Air Power
Review

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Royal Air Force Air Power Review

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Feedback from readers is encouraged and those wishing to comment on published articles or make suggestions for how APR 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 are not generally required but where they are necessary for an article, they 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.

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RAF Station Feltwell pictured on 5 November 1918.
At the time, the Norfolk station was known as
No 7 Training Depot Station where aircraft such
as SE5 fighters, DH4 and DH9 bombers and BE2
reconnaissance aircraft were used to train pilots.

Technicians from the Tactical Communications Wing
setting up a satellite link at Gioia del Colle, Italy,
during Operation ELLAMY, 2011.

An unidentified group of Royal Flying Corps officers
pose with an Avro 504 training aircraft.

Air Power Review

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Foreword

by Wing Commander Chris Hunter

This 2016 Autumn/Winter edition of Air Power Review includes a mix of articles that cover contemporary and historic operations with perspectives ranging from the tactical to strategic. The contributors are a blend of members of the broad air power community, Chief of the Air Staff's academic Fellows, and academics. This ensures that thoughtful, relevant and contemporary analysis remains the touchstone of our publication and we hope you find these thought provoking.

This edition starts with an insightful article by Sqn Ldr (Rev) David Richardson on '*The Royal Air Force and the Irish War of Independence 1918-1922*'. This is an absorbing case study on the early use of air power during COIN operations, which argues that 'despite numerous difficulties, mutual understanding between aviators and ground troops evolved to such an extent that by 1921 the Royal Air Force had become a central and highly effective element of the Crown forces in Ireland.' Our second article is by Mr Trevor Nash on '*Flight Training in the First World War and its Legacy*'. Nash explores the training methodologies developed during the First World War, at a scale that is difficult for us to comprehend whilst the RNAS, RFC, and later RAF were 'in contact'. The final article of this edition is co-authored by Air Cdre Simon Harper and Wg Cdr Jim Beldon on '*Communicating to Win*'. They examine the implications of a 'new digitally-driven communications operating space' where instant perception is the new reality. The implication of which is that however successful the RAF is tactically, in an era in which the narrative is king and is delivered digitally across the globe, we need to adopt a new approach to communications which would lever tactical advantage to produce strategic success.

The three articles are complemented by two personal viewpoints, which are intended to be thought provoking and stimulate debate. As ever, the editorial team would welcome comments in response to either viewpoint, indeed anything published, and is poised to publish constructive comments or a counter viewpoint. '*Inner Lights: The Sources of Insight and Innovation Within Air Forces*' is from Prof Rob Owen and first delivered during CAS' Air Power Conference 2016 as part of a Session on 'Fighting Systems'. In it he offers some insights on the link between fighting systems and innovation and goes on to answer what air forces might do in response to those insights. '*Assessing Assessments: How Useful Is Predictive Intelligence?*' is co-authored by WO2 John Hetherington, British Army, and Wg Cdr Keith Dear. They explore the predicament of, on the one hand, making military intelligence staff responsible for 'predicting' the future actions and intentions of enemy, neutral and allied parties, but, on the other, having little in the way of analysis that shows how accurate and useful these predictions are.

This edition of Air Power Review concludes with six book reviews. This eclectic mix starts with '*The Battle for Britain*' by Anthony Cumming reviewed by Mr Colin McHattie. The author is perhaps better known for his controversial, revisionist account of the Battle of Britain

'*The Royal Navy and the Battle of Britain*'. We include it for the simple reason that it is provocative and challenging and to quote Francis Collins 'One must dig deeply into opposing points of view in order to know whether your own position remains defensible. Iron sharpens iron.' '*The Baghdad Air Mail*' reviewed by Flt Lt Chloe Bridge is an intriguing personal account about transporting mail in the 1920s. Setting up the Cairo - Palestine - Baghdad air/airmail route after 1921 was a truly pioneering endeavour and the author, Wing Commander Hill, provides us with a fascinating insight into his involvement. Both '*Binary Bullets: The Ethics of Cyberwarfare*' reviewed by Sqn Ldr Eoin Sands and '*Red Team: How to Succeed by Thinking like the Enemy*' reviewed by Wg Cdr Mal Craghill are from CAS' Reading List 2016. The first tackles the thorny problem of ethics and emerging international norms for cyber-conflict and the second highlights how the appropriate use of red teaming can improve the chances of favourable outcomes. In '*Hubris: The Tragedy of War in the Twentieth Century*' reviewed by Dr Frank Ledwidge the author revisits six battles that changed the course of the twentieth century, each study 'is a masterpiece in miniature'. He reveals the one trait that links them all which is excessive human pride - hubris. By making clear the associated danger his insights are key lessons for today's civilian and military leaders alike. Lastly, '*The Unravelling: High Hopes and Missed Opportunities in Iraq*' reviewed by Sqn Ldr Matthew Smith is 'a unique, honest and detailed memoir of one woman's experience working side by side with the military and political elites charged with rebuilding Iraq following the 2003 invasion' up to the rise of Daesh. The book's key strength is its well-informed perspective from someone who established 'herself as an essential intermediary between the politico-military elites of the Coalition and Iraq'.

All of our selections, including the historical articles, are guided by an editorial ethos that strongly promotes 'relevance' to the contemporary and potential future operating environment for air power employment.

Finally, RAF CAPS, publisher of APR, has a Facebook page. Find us at **https://facebook.com/ RAFCAPS/** for daily insights into air, space and cyber matters – get involved in the debate.

The Royal Air Force Centre For Air Power Studies Academic Awards 2016

The Royal Air Force Centre for Air Power Studies (RAF CAPS) Academic Awards for 2016 were presented on 6 July during CAS' Air Power Conference held at the IET Savoy, London. The presentations were made by Air Chief Marshal Sir Andrew Pulford in front of over 400 delegates comprising visiting air chiefs, academics, member of the civil service, and service personnel, both regular and reserves.

The Gordon Shephard 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 Flt Lt Slessor MC (1923), Wg Cdr Leigh-Mallory DSO (1930) and Sqn Ldr Graydon (1974). In abeyance since 2011, the prize was re-established in 2015 and awarded to an RAF airman or woman for the best Service paper or essay published through RAF CAPS.

The recipient for 2016 was Wg Cdr Jim Beldon an RAF navigator (E-3D Sentry) who currently works within the Directorate of Defence Communications (DDC) at the MOD. He was awarded a Tedder Fellowship in AY11/12 under the CAS' Fellowship Scheme.

In his paper '*Lethal Autonomous Weapons Systems – Warfare's Best Humanitarian Hope?*' Beldon suggests governments could be moved to embrace a future of Lethal Autonomous Weapons Systems (LAWS) as an inevitable technology development cycle begins to unravel. He moves the debate beyond the false characterisation of the current generation of Remotely Piloted Air Systems (RPAS) as 'autonomous, killer-machines beyond human control', to the point in time when advances in artificial intelligence and robotics will be able to 'form reasoned judgements and then decide and act on them without human input'. His paper was published in APR Vol 18, No 3, and also on the Leading Edge Blog website.

The Salmond Prize

The Salmond Prize is awarded in memory of Air Chief Marshal Sir John Salmond who was appointed CAS in succession to Lord Trenchard. In abeyance since 2010, the Prize is awarded annually for the best essay on an air power topic submitted to RAF CAPS by a civilian or non-RAF serviceman or woman of any nationality.

The recipient for 2016 was Dr Richard Moore who was not able to receive his award in person. Dr Moore is a visiting research fellow at the Department of War Studies, King's College London, working on the history of the British nuclear weapons programme. His second book *Nuclear Illusion, Nuclear Reality: Britain, the United States and Nuclear Weapons 1958-64* was published by Palgrave Macmillan in 2010.

His paper '*F-111K: Britain's Lost Lost Bomber*' is a revealing study of Britain's ultimately aborted attempts to purchase a tactical strike bomber in the 1960s. Moore dispels some of the myths and misunderstandings around the F-111K's complex and turbulent procurement following the decision not to pursue TSR.2 for the RAF. His paper was published in *APR Vol 18, No 3* in 2015.

The Air Power Defence Research Paper Prize

The Air Power Defence Research Paper (DRP) Prize is awarded to the Advanced Command and Staff Course graduate who produces the best air power related DRP. The prize was awarded for the first time in 2015 and is now awarded annually.

The recipient for 2016 was Wg Cdr Will Saunders an RAF pilot (Tornado F3, Typhoon) who is currently serving at MOD DE&S at Abbey Wood as the Requirements Manager for Typhoon.

In his DRP '*The Fallibility of Judgement: Analysing the Influence of Technology in failures of British Military Strategic Decision-making*' he examines the systemic causes of failure in strategic decision-making caused by technological complexity. Utilising 2 case studies: the morale bombing decision in the Second World War and the JSF variant decision taken in the 2010 SDSR, he identifies a common source of failure where decision-makers fail to comprehend the uncertainty, assumptions and limitations present in the evidence informing their decision.

The CAS' Fellows' Prize

The CAS' Fellows' Prize has been established to recognise the CAS' Fellow who has made the greatest contribution to the study and promotion of air power. The Prize was awarded for the first time in 2015 and is now awarded annually.

The recipient for 2016 was Wg Cdr Keith Dear, an Intelligence Officer currently undertaking a full-time DPhil at Oxford University. His research, co-funded by the RAF and USAF, is examining the effects of surveillance on behaviour. His DPhil is being pursued under an experimental Portal Fellowship; he was previously the recipient of a Trenchard Fellowship in AY10/11.

The Royal Air Force and the Irish War of Independence 1918-1922

By Reverend Dr (Squadron Leader) David Richardson

Biography: The Reverend Dr (Squadron Leader) David Richardson is a graduate of the universities of Edinburgh, Belfast, Trinity College Dublin and King's College London, and a contributor to the Cambridge Dictionary of Irish Biography. Ordained in the Church of Ireland, he has served 10 years as a chaplain in the RAF. Operational experience includes two tours of Afghanistan and a recent deployment on Op SHADER, working with both air force elements in Cyprus and training teams in Iraq.

Abstract: Although the Royal Air Force was involved in active operations in Ireland between 1918 and 1922, this has attracted comparatively little scholarly interest; the scant secondary literature on the subject tends to suggest that air operations were of tangential relevance to the War of Independence. Drawing extensively on British and Irish primary sources, including accounts by combatants on both sides, this dissertation seeks to demonstrate that air operations in fact had a distinct impact on the conflict. Although there were admittedly numerous shortcomings in the application of air power in Ireland, it will be argued that by the summer of 1921 the RAF had been closely integrated into British security operations, and had a significant effect on the activities of the Irish Republican Army.

Introduction

In the autumn of 1923, some two decades before the battles of Alamein and Singapore made them household names, Bernard Montgomery and Arthur Percival engaged in correspondence concerning their recent campaign service in Ireland. Of aircraft, Montgomery had this to say, 'These were really of no use to us, except as a quick and safe means of getting from one place to another….the pilots and observers knew nothing whatever about the war, or the conditions under which it was being fought, and were not therefore in a position to help much'.[1] Subsequent histories of the Irish War of Independence have tended to echo Montgomery's verdict that the Air Force was of limited utility.[2] In particular, most of the limited academic interest in the RAF's Irish deployment has focused on the vexed question of arming aircraft in Ireland, to the relative neglect of other aerial operations. Nor has much work been done to analyse how the IRA actually viewed the Bristol Fighters and Airco DH9s droning overhead.[3] The Bureau of Military History in Dublin contains a considerable number of IRA accounts on the subject, which have received little attention from historians in the decade since their release.[4]

By offering an account of air operations across the period from 1918 to 1922, using a range of British and Republican sources (including some previously unpublished private papers), this paper will argue that the airmen contributed rather more than Montgomery allowed. By 1921 the Royal Air Force had, in fact, become a central and highly effective element of the Crown forces in Ireland.

