely readable and offers something for everyone, from those with little knowledge of RAF history to the veritable enthusiast. To attempt to cover the history of the RAF in a single volume was ambitious, but the authors have succeeded admirably and have produced a fitting tribute to the world's oldest independent air force.

Book Reviews

GOVERNING FROM THE SKIES: A GLOBAL HISTORY OF AERIAL BOMBING



BY THOMAS HIPPLER

PUBLISHER: VERSO 2017, (ISBN-10: 978-1784785956), 240 PAGES

REVIEWED BY GROUP CAPTAIN JOHN ALEXANDER

Biography: John Alexander is a part-time historian at the Royal Air Force's Air Historical Branch, and also works on national security in Whitehall and is an RAF Reserve. As a regular he specialised in air/land integration, including in the Falklands and various Middle Eastern campaigns, was twice a Chief of the Air Staff's Fellow, conceptualised future conflict for the UK MOD, and spent his final six years in the Service in Afghanistan and Pakistan.

INTRODUCTION

Thomas Hippler, the French philosopher and historian, argues in his 2017 book *Governing from the Skies: A Global History of Aerial Bombing*, that the history of war over the past century is a history of the aerial bombing of civilian populations. Though early twentieth century philosophers, such as H G Wells, dreamt that air power would enable perpetual peace between nations, air power has instead (according to Hippler) been used to target non-combatants. First to cow colonial populations, then later to target European and Japanese peoples' support for their nations' war effort, and now to enforce world governance under United States' hegemony. In Hippler's view, aerial bombing is now used for 'perpetual low-intensity war', in places such as Yemen and Pakistan, and for the 'imperial neo-Douhetism' used in Iraq in 1991 and 2003, Kosovo in 1999 and Libya in 2011. This radical view is worth understanding.

The book is organised chronologically, with the apparent symmetry of starting with the first ever air raid by Italian Lieutenant Giulio Gavotti on the Libyan oasis of Ain Zara on 1 November 1911 (dropping grenades on the guerrillas and civilians there), and concluding with the end of NATO air operations over Libya on 31 October 2011.

In between, the book's 218 pages sweep through early thinking on the bombing of civilians: its use in the First World War, for colonial policing, in the Second World War, Cold War, and post-Cold War. For such a short book, the chapters are broad ranging, with an eclectic cast list: the chapters' introductions alone include: H G Wells, Franz Kafka, First World War aces, the Mad Mullah of Somaliland, Arthur Harris, Jan Smuts, Operation Gomorrah, Operation Linebacker, and George W Bush. The book, perhaps unsurprisingly for a philosopher, focuses on the history of thought, rather than the history of events.

The book is a challenging and interesting read, particularly because of its engagement with the development of air power thinking, drawing on Hippler's comprehensive and highly regarded study of Douhet's air power concepts, *Bombing the People: Giulio Douhet and the Foundations of Air-Power Strategy, 1884–1939* (Cambridge University Press, 2013). *Governing from the Skies* is more of a polemic than a history, however, as it argues from a critical perspective while failing to acknowledge the broader and recent historiography. There are many examples of this. Hippler repeats the trope that the British used poison gas in Mandate Iraq (p. 67) when, although the use of tear gas was considered, it was not used for practical and policy reasons. Furthermore, the policy of air control used in Iraq was far more nuanced than Hippler's account of 'proscription bombing', as Sebastian Ritchie's 2011 Air Historical Branch Narrative *The RAF, Small Wars and Insurgencies in the Middle East, 1919–1939* (RAFCAPS, 2011) makes clear. Moreover, Hippler's claim that during the Second World War 'strategic bombing proved militarily ineffective in Germany, as even without bombing, the war would have ended in the same way at the same time' (p. 143) ignores the evidence that the Anglo-American Combined Bomber Offensive, notwithstanding its strategic and ethical controversies and amongst many other effects, totally deprived German armies of air support from 1943 onward (see the review of O'Brien's *How the War was Won* in the Spring 2018 edition of this Journal).