Military aviation first appeared in Ireland in September 1913 when seven aircraft were briefly detached from Scotland on a training exercise.[5] A more permanent presence was established after the outbreak of the First World War, when new airfields were required across the United Kingdom to train the expanding Royal Flying Corps. Although Ireland was primarily regarded as a training facility, a number of anti-submarine patrols were also flown from the west coast.[6]

By 1918, the political situation in Ireland was in a state of flux as the third Home Rule Act remained in suspension, and the shock waves of the 1916 Rebellion continued to reverberate. Even as those first aerodromes were under construction, the Royal Air Force was already being employed on security duties, seeking to observe the Irish Volunteers drilling in the Dublin hills. As an Irish nationalist activist later recalled, 'when we could be seen from the Phoenix Park, an aeroplane would be sent over to try and find out what we were doing...Captain Cullen would have the men so arranged when the plane came over that she could not find us'.[7] Nor was the activity limited to observation. Flight Lieutenant Edward Taylor was sent to patrol the Irish countryside searching out Sinn Fein gatherings and records that 'we dived upon the motley crowd, endeavouring to break up the meeting'.[8] This tactic was not invariably successful; as one eyewitness recorded at Eyries in Cork in the summer of 1918, the crowd simply 'jeered and booed' at the low flying aircraft.[9] However, even at this inchoate stage of the conflict, the RAF was having an impact. Patrick Kelly of the Irish Volunteers records how an aircraft scattered his

unit on parade and subsequently co-operated with ground forces to ensure the detention of some suspects.[10]

The newly appointed Viceroy, Lord French, was certainly in favour of employing air power against the developing threat of armed nationalism as early as April 1918. In a letter to Lloyd George, he advocated that aircraft armed with bombs and machine guns would 'put the fear of God into these playful young Sinn Feiners'.[11] Although it would take almost exactly three years until military aircraft in Ireland were permitted to carry lethal ordnance, aviation was able to fulfil numerous other roles in the interim. Two squadrons were despatched to Ireland in the spring of 1918 and were tasked on communication and reconnaissance.[12] Within six months of French's letter, plans had also been drawn up to use aircraft in the event of disruption to the postal system, operating alongside mobile columns and overflying outlying garrisons on a daily basis.[13] Thus even before the end of the First World War, the RAF was beginning to acquire a defined role in the British security plan for Ireland.

The armistice of November was swiftly followed by a General Election, which in Ireland saw the pre-war mandate of the Irish Parliamentary Party overturned by a Sinn Fein victory. Clearly, the Irish question could not be resolved by simply defrosting the Home Rule Act that had been placed into cold storage in 1914. The new parliamentarians refused to assume their seats at Westminster and established their own conclave in Dublin on 21st January 1919. In an entirely unrelated development, a group of restive Irish Volunteers in County Tipperary chose that morning to ambush a cartload of gelignite en route to a local quarry, killing the pair of Royal Irish Constabulary escorts. Although this was but one of a growing number of attacks on the RIC, the chronological coincidence has proved irresistible to historians, who tend to regard the shots at Soloheadbeg as the opening of the War of Independence.[14]

It was by no means apparent at the outset that Britain was about to be embroiled in a major campaign; the Irish Republican Army, as the Irish Volunteers were increasingly being called, initially conducted low-level attacks that were 'sporadic and directionless'.[15] The British Government had plenty of other distractions to deal with; peace making at Versailles, civil war in Russia, and unrest in Iran being just some of the concerns facing the Cabinet. In the face of this, ministers 'did their best to avoid Irish affairs altogether', and management of the developing crisis was left, at least initially, in the hands of the sclerotic British administration in Dublin Castle.[16] However, even as the IRA campaign intensified, the Cabinet's interest in Ireland was intermittent at best; not until the spring of 1921 did Lloyd George fully engage with the Irish situation.[17]

At the same time, Britain was trying to divest itself of the huge armed forces it had amassed.[18] The Royal Air Force, formed a bare seven months before the end of the war to deal with a specific German threat, was especially vulnerable with the advent of peace.[19] In January 1919, the Air Ministry was disestablished as a separate department, and as the year wore on the RAF was trimmed of some 90% of its personnel.[20] Faced with swingeing defence cuts, the

leadership of the Army and Navy were not overly solicitous for the welfare of their young rival. Indeed, the Chief of the Imperial General Staff opined that 'the sooner the Air Force crashes the better'.[21] The strategy adopted by Sir Hugh Trenchard, Chief of the Air Staff in 1919, was 'to preserve the vital essentials of a skeleton force whilst giving way on every possible detail on which he felt that expense could be saved'.[22] It was against this backdrop of a distracted Government and a shrinking military capability that the RAF conducted its campaign, and these factors help explain many of the decisions that were subsequently made.

As 1919 wore on, the IRA campaign was initially focused on obtaining weapons, generally from lightly defended police barracks; one early raid in March also netted a substantial haul of arms from RAF Collinstown, just north of Dublin.[23] Under the RAF 'Defence of Ireland Scheme', all Royal Irish Constabulary and military units were instructed to select aerial dropping stations close to their headquarters to facilitate communication by air mail.[24] The scheme also adumbrated proposals for the RAF to work in close co-operation with the Army in Ireland, carrying out reconnaissance and patrols, with the especial aim of deterring IRA training meetings on Saturdays and Sundays.[25] One pilot later recalled patrolling the Wicklow Mountains, firing Very lights to indicate the location of IRA activity.[26] Some additional aircraft were transferred across the Irish Sea and initial steps were also taken to consolidate the various fragmentary RAF units in Ireland into two effective squadrons.[27] Aerodromes were retained in Dublin, Fermoy in the south and Oranmore in the west, together with a number of additional landing grounds.[28] Although an RAF inspecting officer noted that 'no particular animosity' had yet been evinced against the RAF, by the summer the 'hopeless, defenceless state of …aircraft ...and living quarters' had become apparent.[29] The lessons of Collinstown had clearly not been learnt and special instructions were issued to RAF personnel for the securing of arms.[30]

Despite limited resources, the RAF had been continuing to conduct useful activity in early 1920. British policy during the conflict tended to veer uneasily between conciliation and coercion, and opted for the latter in the aftermath of an attack on the Viceroy. The RAF thus found itself involved in the Crown's efforts to curtail Republican activity.[31] A proscribed Sinn Fein demonstration in County Armagh had been carefully choreographed to mislead the RIC, who set off on a false scent. However, the real location of the gathering had been identified by an aircraft which then dropped a message at Blackwatertown barracks, enabling the police to carry out a raid.[32] Regular reconnaissance reports were also issued, helping to build up the general intelligence picture for the Crown forces by recording such phenomena as the appearance of large crowds.[33]

Group Captain Bonham-Carter, the new local commander, was determined to expand the role of the Air Force in Ireland still further, however. In a letter to Trenchard, Bonham-Carter gave a useful *tour d'horizon* of RAF activity in the early spring of 1920. Personnel were engaged in conducting spring drills, weeding out surplus stores, and improving airfield defences, in addition to occasional patrols for the Army. A great deal of time seems to have been spent simply tidying up detritus from the war; 'the work of closing stations and straightening up the

aftermath is dispiriting'. Aviation activity was restricted by the fact that many of the pilots based in Ireland had not yet trained on the Bristol Fighter, which was becoming the preferred type for local use. Many of the local Army units were also composed of new recruits who were simply not ready for the demands of working with aircraft. Bonham-Carter was anxious to achieve more, and even devised a plan for potential nocturnal flights, dropping flares to deter IRA units attacking police barracks.[34]

As the year passed, there were encouraging signs of a developing liaison between the Air Force and the Army, which Bonham-Carter sought to foster. In April, 2 Squadron advised the local Fermoy brigade in advance of a reconnaissance mission and offered to drop information if anything significant was discovered.[35] The Army was also actively seeking aerial assistance; for instance, the general commanding troops in Kerry sought to develop a landing ground and petrol dump at Killarney or Tralee to enhance access to air services. The carriage of an Army officer as an observer was also suggested as a way of enhancing coordination between air and land.[36] The aerial mail service was enhanced throughout the south west of Ireland, although at least one successful attempt was made to dupe aircraft into dropping military mail on to an IRA-constructed receiving station.[37] Liaison work developed with all three brigades in the area, and by late summer a programme had been drawn up for practice with Popham Panels, a basic ground-air signalling system.[38] It seemed as if real progress was being made in the employment of air assets in Ireland.

However, those assets were proving rather fragile in the Irish environment. By August 1920, only one aircraft was serviceable at Oranmore airfield in Galway, which meant that the aerial mail service and 'anti Sinn Fein operations' suffered accordingly.[39] Bonham-Carter wrote to Trenchard for assistance, expanding on the RAF's situation. Breakdowns and forced landings were common, and pilots were beginning to 'grouse' about flying the increasingly unreliable Bristol Fighters. The repairs unit was patching up machines which really required a proper overhaul, whilst the weather conditions on the west coast were quickly degrading even the newest aircraft.[40] In a splendidly blimpish response to the pilots, Trenchard opined that 'this sort of grousing started in France' but nonetheless agreed to try and despatch some more aircraft to Ireland.[41] Pleading that Bonham-Carter was 'practically at war', he urged the RAF's Director of Equipment to send more machines across.[42] As it turned out, however, this would not be the end of the matter. Trenchard's absence from the office one day in late September would result in the shortcomings of the RAF's Irish operation being closely scrutinised by a Cabinet minister.

General Tudor, the police commander in Ireland, had travelled to London to ask for more resources from the Secretary of State for War, Winston Churchill. Although Tudor had apparently only intended to discuss the provision of armoured vehicles, the discussion also ranged over the role of aircraft in Ireland. Churchill may have raised the subject, as he had recently commented on the potential for employing the RAF against IRA members found drilling, 'using ...no more force than is necessary to scatter and stampede them'.[43] In Trenchard's absence that day, aviation advice was provided by the Air Secretary, Group Captain Scott.

He was ill-prepared to answer Churchill's probing questions, such as why only half of the three dozen aircraft in Ireland were in working order.[44] In a subsequent letter to Trenchard, Churchill urged that the RAF dredge its reserves to provide fifty effective aircraft in Ireland, and personally charged the Chief of the Air Staff to 'give the Irish position a searching overhaul yourself'. Churchill also despatched the Air Secretary to Ireland on a tour of inspection to establish the facts.[45]

This must have been a galling development to Trenchard, who had after all been taking steps to reinforce Ireland before Churchill intervened. From previous experience, the airman felt that the minister 'had an imagination... too strong for comfort and... tended to be swayed by the last devil's advocate he happened to meet'.[46] Nonetheless, he responded to the political pressure; ten additional Bristol Fighters were made ready immediately and quickly despatched across the Irish Sea.[47]

Bonham-Carter quickly produced his own justification to Trenchard to explain the embarrassing serviceability record. Many of the aircraft were stored in canvas hangars which proved less than resistant to Irish weather conditions, whilst aircraft log books had not been properly kept, with deleterious effects on maintenance schedules. A shortage of spares and technical personnel such as fabric workers further exacerbated the situation. Bonham-Carter also explained that the RAF had been seeking to meet a rising Army demand for aviation services, whilst conducting its own reorganisation from its wartime footing.[48] It should be noted that the RAF was not the only service in Ireland to be afflicted by mechanical problems; the summer of 1920 had also seen a high rate of breakdowns in the Army vehicle fleet.[49] Even so, given that he had offered similar pleas for the parlous condition of the Irish detachment six months before, Bonham-Carter was effectively admitting that his command had failed to address some fundamental issues.

Meanwhile, Group Captain Scott had crossed to Ireland with Tudor and submitted his report on 28 September, exposing even more shortcomings than Bonham-Carter had admitted to. Scott visited most of the RAF estate, and found the aerodrome at Fermoy to be hazardous for aviators and ill-equipped for all, with most of the men living in tents. Overall, the station was 'squalid to the last degree'. Simply adding more aircraft to the Irish roster would not resolve matters, as there was nowhere to put them.[50] Some mitigating circumstances were pleaded by Air Vice-Marshal Steel, Director of Operations and Intelligence. Arguing that the excessive number of machines out of service detected by Churchill's census was a temporary affair, Steel felt that the arrival of the promised repair unit would greatly enhance aircraft availability.[51]

Nonetheless, the state of military aviation in Ireland clearly left a lot to be desired, and Trenchard convened a special meeting to discuss Scott's findings. After a lengthy discussion of just what powers would be required to cut down trees at Fermoy aerodrome, the conclave considered the matter of aircraft serviceability. Some of the problems had been caused by industrial action in mainland Britain which interfered with the flow of military supplies to

Ireland, such as heavy aircraft equipment. In Trenchard's view, however, unserviceable aircraft were not necessarily a bar to operations. After all, it had been acceptable to fly machines during the War when not airworthy, and the 'present position practically amounted to War'. The Chief of the Air Staff also dismissed the complaint that the RAF stations in Ireland had lacked technical advice; 'Officers in Units should be able to look after this themselves'. Had complaints been made about RAF rations in Ireland, Trenchard would presumably have commended the consumption of cake. Some progress was at least made by the close of the meeting in agreeing to look into alternative means of transporting materiel to Ireland, such as military shipping.[52] Given that the most senior commanders of the Royal Air Force had been gathered to discuss affairs in Ireland, it was hardly a decisive outcome. This was due in part to a lack of enthusiasm for Irish operations, but also to severe financial constraints. The Treasury had made it quite clear to Trenchard that extra money would not be granted to support 11 (Irish) Wing – any expenditure would be borne from the RAF's standard budget.[53]

A further meeting on Ireland was held within a few days, with Bonham-Carter in attendance. Trenchard was loath to spend more money than necessary on improving RAF Fermoy and wanted to know if the Army would still require support from the airfield in three months' time. Given that Fermoy was the principal aerodrome in one of the most contested areas of Ireland, and that the conflict showed no sign of ceasing, this should have been a fairly safe assumption. Trenchard did call Bonham-Carter to account for failing to give an accurate picture of how acute the stores shortage had been, and instructed him to 'see that all the Officers were doing their work'. The Chief of the Air Staff had been particularly exercised by the inefficiency of the squadron commander at Fermoy, and dismissed Bonham-Carter's defence that he was new in post. Nor did Trenchard feel that Irish conditions were an excuse for poor aircraft husbandry, pointing out that machines had been field-stripped and overhauled in France. The meeting effectively concluded with a consensus that there were no facilities for a further squadron to be housed in Ireland, but replacement aircraft would be provided whenever possible.[54]

In early October, Trenchard wrote to Churchill to summarise the state of military aviation in Ireland. He argued that the serviceability figures which had so shocked the minister were atypical, but admitted that more aircraft in working order were required. The Air Marshal did suggest that Churchill's proposal for fifty aircraft was unrealistic, given the difficulties of maintaining and housing such an increased number of machines. Trenchard was especially resistant to Churchill's proposals to denude training establishments of airmen and aircraft, pointing out the impact this could have on the developing air force. Only one squadron remained in Great Britain for use with the Army, and even that had been depleted to augment Ireland.[55] Clearly, Trenchard had limited room for manoeuvre in resolving Irish matters, given the paucity of resources at his disposal. However, matters in Ireland had been allowed to drift and Churchill's enquiries had uncovered a number of shortcomings which should have been addressed by local commanders. Although the campaign against the IRA continued until the following summer, there were to be no more summit meetings on Ireland in Trenchard's office.

The immediate political pressure had been satiated, and some basic remedial work had been done, but the work in Ireland never really fired Trenchard's imagination. Army co-operation, the primary focus of the Irish squadrons, was not an aviation role that the air chief favoured; indeed, he had considered returning this capability to the Army in order to concentrate on more offensive roles.[56]

Some of Trenchard's lack of enthusiasm can also be explained by the contention over the arming of aircraft in Ireland. Although first raised by the Viceroy in 1918, the idea was taken up again by Bonham-Carter soon after his arrival in Ireland in March 1920. In a letter to the Chief of the Air Staff, he suggested that in due course the RAF might be allowed to take 'more drastic measures' against the Irish insurgents, employing bombs and aerial gunnery.[57] No response from Trenchard is recorded to this request, but developments in another theatre provide an insight into his views.

In the aftermath of events at Amritsar, when aircraft had fired on a crowd at Gujranwala to lethal effect, the RAF commander drafted a response to the India Office which recommended that, given the difficulty of identifying targets from the air; 'the use of aircraft in industrial unrest or risings for several years to come should be definitely confined to reconnaissance and communication purposes'. Offensive air power could only be considered against obvious 'murder and arson' in an area where 'the majority of the inhabitants are definitely hostile'.[58]

Trenchard's concern for discrimination was understandable; it was clearly not in the interests of the fledgling air force to repeat the Indian experience. Bonham-Carter received Trenchard's memorandum in May, but within three months had apparently discovered circumstances which would allow the employment of armed aircraft in Ireland.[59] A mail lorry had been ambushed by the IRA, and during the ensuing gun battle an RAF aeroplane flew past. The aircrew considered that their weapons could have been used to decisive effect, without 'any question of the innocent suffering with the guilty'. Bonham-Carter pleaded this case to the Air Ministry, asking that the memorandum be altered to permit aerial engagement if 'the rebels could be clearly distinguished'.[60]

A reply was drafted by the Director of Operations and Intelligence at the Air Ministry, pointing out that the General Officer Commanding in Ireland could issue orders to this effect, but warning against the 'possible misemployment of aircraft'.[61] The letter was not sent in the event; the surviving correspondence on this subject shows that senior military and Government figures in London were generally chary of endorsing requests from Dublin for airborne weapons. It is particularly noteworthy that the Irish and Indian documents are interleaved in the same Air Ministry file – there was clearly an anxiety about recreating Gujranwala in Galway. However, the pressure to arm RAF aircraft was growing as the Irish military and police commanders became involved in the debate. In August 1920, General Macready, the Army commander in Ireland, wrote to his superiors in the War Office, asking that Trenchard's memorandum be amended to allow the use of ordnance against identifiable assailants.[62]

Although the War Office did not hasten to reply, the concerns of General Tudor were being thoroughly discussed at the Air Ministry.

In the course of his September discussions in London, General Tudor had asked that aircraft be armed, as he felt that the existing unarmed patrols were an insufficient deterrent to the rebel forces. Group Captain Scott, the Air Secretary, initially made some objections on the grounds of distinguishing friend and foe, but came up with some compromise solutions. These included RAF stations in Ireland conducting regular target practice as a demonstration of capability, and painting British lorries with coloured roundels to facilitate discrimination from the air.[63]

After his inspection visit to Ireland, Scott had more suggestions which included the occasional use of machine guns, 'the very greatest pains being taken to ensure that no mistake is made … Bonham-Carter said that he had two or three really careful and reliable pilots who could be trusted not to fire unless they were certain that they were attacking Sinn Feiners'. The remaining careless and trigger-happy pilots could presumably have been employed on Scott's other scheme which involved designating the Wicklow Mountains as an RAF bombing range, where the echoing detonations could demonstrate the potential of air power.[64]

Scott's rather offbeat efforts to find a way of employing armed aircraft found scant support from his superiors in the Air Ministry. The Director of Operations and Intelligence argued that it was difficult to find clear opportunities for the use of weapons, and the RAF should focus instead on communication and reconnaissance work in Ireland.[65] Trenchard was in complete agreement with this, arguing that the use of armed aircraft would simply leave the IRA 'annoyed and exasperated without being impressed'. Any resulting 'mistakes' would result in a press campaign against 'irresponsible pilots', whilst downed aircrew might find themselves at the mercy of an incensed populace. The Chief of the Air Staff also adduced previous military experience to prove his case, arguing that road strafing in wartime France had little impact in reducing enemy traffic.[66]

Macready had in the meantime renewed his petition to the War Office, further adumbrating circumstances in which aerial firing could be employed with confidence. In the General's view, aircraft responding to road ambushes in isolated country could do so with impunity as the 'open hostility of the assailants' would be obvious, 'even to a man in an aeroplane'. In more populated areas, crowds could be dispersed by dropping warning leaflets before opening fire.[67]

The matter was discussed at the highest military level when Trenchard met with the Chief of the Imperial General Staff, Sir Henry Wilson. The airman pointed out that even Macready's isolated roadside battle would by no means offer a pilot clear and undisputed targets. Dropping pamphlets before opening fire was also unreliable, as there was no guarantee that the information would fall where it was intended; pilots could be opening fire on people who had received no warning. Given the damage that could be caused from 'a runaway gun', Trenchard decried Macready's proposed policy as 'ineffective and highly dangerous.'[68] Wilson and the War

Office followed Trenchard's line, considering that the proposition entailed enormous risks of public opprobrium with little military gain. This is illustrated by a memorandum from a Colonel Braine opining that 'the whole responsibility would be placed on..a very young air officer with plenty of dash and keenness but perhaps little idea of responsibility or judgement'.[69] Patronising and stereotypical as Braine's statement may have been, it perhaps contained an element of truth. Finally, at the end of October, Macready obtained his official answer from the Army Council. Authority would not be given for the arming of aircraft, as concerns of discernment, accuracy, and communication precluded 'the exercise of that delicate control which is necessary'.[70] Within six months, however, the issue of arming aircraft would again be back on the agenda, albeit with a different outcome.

Indifferent weather had delayed the despatch of more Bristol Fighters to Ireland, but the squadrons were slowly building up strength, albeit by denuding British home defence and Army co-operation squadrons.[71] By late October, Bonham-Carter was also able to advise Trenchard that progress was being made on enhancing Fermoy aerodrome, whilst an extra hangar was due to arrive at Oranmore within the week.[72] The improvements soon began paying dividends in operational output.

For instance, intelligence officers had noticed that Dennis Galvin was leading a rebel band near Kanturk who tended to muster on Thursdays for activity on Fridays – the brigade requested aerial reconnaissance to monitor Mr. Galvin's activities.[73] Army brigades were also submitting requests for missions such as low flights at random times to detect ambushes.[74] In addition to the quotidian task of mail carriage, reconnaissance was also carried out for illegal drilling, and damage to communications, whilst thousands of leaflets were dropped with descriptions of wanted men. In one notable episode on 13 December 1920, three DH9 aircraft from 100 Squadron worked with 16 Brigade in Tipperary. An area of three square miles was sealed off and searched by police, soldiers, and Auxiliaries, the aircraft co-operating with ground forces through the use of Very lights and dropped messages. Wireless transmissions from the aircraft were used to update the squadron headquarters.[75]

One especially positive development was the circulation of a memorandum in February 1921 by 6 Division in Cork. The authors of the document were keen to ensure that aircraft were used in a manner that kept pace with rebel tactics, the key issue being effective ground to air communication. This proposal was considered by 2 Squadron in Fermoy, who set out a sample list of signals involving Klaxons and Very lights.[77] The brigade operating in Kerry had also been considering these issues, and decided to use a method of reporting map references that had been used in the War; this established practice should, however, have been revived long before the spring of 1921.[78] Air power was at least being used with increasing care and planning.