Though titled a 'Global History' the book seems focused on Anglo-American bombing. The suggestion that John Warden, like Douhet, proposed the targeting of civilians, and that these theories were used in post-Cold War interventions, is simplistic. The timing of Hippler's book, published in French in 2014 and in English in 2017, may explain why the indiscriminate use of Russian air power in Syria or the almost total reduction in US 'drone' strikes in Pakistan since the Pakistan military moved into Waziristan in late 2014 are not mentioned, but the result is the book already seems dated.

Governing from the Skies: A Global History of Aerial Bombing is, nevertheless, worth engaging with because it portrays a 'critical' view which all students of air power should understand. It is an attempt to place air power thinking amongst the major themes of the past century from a historical sociology perspective: the nationalization of societies and war, democracy and totalitarianism, colonialism and decolonization,

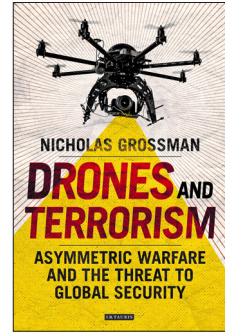
Third World-ism and globalization, and the welfare state and its decline in the face of neoliberalism, rather than a narrow operational view. Hippler's book, however, is neither truly global or a thorough history for the reasons outlined above, or a history of aerial bombing, as it ignores air power's utility against military targets.

Book Reviews

DRONES AND TERRORISM: ASYMMETRIC WARFARE AND THE THREAT TO GLOBAL SECURITY

BY NICHOLAS GROSSMAN

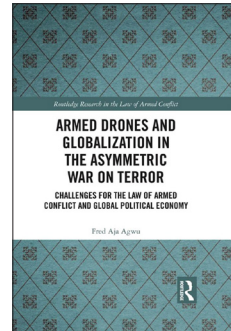
PUBLISHER: I. B. TAURIS 2017, (ISBN-13: 978-1784538309), 272 PAGES



ARMED DRONES AND GLOBALIZATION IN THE ASYMMETRIC WAR ON TERROR

BY FRED AJA AGWU

PUBLISHER: ROUTLEDGE, 1 EDITION 2017, (ISBN-13: 978-1138566934), 358 PAGES



REVIEWED BY GROUP CAPTAIN CLARE MUIR¹

Biography: Group Captain Clare Muir is Director, RAF Division at the Joint Services Command and Staff College. She completed a Chief of the Air Staff's Tedder Fellowship at Cambridge in 2013, studying International Relations, and attended the Royal College of Defence Studies in 2018. She has a keen interest in legislative, regulatory and technological developments in the fast-paced UAS sector.

*"We are building a bridge to the future while standing on it."*²

INTRODUCTION

Drones and Terrorism follows in the footsteps of texts such as P W Singer's *Wired for War*,³ Richard Whittle's *Predator*,⁴ and Singer and Cole's *Ghost Fleet*,⁵ all of which have featured in previous Chief of the Air Staff's reading lists and which aim to contribute to the ongoing debates surrounding emerging UAS technologies in an accessible manner for the non-specialist.

Grossman begins by defining and explaining the characteristics of asymmetric warfare before going on to describe the panoply of technological advancements in the UAS sector. Having set the contextual bedrock on which to build his argument, Grossman moves on to examine the options available to the protagonists of asymmetric warfare. He first assesses the strategic value of the United States' drone campaign before outlining the options available to terrorists and insurgents who may wish to exploit this technology to further their own strategic ends. In his concluding chapter, Grossman proposes a 'smart SWARM [Systematic Warfighter-Assisting Reconnaissance Measures] strategy,' advocating the development of *information*-focused (as opposed to *strike* focused) robotic warfare as a winning strategy for states who wish to lessen the informational advantage, which he argues are characteristically held by insurgents and terrorists.