One of the arguments that had been advanced by Tudor, Bonham-Carter, and Macready in the debate over the arming of aircraft was the fact that the IRA would not be intimidated for long

by unarmed machines.[79] However, there is clear evidence to show that the insurgents took the RAF seriously despite its lack of offensive capability. As early as 1918, the Irish Volunteers had experienced something of air power's ability in reconnaissance and learned to take avoiding action.[80] Although early attacks on RAF stations may have simply been part of the IRA's weapons harvesting campaign, as the war progressed the Republican forces considered that aircraft themselves were worth destroying. When machines had forced landings in the Irish countryside due to mechanical failures, it was not uncommon for the local Republican forces to attack the guard force and incinerate the unfortunate biplane.[81] At least two aircraft were spotted by rebel forces on railway wagons and burned in transit.[82] These attacks may of course have simply been part of a general campaign to destroy British materiel, similar to the burning of military laundry.[83] By January 1921, however, it was clear that the IRA had begun to specifically target aircraft, as orders were issued to local commanders to log known air routes and snipe machines 'at least once weekly if flying low'.[84]

In early February 1921, a group of IRA volunteers in County Limerick had the opportunity to put this order into execution. Six separate Republican statements concerning the incident have survived, and provide a credible account. An aircraft flying low over Kilfinane, apparently in mechanical difficulty, was fired on by an IRA column and subsequently landed, with bullet holes in the petrol tank.[85] The laconic British account of the incident makes no mention of hostile fire whilst the rather diffident insurgent records state that 'it was never learned whether the 'plane came down directly as a result of the I.R.A. fire'.[86] Whatever the ultimate cause of the aircraft's demise, the pilot had sufficient time to make good his escape towards the local town to seek help, leaving the hapless observer, Flying Officer Mackey, to face the advancing IRA.[87] The aircraft was set on fire and Mackey became a guest of the Irish nation, although his silk socks and light shoes were ill-suited for his marshland trek with the IRA column.[88] The observer, who was 'a very likeable person and fairly well educated for an Englishman', spent several days in the company of the rebels, and promised at least one of them a flight when the conflict was over.[89] Mackey's hosts ensured that he was provided with boots and he commented that the IRA was 'far different...from what he had been led to believe'.[90] Whilst this exercise in Anglo-Irish understanding was going on, the RAF was making its own efforts to recover Mackey, dropping leaflets and even smoke grenades on a local town to encourage his release.[91] These efforts had no apparent influence on the IRA decision to free Mackey, who was deposited unharmed at Charleville railway station, complete with a letter from his captors assuring the RAF that he had been held against his will.[92] Some genuine rapport does seem to have been established between the airman and his captors – on a subsequent visit to the area with local security forces, Mackey did not betray his erstwhile hosts.[93] Despite the rather picaresque flavour of the airman's adventure, however, there were some sinister undertones. British troops burnt a local house as a reprisal after Mackey's capture, whilst at least one of his guards had suggested his execution.[94]

Although this was the only episode where IRA ground fire may have been a factor in bringing down an aircraft, insurgent units persisted in their efforts.[95] There are also numerous examples

of IRA units withholding anti-aircraft fire to avoid detection, whilst various instructions to Volunteers urged the need for camouflage and concealment from aerial observation.[96] Kautt has argued that the IRA showed a 'disproportionate' reaction to aircraft, and states that unarmed machines posed little real threat to the rebels.[97] However, the IRA reaction was hardly excessive – Republican leaders simply had a healthy understanding of the dangers posed by RAF reconnaissance.

In the spring of 1921, as rumours grew of a planned general uprising in Kerry, Macready decided to renew his argument for the arming of aircraft.[98] In a letter to the War Office, he argued that the situation in Ireland had changed since the autumn of 1920. The IRA was now operating as 'large commandos' and developing 'minor military engagements' rather than small ambushes. Macready did propose that armed aircraft should be confined to the martial law area of south west Ireland, in cases where 'a definite action was taking place, or when an aeroplane itself was fired at'.[99]

In an echo of the October correspondence, the War Office again sought the views of the Air Ministry, enquiring whether Trenchard's views had changed. For their part, the War Office felt that the changing circumstances in Ireland might now permit the use of armed machines under strict conditions. The issue was not simply a matter of inter-service consultation, however; 'if we agree together on any modification it will have to receive the sanction of the Cabinet ...since whatever we do in Ireland we will have to meet severe criticism from various quarters which would be particularly aggravated...by some unfortunate mistake'.[100]

In contrast to the comparatively drawn out debate of 1920, the operational tempo in Ireland ensured that the discussion proceeded with brio. Macready wrote to Sir Henry Wilson, citing the Kerry divisional commander's desire to have aircraft equipped with bombs and machine guns immediately.[101] British intelligence indicated that the suspected imminent general rising would afford an opportunity to engage substantial rebel forces in open conflict – an ideal arena for air power.[102] The War Office accordingly sought a rapid reply from the Air Ministry, stating that 'the matter has now become very urgent'.[103]

Although the Royal Air Force still inclined to Trenchard's views, the airmen were prepared to concede that in the martial law areas 'a state of war may ...be considered to exist'. This meant that air assets would no longer be supporting the civil power but providing support to an Army commander in a campaign.[104] The general thrust of the letter was that the RAF would use weapons if the Army was responsible for issuing the necessary orders.

This understanding was emphasised at the political level when the Minister for Air, Lord Londonderry wrote to the War Minister, Sir Laming Worthington-Evans on the subject. Londonderry pointed out that the Air Ministry had altered its views only at the request of the Chief of the General Staff. Indeed, the peer wanted reassurance that 'this has been done with your full knowledge, and that you are prepared to support the policy in Parliament should

the question arise'.[105] Worthington-Evans quickly responded that no aircraft were to be armed 'without my express direction, as this is a matter for the Cabinet'.[106]

The issue was debated at a Cabinet meeting on the following day. The politicians were under no illusions regarding the 'great risk of death and injury to innocent people' that could result from the use of aircraft weapons. However, they were also aware that Macready was 'fully alive to the risks and his personal responsibility in the matter' and was still pressing his claim. In the event, the Cabinet decided that the General could draft instructions for the use of armed aircraft, with the caveat that weapons were only to be used when operating with land forces. Macready's plans would have to be approved by Lloyd George, who could bring them before the Cabinet again if he chose.[107]

Five days after the Cabinet meeting, Lloyd George gave his approval without further discussion.[108] Increasingly desperate to solve the Irish question, allowing the use of aircraft weapons was simply a step beyond the 'official reprisals' the premier had already authorised.[109] Brigade commanders could now approve aerial weapons in rural areas, although bombs were only to be used on 'effective targets', such as thirty men in close order. Any orders issued were to include clear objectives and limits for the operation. Even then, the pilots bore a heavy responsibility for opening fire, and should be prepared to break off or delay attacking if in doubt.[110] This was hardly *carte blanche* for the use of aerial firepower but allowed some opportunity at least to prove French's hypothesis of 1918.

Bruited though it had been, the 'Kerry Rising' never materialised. The permission to use aircraft, however, remained in force. The records of the Irish squadrons show that occasional requests were made by the local brigades for the provision of armed escorts, such as 16 Brigade's desire to have aerial support on an 'official reprisal' operation.[111] The neighbouring brigade requested support two days later, asking for armed aircraft to 'engage any rebels seen' near Bandon.[112] Given the sheer amount of effort which had gone into acquiring this permission, however, it was to be employed on comparatively few occasions. The Royal Air Force in Ireland was, nonetheless, developing its role and proving highly effective, with or without weapons.

A key development had been the fostering of even closer relationships with the Army. The early work in developing ground-air signalling through Klaxon horns and Very lights was paying dividends, ensuring that aircraft co-operated more effectively with land forces. Each Brigade headquarters had an RAF liaison officer, who was able to advise on the capabilities and limitations of air power, leading to 'much closer and more useful co-operation'.[113] A clear example of this was the development of aerial escort procedures for military trains, marking carriage roofs with identifying white crosses, and establishing a Very light code for communication between the aircraft and the train.[114] Evidence from the IRA archives suggests that the presence of aircraft had a notable deterrent effect on railway ambushes. Thus Seamus Finn, a member of a County Meath column, later recalled how he and his comrades ordered a

'general retreat' from a carefully planned attempt to blow up a troop train when spotted by the escorting aircraft.[115]

Trenchard was, however, unimpressed by the activity in Ireland, commenting that 'it seems to me that the work done in Ireland is very, very little'.[116] The air chief scrawled these words on an RAF minute sheet just days after his return from the Cairo Conference.[117] This gathering of Imperial leaders had endorsed Trenchard's view, based on the success of a 1920 air campaign in Somaliland, that air patrolling and armoured cars offered a cost-effective means of controlling Britain's colonial badlands.[118] Indeed, one commentator argues that the Cairo Conference 'probably saved the RAF from extinction'.[119] By comparison, the work in Ireland of mail runs and support to Army operations was rather mundane and never really aroused Trenchard's enthusiasm. For the Chief of the Air Staff, the future role of RAF lay rather in air-centred operations than as an accessory to land and sea engagements.[120]

Whatever Trenchard's feelings may have been, the Irish squadrons were proving increasingly effective in operations alongside ground forces. In the first week of April alone, for instance, aircraft thwarted a planned ambush, advised troops of numerous damaged railways and bridges, escorted prisoners, dropped supplies and patrolled roads. In an impressive feat of co-ordination, aircraft were employed in relays to assist the Kerry Brigade, dropping reports at pre-arranged locations.[121] A party of Royal Fusiliers operating in a remote RIC barracks in Kerry were also sustained for some weeks by rations dropped from aircraft.[122] A high level of activity continued throughout the month into May, including the dropping of propaganda pamphlets, transporting spares for an armoured car, and assisting with round-ups of suspected rebels. RAF reconnaissance skills even earned a grudging tribute from the IRA, who realised that effective aerial observation had diverted a patrol from a freshly demolished bridge.[123] In one particularly ambitious operation, four aircraft worked together on a reconnaissance mission following an ambush in County Galway. For remote garrisons with no access to wireless telegraphy, 'aeroplanes were the only means of getting news through'.[124] Aerial photography was also proving useful in identifying IRA dugouts and tracks in mountainous areas, leading on at least one occasion to the capture of ammunition and bandoliers.[125] This capability was initially limited to 100 Squadron operating on the eastern coast, an unfortunate restriction as the airborne cameras would have proved highly useful in the wilderness areas of the south west.[126]

Although the British administration had long sought to underplay the IRA campaign, by June 1921 the Lord Chancellor finally admitted that 'a small war' was going on in Ireland.[127] One of the most obvious manifestations of this were 'drives' throughout rural Ireland, involving large numbers of Crown forces sweeping through an area searching for IRA units. By the summer of 1921, these operations made considerable use of aircraft. The effectiveness of these drives has been called into question by some historians, who argue that few rebels were actually caught by these means.[128] However, the IRA took such operations very seriously and ordered its members to constant vigilance against drives; although few Volunteers may have been captured, their operational freedom was drastically curtailed.[129]

The RAF records for June 1921 certainly record a great deal of activity in support of drives. On June 6th, for instance, aircraft were involved in separate operations across Kerry, Galway, and the Midlands, dropping information to the advancing troops. On the following day, aircraft were in action again over Lough Allen in the west, working with police who wore special covers on their caps to facilitate identification from the air. Armed assistance was also given on occasion, including the dropping of 20lb bombs for 'moral effect', whilst aircraft searching for an IRA formation 'fired into the wood where they were supposed to be, but no one was seen'. These operations across open country were arguably the ideal opportunity to employ aircraft weapons, yet the month of June saw only four bombs and 147 rounds of ammunition expended.[130] It is therefore unsurprising that only one insurgent account mentions RAF gunfire, when a County Clare column remained in hiding as the low-flying aircraft which had followed them strafed vegetation nearby with its machine gun.[131] Aircrew recorded withholding fire on one occasion in Cork as the men in their sights 'were not in action against Crown forces'.[132] The carefully drawn rules of engagement meant that most crews would return home with their magazines intact. However, whilst the Royal Air Force did not have much occasion to bring its firepower to bear, the numerous IRA accounts of this period illustrate that aircraft still had a very significant effect.