With regards to supporting evidence, Grossman quotes a BBC article which states that 'a drone hit the front of a British Airways flight approaching Heathrow';⁶ however, as subsequently reported in open source, this particular 'strike' was never confirmed and the ensuing investigation closed due to lack of evidence.⁷ Highlighting this inconsistency could seem pedantic; however, it planted a seed of doubt in the reviewer's mind about the reliability of other media references used to support Grossman's arguments.

Nevertheless, Grossman successfully argues that robotics, 'will significantly alter asymmetric warfare,'⁸ and his lively and accessible text provides a balanced exploration of how the technology provides both opportunities and threats for the stronger and weaker protagonists. Irrespective of the veracity of the reported drone attack on the Venezuelan President in August 2018, commentators and policymakers may yet find themselves reaching for this topical text, to further understand the potential capabilities of these systems.

From the title alone, *Armed Drones and Globalization in the Asymmetric War on Terror* would appear to occupy the same discursive space as *Drones and Terrorism*. However, *Armed Drones* speaks with a more obviously scholarly tone, and is aimed towards researchers, academics, legal and security professionals rather than a general readership. In this book, armed drones (and globalization) are not the *subject* under examination; instead they serve as a *lens* through which the global war on terror is examined.

Through this lens, *Armed Drones* focusses on the broader legal debates surrounding the use of armed drones to prosecute the war on terror. The author explores whether the 'War on Terror (WoT)' should have been declared in the first place, whether terrorist attacks met the United Nations' *casus belli*, and whether the 'War' should instead be characterised as a law enforcement issue. Within the broad context of International Humanitarian Law, the book assesses the drone as a weapon of engagement; discussing such issues as 'signature' strikes as well as the implications of United States' drones coming under the jurisdiction of the Department of Defense, Air Force or Intelligence Agencies. The book has an unashamed focus on the United States; nevertheless, the conclusions drawn can be applied to the UK, although Agwu disappointingly fails to reference or acknowledge the UK's own armed drone capability.⁹

Agwu outlines the challenges of the war on terror's 'nomadic' frontline and explains why drones are 'tailor made' for asymmetric warfare.¹⁰ He investigates some of the important legal questions which quickly bubble up when 'technology out-paces the law.' Here, Agwu devotes special attention to ethics and 'chivalry' as dual 'institutions of restraint',¹¹ which he argues 'get a short shrift'¹² in asymmetric warfare. The seven chapters at the centre of the book are perhaps the most interesting and relevant for those readers who are less interested in the context and are more interested in drones and their associated capabilities and challenges, and illustrate that reliance on this capability alone will not win the war on terror;¹³ however, the penultimate chapter, 'Globalization, Postmodernism, and the WoT,' tacks sharply away from the narrative flow. While this is intended to frame the collective, multilateral and unified responses to the war on terror proposed in the concluding chapter, this argument might have been better placed adjacent to those chapters which discuss the antecedents for asymmetric warfare. Although Agwu offers suggestions for ways to effectively prosecute the war on terror in his concluding chapter, he emphasises that his book is 'more of a...prognosis rather than a solution.'¹⁴

While the books are not close companions, (their differing arguments and style making them too distinct for such a neat coupling) they both individually shine a light on this important subject matter. *Armed Drones* has a narrower, more intense beam, whereas *Drones and Terrorism* widens the aperture to allow a broader, more accessible, if less detailed, approach.

There is growing acceptance that we are witnessing what has been described by many as a 'drone revolution.' The UAS industry has been described as the 'most dynamic growth sector of the world aerospace industry,'¹⁵ and there is an almost universal assessment by opponents and advocates alike that drones in civilian and military life, if not ubiquitous, will be at the very least vastly increased in both number and capability in the near future. Of specific relevance to air power advocates are the ways in which drones are 'democratising and transforming air power.'¹⁶ We should therefore be seeking to shine an array of lights on the subject. As an oft quoted strategist observed,

twilight... often tends to make things seem grotesque and larger than they really are. Whatever is hidden from full view in this feeble light has to be guessed at by talent, or simply left to chance.¹⁷