Thus Con Leddy, a member of the Cork IRA, recorded a cross-country retreat following a gun battle at Ballyduff, seeking to elude an aircraft which pursued his unit over five miles of open country.[133] Elsewhere in the county, Thomas Barry's column was detected by the RAF and 'had no option but to withdraw'.[134] Drawing on the expertise of a former British serviceman in the column, John Bolster's unit also left their firing positions when spotted by an aircraft.[135] Michael Brennan, a commander in East Clare, similarly records how aerial reconnaissance forced his men into cover.[136] The RAF also played a key role in the capture of Timothy Considine and Joe Toohy, circling overhead until ground forces arrested the duo.[137] Quartermaster John Feehan of the Western Division sacrificed his new hat in his haste to elude a searching aircraft, realising that detection could mean the capture of the Connemara Active Service Unit.[138] Commandant Sean Gibbons found that his sentries had 'quite a lot of trouble' from aircraft, and his unit was unable to break cover on account of the 'plane activity'.[139] High in the mountains of the west, Martin Conneely and a colleague also found their progress impeded by the RAF; 'our only danger was the plane, which at times skimmed quite close to the mountain tops'.[140] Nor was the city safe from aerial observation, as the weapons smuggler Peter Gough discovered in north Dublin.[141] One of the IRA's leading commanders, Sean Moylan, even records how the RAF presence effectively interdicted his column's food supply on one occasion.[142] These samples from a rich vein of IRA memoirs clearly illustrate that air power had made an impact.

Even as the drives swept across large tracts of rural Ireland, secret negotiations were in hand to find a political settlement, and a truce was arranged from 11 July.[143] It was by no means obvious at the time that the cease-fire would last, and British forces continued to train for operations. Air power was integral to this process; within a week of the truce the Army units in

south-western Ireland were already seeking ways of enhancing air-ground liaison still further.[144] Throughout the summer of 1921, troops and aircraft trained together, concentrating particularly on effective communication with Popham panels.[145] Aerial reconnaissance was an ideal way to monitor the on-going activity of Republican forces; thus on 13 August, a patrol from 100 Squadron discovered numerous encampments across the Dublin region.[146] RAF aircrew also spotted IRA 'fortifications and works' in the Wicklow Mountains, and treated British intelligence officers to flights over the capital.[147]

One consequence of the Anglo-Irish Treaty eventually concluded in December 1921 was that the withdrawal of aircraft began before the month was out.[148] Trenchard certainly anticipated that 'all the Royal Air Force will be very shortly out of Ireland'.[149] As it transpired, however, elements of the RAF would remain for almost a year as Ireland disputed the political settlement. Although most of the personnel and machines had left by the end of March 1922, General Macready thought it 'imperative' to retain an aerial capability.[150] Fearing 'more or less open warfare' on the frontier between Northern Ireland and the Irish Free State, the General wanted at least four aircraft available to cover the evacuation of British forces from Dublin.[151] As a precautionary measure, no troop trains during April were permitted without an aerial escort.[152] Working on the assumption that an outbreak of hostilities could make Baldonnel aerodrome unusable, plans were prepared for a highly mobile RAF detachment with a workshop lorry and portable hangars.[153]

The small RAF detachment, now concentrated at Collinstown in Dublin, continued its regular duties of escorting troop trains and carrying military mail as the British military presence in southern Ireland drew down.[154] There was an upsurge in activity in late June as IRA units opposed to the Treaty occupied the Four Courts in Dublin and fatally wounded Field Marshal Sir Henry Wilson outside his London home. To the British administration, it appeared as if Michael Collins' Provisional Government was unable to keep militant Republicanism in check, and the fate of the Treaty hung in the balance. Under pressure from London, Free State troops attacked the Four Courts, but failed to penetrate the masonry walls, even after the British garrison in Dublin provided Collins' troops with artillery.[155] Winston Churchill, now Colonial Secretary, was increasingly anxious to bring matters to a conclusion, commenting that the 'consequences of a failure may be fatal'.[156] To expedite the defeat of the rebel troops, Churchill offered Collins the use of aircraft painted in Free State colours, but flown by RAF personnel, to drop bombs on their stronghold.[157] Accordingly, Bonham-Carter ordered aircraft to be made ready, fitted with a variety of 'good sized eggs'.[158] Trenchard had initially endorsed the scheme in principle, bar the camouflage ruse which he deplored. However, even as preparations proceeded he decided that the plan was politically mistaken and would 'wreck the discipline of the air force'.[159] Whatever the internal consequences may have been for the RAF, the bombing of central Dublin by thinly disguised British aircraft would have been a gift to Republican propagandists. Mercifully for future Anglo-Irish relations, Rory O'Connor's garrison surrendered before the bombers could launch.

The threat to the RAF from ground fire remained, and anti-Treaty forces attacked a cross-border mail flight on at least one occasion.[160] At least the requirement for a permanent aircraft presence in southern Ireland was rapidly diminishing as British forces withdrew into Dublin. The Irish RAF headquarters relocated to Aldergrove in September, whilst the aerodrome at Collinstown was evacuated on 1 November.[161] However, even as the last vehicle convoy crossed the border into Ulster, a small RAF presence remained in the Irish capital. Based in Phoenix Park, half a dozen airmen maintained a landing ground and wireless equipment for Macready's headquarters.[162] Only as dusk fell on December 14th, in the closing phases of the British departure, were the last RAF personnel withdrawn.[163]

There were undoubtedly failings in the application of air power in Ireland; one egregious error being the drawn-out discussion over the arming of aircraft. The Cabinet's failure to develop a consistent Irish strategy lay at the root of this, by leaving military officers in Ireland to implement the Prime Minister's 'erratic coercion policy' as best they could.[164] Trenchard's original advice to use aircraft in unarmed roles was sound and should have sufficed; a great deal of nugatory work would have been avoided.

The staff work expended on discussing aerial weapons would have been better spent considering aircraft cameras; the IRA did not fear destruction from the air so much as detection. As a writer for the Republican military journal *An T'Oglach* expressed it, 'the best means the English have at their disposal for locating our standing positions, strong points and dumps in the country is the aerial photographer'.[165] This insight was not sufficiently appreciated by the RAF until late in the conflict, and a specialist photographic unit was not deployed to Ireland until the summer of 1921.[166] For Trenchard, seeking to justify the continued existence of his infant service, the RAF role in Ireland was not a central concern. Uninspired by the supporting role of the Irish squadrons, he tended to take a reluctant interest only when importuned by Bonham-Carter or pressed by Churchill.

A high level of air-land integration had been achieved in the Great War, but much of this had been allowed to lapse by 1920.[167] Basic issues such as common map referencing between air and land units could have been resolved at a much earlier stage of the operation. Again, this echoes a wider malaise; co-ordination between the Army and the Royal Irish Constabulary was similarly slow in developing.[168] The piecemeal British approach to security in Ireland, with no overall strategy or commander, did little to foster co-ordination between the various force elements.[169]

Despite these caveats, however, there is much evidence to suggest that the Royal Air Force accomplished a great deal in Ireland. Montgomery's scepticism was certainly not shared by General Macready, who came to regard Bonham-Carter as 'his most trusted divisional commander'.[170] Brigade commanders described the RAF in equally glowing terms, commending the airmen's efforts in co-ordinating the work of ground forces.[171] By the time of the Truce in 1921, air power had become an integral part of British military operations in

Ireland. As the history of the 6th Division noted, the Irish experience demonstrated 'of what great use planes could be in all guerrilla operations'.[172]

Although Townshend contends that there was 'little military contact with the RAF and little development of ideas', this is not borne out by the evidence.[173] As the conflict progressed, the Army and Air Force worked closely in tandem to refine suitable techniques for Irish operations. The 1921 monthly resumes of RAF activities in Ireland are liberally peppered with references to requests from the Army for aerial assistance, whilst aviators and soldiers frequently trained together.[174] The lessons of air-ground integration may have taken some time to learn, but they were well applied. By April 1921, aircraft escort had 'been found to be the best means of preventing ambushes on either roads or railways', and the squadron diaries record almost daily co-operation with troops and police.[175] It is surely a testament to the utility of the RAF that the Dublin garrison maintained access to air services right up to the withdrawal in December 1922.

Evidence from the IRA also indicates that aircraft had a definite effect on Republican activities throughout the War of Independence. The IRA developed a healthy respect for the reconnaissance capabilities of the RAF, and members were reminded that 'the most dangerous thing was being observed by...aircraft'.[176] Michael Brennan, the commander of Republican forces in County Clare later commented that the 'addition of [more] aeroplanes and armoured vehicles would have made short work of us'.[177]

Indeed, it was perhaps the quondam enemies of the Royal Air Force who paid the ultimate tribute to its effectiveness in Ireland. As an insurgent leader, Michael Collins had admired the British use of air power, and his new Provisional Government wasted little time in acquiring an aerial capability of its own.[178] Once again, the skies of south-west Ireland witnessed Bristol Fighters engaged in reconnaissance, leaflet dropping, railway patrols, and occasional armed attacks.[179] Perhaps Collins understood better than Montgomery that, when dealing with an insurgency in Ireland, pilots and observers were in a position to offer a great deal of help indeed.

Notes

This article is an abridged version of a dissertation undertaken as part fulfilment of the Master's Degree in Air Power at King's College London, submitted June 2013. Sources marked NAUK are drawn from the National Archives at Kew, whilst archives prefixed RAFM refer to the holdings of the Royal Air Force Museum. The Bureau of Military History (BMH) archives in Dublin are accessible online at **http://www.bureauofmilitaryhistory.ie/**.

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[4] Sheehan, the only author to refer to the BMH archive regarding the RAF, merely cites three accounts of a single incident; Sheehan (2011), p.145

[5] MacCarron (2000), pp.31-33.

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[7] BMH WS 0907, Laurence Nugent, p.137.

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[25] NAUK AIR 5/777, 11 Group Memorandum, 'Defence of Ireland', 27 September 1919.

[26] RAFM B2191, 'Life Record of Group Captain George Ivan Carmichael', pp.171-2.

[27] Hayes *op.cit.*, p.41.

[28] Ibid., *passim*.

[29] RAFM B2191, 'Life Record of Group Captain George Ivan Carmichael', pp.169-170.

[30] NAUK AIR 5/777, 105 Sqn Memorandum, 25 September 1919.

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[74] NAUK AIR 5/776, 16 Brigade to 2 Squadron, 21 December 1920.

[75] NAUK AIR 5/214, 'Resume of 11 (Irish) Wing Operations, November 1920 –January 1921'.

[76] NAUK AIR 5/776, 6 Division memorandum, 28 February 1921.

[77] NAUK AIR 5/776, Officer Commanding 2 Sqn to HQ 6 Division, 15 March 1921.

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[81] BMH WS 1416, Cornelius Healy, p.7.

[82] BMH WS 808, John Bolster, p.17; WS 423, Vincent Byrne, p.70.

[83] BMH WS 596, George Nolan, p.6.

[84] NAUK AIR 5/772, IRA Order, HQ Cork No 2 Brigade, 24 January 1921.

[85] BMH WS 600, Donnchadh O'Hannigan, p.27; WS 883, John McCarthy, p.82.

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[87] BMH WS 1412, Michael Hennessy, p.11.

[88] BMH WS 883, John McCarthy, p.85.

[89] BMH WS 600, Donnchadh O'Hannigan, p.28; WS 1435, Daniel O'Shaughnessy, p.71.

[90] BMH WS 1412, Michael Hennessy, p.11.

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[92] BMH WS 883, John McCarthy, p.84; WS 1451, Edward Tobin, p.86.

[93] BMH WS 1435, Daniel O'Shaugnessy, p.71.

[94] O'Snodaigh, *op. cit.*, p.235; BMH WS 1435 Daniel O'Shaughnessy, p.71.

[95] BMH WS 783, Thomas Ryan, p,103; WS 1359, Ed.Curran, p.3.

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[137] BMH WS 1334, Joseph Stanford, p.53.

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**ROYAL
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Flight Training in the First World War and its Legacy

By Mr Trevor Nash

Biography: Trevor Nash has a BA (Hons) in Modern History from the Open University and an MA in Air Power Studies from the University of Birmingham. He is currently a PhD candidate at the University of Birmingham. In his day job Nash is the editor of Jane's Simulation & Training Systems.

Abstract: By the middle of the Second World War, the Royal Air Force was employing an extremely sophisticated training process that in many ways, has provided the global model for modern air forces to train their aircrew today. This process did not evolve overnight but had its roots in the training methodologies that were developed during the First World War. Although a number of authors have condemned these early training methods, it must be remembered that training was developing in parallel with evolving tactics, rapidly improving aircraft performance and general understanding of aeronautics and the application of air power. Like aviation itself, training during the First World War developed at a fast pace and saw new and innovative developments such as the creation of a formalised training structure, purpose designed training aircraft and the use of overseas training locations to counter poor weather and a lack of airfields at home. Perhaps more importantly, the experiences of the First World War highlighted that the production of aircrew to meet the requirements of an industrialised war needed massive resources and a dedicated focus. It became clear that the 'training pipeline' was a dynamic concept that demanded major resources to ensure its functioning success.

Introduction

By the middle of 1942 the Royal Air Force's (RAF) operational training process and organisation was well established and few changes were made between then and the end of the Second World War. The process and organisation of operational training in 1942 was exemplified by the use of overseas training due to a lack of facilities in the UK, airspace restrictions and reduced training opportunities caused by inclement weather; the use of specialist schools for teaching specific tasks; the use of dedicated training aircraft types; and a growing recognition of the benefits of using Synthetic Training Equipment (STE).[1] Although many might assume that the training model adopted by the RAF in the Second World War was new, many concepts were initially developed during the First World War although like most conflicts, many historical lessons had been forgotten or ignored during the period of expansion and the early years of the war. In 1940 for example, many senior officers realised the resources and time required to undertake this training. In a memorandum from the Directorate of Staff Duties (DSD) to the Director of Postings in January 1940, the author highlighted that it was, 'essential for us to maintain an operational training organisation on a very large scale if we are to provide crews who are capable of operating modern aircraft satisfactorily.'[2] This recognition was not always widespread. In January 1942, the Air Officer Commanding 6 Group Bomber Command, Air Commodore F. MacNeece Foster wrote that Air Marshal Sir Arthur Harris, soon to be appointed as AOC-in-C Bomber Command, 'frequently complained that the shaft of all our training organisations ... was very thick and the actual spearhead of operational effort was very small.'[3] As was to be expected perhaps, there was always conflict between the desired output standards of a 'training pipeline' and the input resources and time required to achieve that output. This paper will focus on many of those issues with reference to the operational training that was developed during the First World War and where appropriate, highlight where lessons were learnt or how experience shaped later training. As such, the major analysis will focus on the First World War. Consideration of how operational training developed within the RFC, RNAS and RAF and how many 'lessons learned' shaped later RAF training methodologies will be addressed by four key areas. The first will focus on the tactics and technologies that altered the way operational training was conducted during the First World War and their direct impact on the 'training pipeline'. Secondly, training organisation and policy issues will be analysed before looking at the methodologies of training that were used during the First World War. Finally, this paper will consider the logistics of training, including training aircraft, the availability of airfields to conduct operational training and the use of overseas training locations.

Technical and Tactical Issues

When the Royal Flying Corps (RFC) and Royal Naval Air Service (RNAS) deployed to the continent in August 1914 following Britain's declaration of war against Germany, aviation was in its infancy; the first heavier than air flight only having taken place just over 10-years earlier and the first crossing of the Channel just five years previously.[4] Although basic theoretical aeronautical science had advanced rapidly throughout the late-nineteenth and early-twentieth

century, the reliability and capability of technology to deliver robust aircraft and engines to study these theories in greater depth was a major retardant to aeronautical development.[5] Like the Wright Flyer of 1903, both Germany's Etrich Taube and Britain's Sopwith Tabloid aircraft that were deployed to France in 1914, used wing-warping compared to the use of ailerons that were becoming available and increasingly being adopted as a more efficient form of control.[6] By the end of the war however, the performance of aircraft such as the SE5A, Bristol F2B and Albatross D. VII was unrecognisable compared to those deployed in 1914.[7]

The technical improvement to aircraft and their tactical employment during the First World War had a significant impact on training. Firstly, technical improvements led to increased performance and payload, specifically speed, the maximum ceiling of the aircraft and the ability to carry increased types and weights of weapons. In turn, technical enhancements provided opportunities for aircraft to adopt new roles; a legacy mirrored in the different type of aircraft missions flown during the Second World War.[8] These new roles demanded specific types of training, for example, in night flying to counter Zeppelin and Gotha raids against Britain.[9] Initially, the role of the aircraft was limited to reconnaissance although the military was well aware of what could theoretically be undertaken once aircraft performance had improved.[10] This was apparent in the *RFC Training Manual* that was published in June 1914 which stated that although an aircraft's 'chief use is reconnaissance...other duties of aircraft in war' included fighting against other aircraft, transport of people and messages, ground attack and miscellaneous duties including cooperation with artillery.[11] Even before the release of this manual, Major Frederick Sykes, then commander of the RFC's Military Wing, said that aeroplanes would be employed, 'in fighting off the opposing aeroplanes...'[12] The problem that was faced by the RFC and RNAS was a lack of any real knowledge as to how to employ and operate aircraft with any certainty due to performance limitations. This conundrum was summarised in the *Naval Air Service Manual 1915*, written in November 1914 that declared:

> It must be borne in mind that the whole subject [military aviation] is at present in a very experimental stage and that it is impossible in many cases to lay down hard and fast rules of procedure. Every effort must be made by all concerned to improve existing methods until some measure of finality may be reached...Chapters on wireless, night flying, and workshops will be added as further experience is gained.[13]

If nothing else, this excerpt highlights explicitly the recognised need to create a robust training system to provide improved operational capability. As the First World War progressed, technological innovation and specialised designs such as the scout and the bomber, ensured that the aircraft had become 'an integral part of the way wars were fought'.[14] Although the RFC was initially tasked with carrying out reconnaissance, by 1915 improvements to aeronautical technology had begun to shape tactics. Despite Trenchard's memorandum of 1916 that called for incessant offensive action to control the air, it had been recognised for a number of years that conducting aerial reconnaissance was predicated on achieving 'command of the air'.[15] The RFC's reconnaissance activities in the first six months of the war had always been

conducted with an eye to destroying enemy aircraft that tried to interfere with the mission and as such, assorted weapons including revolvers, hand grenades and rifles had been used to try and destroy enemy aircraft when the two sides met although as Morrow has stated, such encounters were usually 'indecisive'.[16] This situation changed in the summer of 1915 when Germany deployed the Fokker E-1 Eindecker with its synchronised Parabellum machine gun that fired through the propeller disc.[17] The great benefit of this design was that if the pilot fired when directly laterally in-line with his target, he did not have to worry about calculating deflection. As Biddle so accurately observed, the 'air war demanded specialization' and '[a]irplanes created a need for other airplanes...'.[18] This observation has also been echoed by Grattan who said that, 'technology was the principal driver of the development of tactics and strategy in the air war' and to this may be added developments in training, the symbiotic sibling of tactics and technology, that was needed to prepare aircrew for conducting new roles in higher performance aircraft.[19] As the Germans took a technological advantage with the Fokker Eindecker, the British had to respond with a more capable counter platform or tactic; a trend that was to continue throughout the war with the technological and tactical advantage tipping between the combatants during the course of the conflict.[20] As Pugh has pointed out, if an air force aspires to control the air, that air force needs the resources with which to achieve that aim and here, aircraft output and aircrew training became vital; a process that created a significant model for the RAF during the Second World War.[21] This model, later referred to as the training pipeline, was shaped by policy to determine the output standards and training methodologies; resources, such as instructors, aircraft, airfields and curricula; as well as factors such as wastage, weather, and changing output requirements in terms of numbers and standards. The context of how the air war was being fought undoubtedly altered the way that training was being undertaken as did the doctrinal development associated with the use of air power. This provided a major legacy for later operational training that can be seen by the use of specialist training schools that evolved during the inter-war years.

The focus on increased and improved training was initially sharpened in May 1915 when the number of pilots per squadron was increased from 12 to 15 but the major catalyst was the growing emphasis on what Brooke-Popham referred to in his February 1915 report as 'Fighting Hostile Aeroplanes in the Air'.[22] The catalyst for this change of tactical emphasis was not, as many authors have written, the Fokker Eindecker as this aircraft only began to appear from August 1915.[23] The major driver behind Brooke-Popham's report was the growing incidence of aircraft attacking each other over the front. This report was supplemented by a re-issued RFC Training Manual that featured a section on aerial combat.[24] These events must also be put into the context of the BEF's spring offensive, notably the battles of Neuve Chappelle and Ypres in March and April respectively and later, the Battle of Loos in September.[25] These offensives called for a more aggressive and proactive approach from the RFC.[26] The new tactics, combined with a greater emphasis on offensive operations, highlighted some serious flaws in training.[27] As Morrow saw it, 1915 was a watershed in aerial warfare with air arms becoming 'more sophisticated' and performing separate and distinct roles.[28] As a result, a number of major initiatives were established to prepare better pilots and observers

for operational service and a range of emerging novel tactics. For example, the way that tactics and technology were altering training can be seen in May 1915 when pilots and observers underwent systematic machine gun training using the Lewis Gun for the first time. The Machine Gun School was established at Dover in May before moving to Hythe in November.[29] Ironically, the importance of training pilots and observers in the use of the machine gun was forgotten in the inter-war years as the role of air gunner and observer were considered part-time roles to be filled by ground crew despite the importance attached to this type of training during the First World War.[30]

There was also an increased emphasis on formation flying which was a result of Trenchard's memorandum of 14 January 1916 that was promulgated to squadrons later that same month and that stated that all reconnaissance aircraft must be escorted by at least three scouts.[31] The pressure to produce more pilots and observers crystallised in 1916 due to two significant factors, one strategic and one tactical. The first was the Somme offensive and the second was the appearance of the first German *Jasta* in August 1916.[32] Unlike the RFC's policy of trying to maintain air supremacy over the complete front and fight the air battle beyond the German lines, the German approach saw them avoid contact unless they had the tactical advantage. *Jastas* were used to gain localised air supremacy for a given tactical objective whilst the RFC's approach, epitomised in Trenchard's *Future Policy in the Air* memorandum of September 1916, was of 'incessant offensive'.[33]