UAS are rapidly developing into a transformational air power paradigm and clear-sighted knowledge of the capabilities, strengths and weaknesses of this technology will avoid us having to ‘trust to talent or to luck.’¹⁸ It has been observed that, ‘if you go anywhere now, you are going to get attacked by UAVs,’¹⁹ and there is an urgent need to develop and embed counter UAS doctrine at a pace which matches both technological advancements as well as the inventiveness of our opponents. As the US Colonel quoted at the start of this review notes, ‘we are building the bridge while standing on it.’ Whether the analogy is a bridge or a dark pathway, we are fortunate that the contemporary wave of books, articles and commentary on the subject helps us to navigate our way forward.

Richard Whittle observed in *Predator* that, ‘after genesis came the flood;’²⁰ as we journey forward, we therefore would be wise to pick up our pace...

NOTES

¹ Group Captain Muir would like to thank Dr Kate Utting, King’s College London, and Squadron Leader Phil Clare, Royal Air Force Division, Joint Service Command and Staff College, for their invaluable editorial inputs.

² U.S. Army Colonel quoted in P W Singer, *Wired for War* (London: Penguin, 2009), 19.

³ Singer, *Wired for War*.

⁴ Richard Whittle, *Predator* (New York: Henry Holt and Company LLC, 2014).

⁵ P. W. Singer and August Cole, *Ghost Fleet* (Boston MA: Houghton Mifflin Harcourt, 2015).

⁶ *Ibid.*, 121.

⁷ The Guardian, “Heathrow Plane Strike Not a Drone Incident,” *The Guardian*, 28 April 2016, <https://www.theguardian.com/technology/2016/apr/28/heathrow-ba-plane-strike-not-a-drone-incident> [last accessed 22 Aug 18].

⁸ Grossman, *Drones and Terrorism*, 7.

⁹ Agwu, *Armed Drones*, 156.

¹⁰ *Ibid.*, 140.

¹¹ *Ibid.*, 241.

¹² *Ibid.*, 242.

¹³ *Ibid.*, 294.

¹⁴ *Ibid.*, xiv.

¹⁵ The Teal Group quoted in Singer, *Wired for War*, 62.

¹⁶ Trevor Taylor, “Costs of Combat Air Power,” in John Andreas Olsen (ed). *Routledge Handbook of Air Power*, (London: Routledge, 2018), 283.

¹⁷ Carl von Clausewitz, Michael Howard, Peter Paret, *On War* (Princeton: Princeton University Press, 1989), 140.

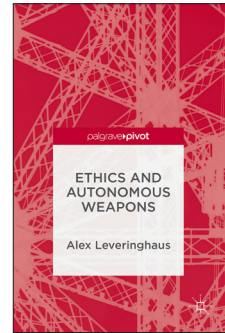
¹⁸ Ibid.

¹⁹ Operation Inherent Resolve Senior Commander, quoted September 2018.

²⁰ Whittle, *Predator*, 299.

Book Reviews

ETHICS AND AUTONOMOUS WEAPONS



BY DR ALEX LEVERINGHAUS

PUBLISHER: PALGRAVE PIVOT, 2016, (ISBN-13: 978-1137523600), 131 PAGES

REVIEWED BY GROUP CAPTAIN MARK PHELPS

Biography: Group Captain Phelps was called to the Bar in 1994 and commissioned into the RAF in 2001. He has served as legal advisor in various guises both in the UK and abroad, he is also a CAS Fellow at King's College London working on his thesis looking at the legal, moral and ethical implications of cyber and autonomous warfare.