The results of this offensive air policy, and a key indicator of how tactics influenced training output, was an increase in the attrition of pilots and aircraft; between July and December 1916, the RFC had lost 499 pilots and observers killed or missing, 250 wounded and 250 removed from service due to 'unsuitability, physical or nervous debility.'[34] This position, Pugh has argued, saw the RFC's capability 'eroded in 1916' and that it continued to 'flag' into 1917.[35] Pugh has stated that this was due to the RFC's inferior aircraft and the increased effectiveness of German tactics and air power. Casualties were so high during the period from the opening battles of the Somme offensive in July 1916 until the Battle of Arras in April and May 1917 through until the German attacks beginning in March 1918 that the length of flying training courses was cut and output standards reduced just to meet the wastage rate of service squadrons.[36] Even in November 1916, scout pilots were 'sufficiently trained only to take off and land without damaging their machines.'[37]

Not all legacies are positive and the period from July 1916 to the end of the war marked a phase of the war where Trenchard's policy of 'incessant offensive' led to poor decision making by a number of senior RFC/RAF officers as training courses were cut to meet increased demand due to aircrew casualties. Barker has argued that failing to train aircrew sufficiently, 'amounted to culpable if not criminal negligence.'[38] Although strong words, Barker's assertion does stand up to examination. Aircrew training during the Second World War was not as frenetic and allowed aircrew to be held in pools and this meant that there was no time pressure to cut corners within the training pipeline. All training is a balance between quality and quantity and

this balance had clearly become mismatched from July 1916 onwards.[39] The result was that the training system was graduating aircrew which in some cases, had their training records falsified.[40] Although Morley argues this falsification argument strongly, some errors may have been put down to lax administration. Both Second Lieutenants G.W.T. Garwood and L.H. Mackay were certified as having flown the BE2c but on arrival in France, told their respective Commanding Officers that they had never flown the aircraft.[41] Second Lieutenant C.F.A. Portal's report card showed that he had fired both the Lewis and Vickers machine guns during training but he had only in fact fired a .303 Lee Enfield rifle.[42]

These training shortfalls were being addressed on a daily basis by Squadron Commanders in France as new pilots were posted in. There are numerous examples of Squadron Commanders writing to Wing and Brigade Commanders about the poor state of training. In March 1917 for example, 3 Brigade wrote to HQ RFC in the Field about the lack of training for observers.[43] Another notable assessment of the state of training was made by Major Learmount, Officer Commanding 22 Squadron to Headquarters 9 Wing.[44] Learmount complained that of five pilots posted to 22 Squadron: none had any practical gunnery training; two had crashed during their first week with the squadron and finally; all five had little experience on the Bristol F2B's Rolls-Royce engine. The OC noted that, 'casualties are directly the result of inexperience and it stands to reason that pilots with no experience cannot put up a decent fight against the pick of the German Flying Corps.' From the perspective of operational squadrons, there was a 'training gap' that they felt should be addressed within the 'training pipeline' at home and not by operational squadrons in the field. Learmount's complaint was picked up by Trenchard who told him that it, 'was not possible to do the amount of training at home that would be desirable if time permitted...' and as the squadron commander, it was up to him 'to overcome these difficulties.' Rather icily, Trenchard tells Learmount and Commander 9 Wing to report to him at HQ RFC on 'the first day' that weather permits flying. It would appear that in this case, constructive feedback was not valued from operational squadrons, the ideal source in fact to provide validation for the training process. Instead, as Trenchard highlighted, operational squadrons were blamed for training failures, a point raised again in March 1918, when 12 and 13 Wings were told, 'Flight Commanders are not paying sufficient attention to the instruction of young pilots, fresh from home.'[45] The fundamental issue highlighted by this argument as far as the training pipeline is concerned is that of the delivery of quantity over quality. The training pipeline was under tremendous pressure to deliver replacement pilots that, as Learmount argued, quality was suffering.

Organisation and Policy

When the RFC was formed in 1912, the Military and Naval Wings received their pilots from the Central Flying School (CFS).[46] With deployment to the continent in August 1914, CFS was closed and many civilian flying instructors joined the RFC or RNAS and thereby denuded the flying training system of its experienced instructors.[47] The instructor cohort was only re-built when some of the pilots from the initial squadrons sent to France in August returned to England for a period of rest in the winter of 1914. The belief that the war would be a short one

created a vacuum in the pilot training organisation and policy development process for the first few months of the war. The paradox is that although both Jones in the *The War in the Air* and Barker's observations on the 'paralysis' of the RFC's training system at the beginning of the war were correct as far as CFS was concerned, these comments did not acknowledge the War Office's recognition that the RFC needed a formalised training structure.[48] As aircraft departed for France, the RFC formed a Reserve Aeroplane Squadron (RAS) at Farnborough with the sole aim of training pilots. Although having airfields as well as the RAS, there was still no practical training programme in place. The first major expansion took place in November 1914 when the initial RAS became No.1 RAS and No.2 RAS was formed at Brooklands. In addition to providing training, these squadrons were also tasked with creating operational squadrons and in January 1915, No.1 RAS formed the nucleus of 10 Squadron.[49] By the end of 1915 there were 17 RASs but perhaps, potentially more importantly, from November 1914, the RFC had restructured into a number of Wings.[50] The fact that training was initially afforded a low priority is perhaps understandable given the belief that the 'war would be over by Christmas.'[51] RASs would now come under the control of Administration Wing, commanded by Lieutenant Colonel E.B. Ashmore to provide centralised control of training. Unfortunately, it would appear that pilot training was still inadequate and haphazard despite this centralised control.[52] Jones stated that training was being provided by RASs, CFS and civilian flying schools but there was no central flying training syllabus or standardised instructional policy.[53] Due to the lack of capacity at CFS, RASs were now providing advanced as well as basic training. It is salutatory to reflect that by the end of 1915, 17 RASs plus the CFS were supporting the RFC's 12 squadrons in France; a clear indication of the scale of the training resources required to support operational squadrons in the field.[54] This realisation that operational squadrons demanded massive investments in a training organisation was a clear legacy of the First World War although this lesson was often forgotten during the period of the expansion schemes and into the Second World War.

With the restructuring into Wings, Fourth Wing was created with its headquarters at Netheravon to coordinate the activities of the RAS training squadrons.[55] Throughout 1915, additional Wings were formed in the UK and each became responsible for initially, two RASs.[56] By September 1915 prior to the Battle of Loos, the RFC in France comprised three Wings totalling 12 squadrons of around 160 aircraft.[57] This structural change was reinforced with command changes during August 1915 when Henderson, the RFC GOC in France and Director General Military Aeronautics in the War Office and replaced as RFC GOC by Trenchard, the commander of the First Wing.[58] During this same re-shuffle, Lieutenant Colonel C.J. Burke, the commander of the Second Wing, was sent to Canada to discuss pilot training in the Dominion.[59] This Canadian initiative will be discussed later but it is interesting to note that the War Office was sufficiently prescient in 1915 to realise that the production of sufficient pilots was a key requirement in prosecuting the war.

The shortage of instructors and training aircraft was compounded by the lack of a, 'definite air service policy as to what the Army wing [RFC] has to do…' and what policy that was present,

was 'haphazard'.[60] Lord Derby's observation neatly identified the challenge to a nation that aspired to deliver a coherent national strategy but lacked the organisational support structure with which to do so; in this case, a robust training pipeline and an industrial system that could deliver aircraft and engines of the right quality, in sufficient numbers in a timely manner.[61] Pugh has stated that this lack of strategic control by the respective politico-military organisations that were active during the war, chronologically the Air Board, Joint War Air Committee and Air Council, was due to a lack of 'executive authority' and that the Air Council in particular, 'was superfluous'.[62] Although 1915 saw the RFC take a number of steps to improve the training of pilots and observers, it still lacked an effective training system and as the tempo of expansion grew, the RFC was subjected to increased pressures to produce additional aircrew. Although not generally recognised as such, Brigadier-General John Salmond provided a significant force for training evolution when he instigated major changes to the RFC's training system following his appointment as commander of V (Training) Brigade in February 1916.[63] Indeed, the rapid rate of expansion of training can be seen in the structural changes that occurred in the first half of 1916. Salmond had only been in post for three weeks when V Brigade was subsumed into VI (Training) Brigade and four months later, VI Brigade was re-titled the RFC Training Brigade.

Salmond made an immediate impact and sped up the delivery of training aircraft to the RASs by ending the process whereby all aircraft had to undergo acceptance testing at Farnborough irrespective of where they were constructed. From April 1916, aircraft were sent directly to the RASs and Aircraft Inspectorate Department (AID) engineers undertook the acceptance tests *in situ*.[64] Salmond also created structural change to training with the establishment of additional Schools of Military Aeronautics; the enhancement of RASs as Elementary and Higher Training Squadrons; increasing minimum solo hours flown from 15 to 20; creating the RFC Officer Cadet Battalion (later Officer Cadet Wing); establishing a School of Night Flying in Hounslow in April 1916; and that same month, forming a School of Military Aeronautics in Egypt.[65] These structural changes were all reflected in the RAF's training policy in the Second World War, especially as far as underpinning the establishment of specialist ground schools and the use of overseas training centres; the latter exemplified by the British Commonwealth Air Training Plan (BCATP). Despite Salmond's efforts, the output standard of the pilots arriving in France was being heavily criticised and this was mainly due to a need to cut corners to speed up the transition through the 'training pipeline' to replace casualty wastage.[66]

As the RFC grew, changes were made to the training organisation. On 1 January 1917, the activities of the Training Brigade were decentralised into three geographic regional Areas, and later, five numbered areas.[67] The Training Brigade remained with a headquarters function and was made a Training Division in August 1917. Within these areas, the former RAS, now renamed Training Squadrons, were located at what were termed Training Depot Stations (TDS), each comprising three training squadrons, but despite the re-organisation, the air service still lacked a, 'definite training programme'.[68] From early 1918, all of the RFC/RAF training activity was coordinated by a Director of Training in the Air Ministry. These massive alterations

to the training organisation are likely to have created confusion and a challenge to policy makers and policy recipients alike. Policy was transient due to a 'need for standardisation' and technological improvements to aircraft; an issue that also had to be addressed during the early years of the Second World War.[69] The common link here was the need for growing numbers of aircrew during both wars and the pressure that this exerted on the training pipeline. As discussed earlier, this challenge of managing the resources within that training pipeline were exacerbated by changing aeronautical technologies and tactics.

Training Methodologies

Although Sturtivant has argued that prior to the declaration of war in August 1914, 'the training and facilities and experience offered by the CFS had proved adequate', the problem of training sufficient pilots for the RFC was identified well over a year before.[70] The initial process, which may be justly described as haphazard, saw potential pilots either undertake a flying course at a civilian flying school and obtain their Royal Aero Club certificate before attending a military flying training course at CFS or undertake *ab initio* training at CFS before acquiring a certificate. CFS was created to provide pilots for both the Naval and Military Wings of the RFC although Barker has stated that the Royal Navy established its training centre at Eastchurch 'independently and without authority' in 1912 as a 'brazen act of unilateralism'[71] The growing gulf between the Military and Naval Wings did cause severe dislocation in terms of planning and equipment procurement with the split finally sealed on 1st July 1914 when the RNAS formally came into existence.[72]

It is important to understand that in its early days, CFS did not have the function of the modern CFS to act as the centre of excellence for training and standards. The early CFS was solely a training provider and as has been shown above, had great difficulty in maintaining throughput of students due to aircraft availability issues. For example, on 8 July 1913, CFS had 36 aircraft on charge of which 16 were serviceable.[73] This whole question of aircraft serviceability plagued the RFC throughout the war and had serious implications for the provision of training aircraft. In October 1917 for example, the Middle East Brigade had around 550 aircraft on charge of which only 218 were airworthy.[74] The impact on the production of pilots within the training pipeline would have been clear.