INTRODUCTION

The legal and ethical implications of autonomous weapons are no longer confined to the more esoteric reaches of academia, as concerns about the promise and potential threats inherent to such weapons have entered the mainstream to pose a conundrum for governmental policy makers. Whilst autonomous technologies have been championed in the civilian commercial sector through such diverse applications as robotic surgery and driverless cars, their potential for use by the military has raised difficult legal and ethical issues. Understood within a working definition that identifies such weapons by their ability (once programmed) to search for and engage a target without further direct intervention by a human operator, the challenges posed by autonomous weapons have been taken up by a number of civil society groups resulting in calls for an outright ban or alternatively the imposition of a moratorium on the development of the technology under the auspices of the Convention on Certain Conventional Weapons.

Against this background, Leveringhaus develops his ethical perspective on autonomous weapons technology drawing upon the Just War Tradition (JWT) as the main ethical framework for the regulation of armed conflict. In this way, he identifies the central

ethical implications of autonomous weapons in respect of the justification for the resort to armed conflict, the application of force during hostilities, and the potential consequences for the peace once hostilities have ceased. Leveringhaus takes the reader through the central concerns raised within the debate, such as whether autonomy will make war without risk a reality and, if so, will this lower the threshold for the resort to war for those possessing the technology? Whether, in the conduct of hostilities, autonomous weapons could ever meet the requirements of distinction, military necessity and proportionality? Whether the use of such weapons would undermine any peace that emerges after the conflict? And where responsibility would ultimately lie for any crimes, specifically war crimes, which may result from actions undertaken by an autonomous weapon. Having provided a general introduction to the key issues, Leveringhaus proceeds to undertake a more in-depth analysis of the central concepts.

In the second chapter, the author discusses the concepts of autonomy and what is meant by the term 'weapon' to look at whether autonomous weapons are unprecedented or can be seen as part of a continuum following on from previous precision guided systems. Leveringhaus goes on to analyse arguments in favour of the development and deployment of autonomous weapons and in particular the claim that removing human emotion from the execution of targeting decisions would reduce the potential for the making of mistakes. This claim is juxtaposed with the argument that the removal of the human from the targeting decision creates a responsibility gap in which no-one can be properly held liable for what an autonomous weapon does, thus, raising the prospect of war crimes being committed without the possibility of justice or retribution being made available to the victims.

In the fourth Chapter, Leveringhaus addresses what he terms the argument from human agency posing the much more difficult ethical question of whether there is something fundamentally morally objectionable in deploying a machine to kill another human being? This argument stands outside of those developed in the previous chapters, which may be characterised as fundamentally technologically dependent, based on the immaturity of the present systems rather than matters of wider ethical concern. Thus, when dealing with the argument from a human agency perspective, Leveringhaus takes as a starting point an assumption that any technological deficiencies that may cause an autonomous weapon to fall short of the present requirements of the law have been resolved. He goes on to pose the question of whether something morally valuable is lost when human agency, the ability to feel empathy or show mercy, when replaced by a machine and, if so, questions the consequences for the pursuit of a just war.

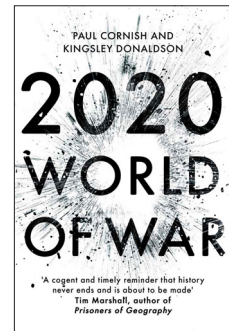
Leveringhaus pulls together the arguments developed throughout the book in the concluding Chapter to argue that much of the debate on autonomous weapons will rest upon how one conceptualises such weapons and to underline the important role

that ethical considerations must play, given the philosophical issues raised in respect of weapons that do not, as yet, exist.

Whilst not the first to tackle an ethical consideration of autonomous weapons, Leveringhaus has provided an important work that brings together in short form many of the central issues currently fuelling the debate. Written for an audience with a working knowledge of the Just War Tradition, *Ethics and Autonomous Weapons* is a work which would be appreciated by anyone wishing to make themselves more aware of the growing (and often nuanced) ethical and legal debate relating to the development of military technologies in general, and the challenges that are inherent to the development and deployment of autonomous weapons more specifically. There are areas of the debate that are not entered into, such as the crossover between autonomy and the ethics of cyberwarfare and the philosophical consequences of Artificial Intelligence, but the author is clear to put such issues to one side to focus his aim in addressing the more practical concerns of near-to-fruitful technologies, and this he achieves admirably.

Book Reviews

2020: WORLD AT WAR



BY PAUL CORNISH AND KINGSLEY DONALDSON

PUBLISHER: HODDER & STOUGHTON 2017, (ISBN-13:978-1473640337, 320 PAGES)

REVIEWED BY WING COMMANDER ANGUS MACINTYRE

Biography: Wing Commander Angus MacIntyre is a Chief of the Air Staff's Fellow and received an MA in Applied Security Strategy from Exeter University's Strategy and Security Institute. His thesis covers the declining influence of the UK in Africa, and what could be done to recover influence. Wing Commander MacIntyre is currently a desk officer in Military Strategic Effects, Operations Directorate

INTRODUCTION

Paul Cornish and Kingsley Donaldson's book is published at a time when there is a broad acceptance that the world is probably the most unstable it has been since 1946. The institutions and agreements that have kept Europe at peace are creaking; the big power alliances, such as NATO, are struggling to meet the threats posed by non-state actors, and the dramatic transfer of power away from the state to non-state actors challenges the accepted norms of how hard and soft power are utilised to meet national strategy, and enforce equilibrium and peace. Cornish and Donaldson argue that in this complex operating environment an absence of national strategy leaves governments in an entirely reactive position. They pursue the premise that, while the future cannot be predicted with certainty, it may be possible to predict where a crisis is likely to occur and skilfully avoid it before it becomes critical. However, an absence of national strategy can leave governments in an entirely reactive position.

Cornish and Donaldson use General Sir John Hackett's book *The Third World War, August 1985: A Future History* as a compass to navigate through a series of vignettes that present the reader (or Western governments) with a series of *crises*. In each vignette,

they consider how General Hackett would have viewed the slowly revealing drama. But before exploring each crisis, Cornish and Donaldson also set the context by providing realistic background scenarios which explain how the particular crisis being discussed emerged and the conditions that incubated it. Crises can be catalysed by unrequited ambition or outcomes that are left incomplete (China and Taiwan), deep festering old wounds (Pakistan and India), water scarcity, the requirements for hydrocarbons and minerals, balancing super-migration with oil sales, food scarcity, extremist religious interpretations, and the often-overlooked world of the dark net and cybercrime. All are powerful driving factors on their own, but become unstoppable when pitched together as an ensemble. Equally, an understanding of super-power politics is introduced so that the reader can appreciate that to create an effect in the East, something may need to be done in the West, whilst also ensuring that when a crisis is escalated to whip up domestic support at home, adequate preparations are made to allow a climb down without losing face. The authors demonstrate that trigger events and miscalculations could lead to overreactions, or worse, unanticipated reactions, which might lead to complete destruction.

The price of getting it wrong in a high stakes enterprise is presented well by Cornish and Donaldson. When a hard-edged strategy is pursued from which foreign policy is drawn, is it sufficiently coherent and flexible to allow room to manoeuvre in a crisis? How does a Government deal, for example, with the potential for nuclear weapons to fall into the hands of non-state organisations, or rogue state elements? How does a '*no first strike*' policy hold up to a high level of provocation in a crisis between India and Pakistan over the disputed Kashmir region, where one side may have lost control over its nuclear weapons to rogue elements? In the Egypt and Saudi vignettes, the difficulties of completely eradicating a rogue organisation (Al-Qaeda) are clearly exposed, against the likelihood that the organisation will reappear somewhere else under a new name (Daesh). Ideally, for the West, the long-term solution would be to address the extremist ideologies directly with a *hearts and minds* like strategy, but to be effective this could take generations and require long term investment and commitment. In reality, countering violent extremist ideology under current practice is entirely short-termist, tactical and kinetic.

This book is a must for students looking to understand and promote the study and use of national strategy, and reflects the current methods of teaching strategy by identifying a crisis, and then immersing the observer (be they students or practitioners) in it, and tracking the crisis through its entirety. The current resurgence in the study of national strategy, driven partly by the perceived absence of it, and a propensity of governments of any colour to 'muddle through', has been partly led by Paul Cornish and is evident in this and his other works. The book is a compelling read and should be understood as much more than an examination of a few worst-case scenarios. A strategist will never claim to be able to predict the future, but if you at least have a strategy, you can maintain a

direction of travel, identify your 'ends way and means', and minimise the impact of any speed bumps that you encounter along the way.

In his conclusion to *World War Three*, General Hackett noted:

We who have put this book together know very well that the only forecast that can be made with any confidence of the course and outcome of another World War, should there be one, is that nothing will happen exactly as we have shown here.

The first responsibility of any government is to defend its people, and Cornish and Donaldson make a very good attempt at predicting where crisis could come from in the complex global operating environment where we all now live. *Fact* can often be stranger than *fiction*, but the two idioms highlight well the total folly of national unpreparedness.

RAF HISTORICAL SOCIETY CALL FOR PAPERS

OVERVIEW

The Royal Air Force Historical Society was established in 1986 to provide a lens through which the study of the history of the Service might be focused. It does this by organising lectures and seminars at which those interested in the history of the RAF have the opportunity to meet those who participated in the evolution and implementation of policy. The Society believes that these events make an important contribution to the permanent record. RAF Historical Society website: <https://www.rafmuseum.org.uk/about-us/partners/raf-historical-society.aspx>

MEMBERSHIP

Membership is open to anyone with an interest in RAF history, irrespective of whether they have ever had any direct connection with the Service. By being a member of the Society you will receive the 3 journals produced each year and be invited to attend seminars designed to explore specific themes – all in all, this will give you access to a rich source of information about various studies undertaken by academics, serving personnel and those simply with an interest in RAF history. You will also be invited to the Society's AGM held every year in the RAF Club where you will be given the opportunity to voice your opinions on how the Society is managed. Membership costs £18 per year. For more details you can email the Membership Secretary (Wg Cdr Colin Cummings RAF (Retd)) at colincummings@tiscali.co.uk.

HENRY PROBERT BURSARY – CALL FOR APPLICATIONS

Air Commodore Henry Probert MBE was one of the most eminent authorities on the history of the RAF, head of the RAF's Air Historical Branch, a founder member of the RAF Historical Society and, whilst serving, the RAF's Director of Education. Following his death, the RAF Historical Society endowed a bursary in Air Commodore Probert's memory to encourage scholarly research which is awarded by the RAF Historical Society Committee on a regular basis to those students who intend to add to the historiography of the RAF through their studies. Enquiries should be directed to the Directorate of Defence Studies (telephone 01793 314848 or email enquiries.dds@da.mod.uk). The next deadline for applications is 8 February 2019.

TWO AIR FORCES AWARD – CALL FOR PAPERS

In 1996, the Royal Air Force Historical Society established the Two Air Forces Award in collaboration with the United States Air Force Historical Foundation. This is presented annually in recognition of outstanding academic work by a serving member of the British military or MOD civil servant adjudged to have significantly contributed to the historiography of air power. Entries are welcomed from any serving military or MOD

Civil Service personnel for any air power-related essay to a maximum of 7,000 words. For more details, please contact the Directorate of Defence Studies (telephone 01793 314848 or email enquiries.dds@da.mod.uk). The next deadline for applications is 8 February 2019.



<https://www.raf.mod.uk/rafcasps>

 <https://www.facebook.com/RAFCASPS/>

 <https://medium.com/raf-caps>

ISSN: 1463-6298

Produced by Air Media Centre, HQ Air Command. 3180_18AJ
UK Ministry of Defence © Crown Copyright, 2018

Sponsor telephone number: 01793 314848
Sponsor Role email address: enquiries.dds@da.mod.uk

 **ROYAL
AIR FORCE**
**Centre for Air and
Space Power Studies**