To overcome a lack of resources at CFS in 1913, some students were being sent directly to RFC Military Wing squadrons to undertake basic training before being sent to CFS to complete their courses. In January 1913, Colonel J.E.B. Seely, the Secretary of State for War said that '… [t]his has been done in order to obtain the number of trained officers we require as expeditiously as possible.'[75] The problem with this approach was that it reduced the time and resources for squadrons to undertake operational and experimental work and meant that squadrons could not concentrate on specific unit operational training. This in-squadron training was sustained throughout the interwar years and only stopped with the creation of Operational Conversion Units (OCU) in 1940. It also added the task of training CFS students that had only been taught 'the elements of handling an aeroplane in the air, landings and simple cross-country flying.'[76]

This level of poor training was partially due to the lack of a specific training aircraft with dual controls.[77] The problem was also exacerbated by the variety of different aircraft types on charge at CFS; these included tractors, pushers, biplanes and monoplanes.[78] The number of aircraft available for training was again reduced when the RFC Military Wing decided to ground all monoplane aircraft following a series of accidents in 1912.[79] As well as the problems of pilots' assimilating the nuances and foibles of each aircraft type, the challenges of spares holdings and maintenance must have caused problems for the ground staff and again, reduced aircraft availability. Finally, the other consideration that perhaps influenced the RFC approach to training was that the role of early aircraft was purely reconnaissance and therefore the pilot ostensibly only needed to take-off, fly a set course and then land; training objectives therefore, were few and relatively simple.

By mid-1917, the RFC's pilot training system had evolved into a process that many air forces would recognise today. In June 1917, the RFC had a total of 5,841 pilots under training all of which were at various stages on the eight-month 'training pipeline'. The first two months were spent in a Cadet Battalion – later to become a Cadet Wing – to undertake basic military training. This was followed by an eight-week technical ground school phase at a School of Military Aeronautics. Once completed, the students would then attend a four-week elementary flying training course followed by eight weeks at a Higher Training Squadron for advanced training. The final four weeks would be spent at a gunnery school before graduating as a qualified pilot prior to being posted to France.[80] Of these 5,841 pilots, Jones argued that only around 4,650 would ever reach a squadron due to being killed in training, general unsuitability or illness.[81] By any standard, this wastage rate of around 20 per cent was a massive drain on the training system. The system and structure was certainly in place but the RFC still lacked a clear method of training that was standardised and universally used throughout the service. One of the major legacies that this left for the RAF was the need to develop an improved aircrew selection process to reduce psychological and physiological wastage.[82] Another major failing was found within the instructor cadre who were still generally employed on rest from active service; they may have been experienced pilots but they were not trained instructors.

The significant change to pilot training, and one which created a lasting legacy, was implemented by Major Robert Smith Barry. In his book, *Pioneer Pilot*, Tredrey paints a picture of Robert Smith Barry, a former commanding officer of 60 Squadron, as a man who single-handedly, changed the way that the RFC, and later the RAF, carried out flying training.[83] Tredrey's narrative is a compelling one that has been taken up by a number of later authors including Barker who referred to this 'daring and spectacular airman' as being 'contemptuous of the whole basic philosophy and psychology of the training organisation' and therefore developed 'revolutionary training methods'.[84] Steel and Hart said that Smith Barry 'developed a completely new method of flying instruction' that 'produced a greater number of better-trained pilots who were not fatally surprised when they moved onto the next stage of their flying education in...high-performance' service aircraft.[85] Smith-Barry was certainly a dynamic

force in focusing a new approach to training but to place all of the credit at his feet does an injustice to officers such as Salmond, Brooke-Popham and Longcroft as well as numerous squadron commanders that called for changes to the training process from 1915 onwards.[86] The myth that surrounds Smith Barry was probably initiated by Jones in *The War in the Air* in which he stated that:

> Before the era of the Gosport school, the training of pilots in England fell short of the requirements of air warfare on the Western Front. In too many instances, pilots had to complete their education on active service.[87]

Although Jones' comment as to pilot training falling short of frontline requirements is patently true, the establishment of the school at Gosport in July 1917 (becoming the School of Special Flying in May 1918[88]) could not immediately change pilot training overnight.[89]

One method of assessing the overall effectiveness of the Smith Barry reforms to pilot training is to consider casualty rates and accidents. As far as the former were concerned on the Western Front, the RFC/RAF officers and NCOs killed, wounded, missing and PoW figures for 1916, 1917 and 1918 were 985, 3,633 and 4,580 respectively.[90] Given these figures need to be considered alongside the expansion in aircraft, and therefore personnel, from 34 squadrons in October 1916, to 46 squadrons in April 1917 to around 108 in November 1918, the continued rise in casualties is still significant.[91] Aircraft losses at No.5 Fighting School are also worth considering and provide a case in point. The attendance at a Fighting School occurred at the end of flying training and so in theory, pilots should be able to operate their aircraft safely and effectively on arrival at the school. The casualty figures for 6 September – 21 November 1918 highlighted many examples of poor airmanship and skill levels. In all there were 29 accidents in that 10 week period that included taxying into parked aircraft, stalling and spinning on take-off and landing, undershooting the runway, stalling and crashing whilst turning down-wind, mid-air collisions, numerous heavy landings and landing 'outside the aerodrome and [running] into a ditch.'[92] Perhaps even more telling about the overall state of training and pilot competency are the accidents that occurred after the Armistice. The number of deaths and injuries caused by air crashes in France from 12 November 1918 to 5 April 1919 were considerable. In the last 19 days of November alone, 30 pilots and observers were killed or injured in 23 crashes.[93] In December there were 27 accidents killing or wounding 32 aircrew; January 1919 saw 16 accidents, killing or wounding 18; and from 1 February until 5 April 1919 when the records cease, there were 33 accidents that killed or wounded 34. Although weather might have played a part during the winter of 1918/1919 and aircraft maintenance issues, the number of accidents cannot be put down to these factors alone.

It took time for the initial batch of instructors to be trained under the Gosport system and for their knowledge to percolate to pupils in the rapidly expanding RFC/RAF. Where Smith Barry's changes really impacted the training legacy left for the later RAF was in his use of a single training aircraft equipped with dual controls, the Avro 504.[94] Previously, pilots had

trained on a number of different aircraft types during their basic training before moving on to a 'service type'.

In terms of the pilots' training experience pre-Gosport, the example of one pilot is reflective of many. Lieutenant J.J. Breen applied to transfer to the RFC from the Royal Irish Regiment in October 1915.[95] After a successful interview at the Air Board, Breen was accepted and sent to 3 RAS at Shoreham where he flew solo after 45 minutes. At the end of November he was sent to Netheravon to complete his training on four aircraft types before being posted to France 'at the beginning of 1916.' Breen was clearly not impressed with the training that he had received.

> The whole training [sic] was of the most haphazard variety. There was of course no method of verbal communication between instructor and pupil in the air and I do not even remember that any adequate lectures on the theory of flight, were ever given. One picked up what one could by observation and asking questions...If subsequent experience has impressed one thing more than another upon my mind, it is the absolute necessity for careful, systematic and individual instruction for pupils in the initial stages of their flying career.[96]

Breen's 45 minutes before going solo was around the norm for military pilot training in 1914-15. Flight Sub Lieutenant T.V. Lister RNAS commenced his flying training at Hendon and took his first flight on 24 November 1914. After four flights of 15, 10, 10 and 20 minutes he was sent solo.[97] After 3 hours and 30 minutes at Hendon flying the Bristol Boxkite, Lister was sent to the CFS where he completed a further 19 hours and 38 minutes on two further aircraft types before being posted to Calshot to undergo seaplane training in March 1915. He arrived in his first squadron in Dover with over 34 hours in his log book. Considering that Kennett has argued that RFC pilots were sent to the front with 'as little as 4-5 hours' it is worth considering whether the RNAS had adopted a different training system and if so, why?[98] It is highly likely that the main reason was the much smaller structure of the RNAS, the generally much reduced pilot wastage rates when compared to the RFC and the need to train pilots for specialist tasks such as flying seaplanes which demanded increased flying experience and therefore, more flying hours. The other factor was that the RNAS was a much smaller organisation than the RFC and it is likely that this environment created an emphasis on quality rather than quantity as was the case with the RFC.

In further moves to alter the training status quo and overcome the experiences of pilots such as Breen, Smith Barry also introduced the 'Gosport Tube' to allow instructors to communicate with pupils, a formal set of instructional procedures and terminologies, the so-called 'Gosport Patter', as well as the creation of a 'wing examining officer' to check and maintain flying instructor standards.[99] Napean Bishop, an observer of Smith Barry at Gosport, has stated that one of the other major innovations that was instigated by Smith Barry was an increase in aerobatic flying, 'particularly as regards spinning, a thing which up until then had been regarded as a 'killer'.' Smith Barry's approach to training was certainly robust and structured

but it could not be universally adopted immediately and its adoption was a slow process as instructors were trained and the Avro 504s procured.

It was not until August 1915 that observer training was improved significantly with the introduction of formalised qualification tests that included gunnery, artillery observation, photography and Wireless Telegraphy.[100] Prior to this, observers were largely volunteers and were given on the job training within operational squadrons however some formal training was conducted in 1914.[101] The realisation of the importance of the observer's role was further recognised with the establishment of the Wireless School at Brooklands and by the creation of the School of Military Aeronautics at Reading in December 1915.[102] This school was primarily aimed at pilots and designed to provide technical ground instruction prior to flying training. However if space permitted, observers were allotted a place. Although clear steps had been taken to improve the professional training of the observer in 1915, a contemporary account does offer criticism of the training. Lieutenant P.S. Jackson-Taylor applied to join the RFC in September 1914 and was eventually accepted for observer training in November 1915.[103] After attending Reading he was sent to the School of Aerial Gunnery at Hythe where he was trained in the use of the Lewis and Vickers machine guns. Jackson-Taylor complained of pupils only firing 100 rounds and the difficulty of flying due to unserviceable aircraft as well as the training being too theoretical and technical 'rather than the practical aspects' needed at the front.

The problem of transmitting a new training methodology however, was aggravated by the changing structure of the RFC and the lack of direct control by the Training Division and later, its abolition in May 1918.[104] In April 1918, the UK was divided into five administrative areas that were sub-divided into groups that also included training units. Following the disbandment of the Training Division, training was coordinated from the Air Ministry's Directorate of Training with some responsibilities devolved to Areas, now no longer numbered but known by geographic locations.[105] Because of this split responsibility, there was a 'need for standardisation' in training which was still lacking.[106] The size of the training coordination challenges presented to the RFC/RAF during this period from late 1917 to the end of the war in November 1918 was reflected in the massive training estate; 383 airfields and numerous depots and schools were operated by the RAF at the end of June 1918.[107]

Logistics – A Means to Train

In August 1914, the combined strength of the RFC and RNAS was 2,073 officers and men; by November 1918, this figure had grown to 291,175.[108] In terms of RFC squadrons, the four that were sent to France in August 1918 had grown to 108 by the end of the war.[109] If home defence, training and overseas squadrons are taken into account, this figure rises to approximately 390.[110] This massive growth in manpower and squadrons during the First World War, and the concomitant need to match training and resources to achieve aircrew output, would cause the same challenges to the RAF during expansion and the early years of the Second World War. The logistics of providing resources such as training aircraft,

accommodation and airfields became critical from the Battle of the Somme onwards. Despite the growth of airfields in Britain, the RNAS opened a training centre at Vendome in France in November 1916. This new training centre was first mooted in March 1916 when Captain Vaughan-Lee, RNAS Director of Air Services said that poor weather in Britain was, '...causing a very serious interference with the training of pilots...'[111] Vendome graduated an average of 15 pilots per month and these included students from the RNAS, RFC, US Army and French Navy.

As the pressure on the RFC's training resources in Britain increased throughout 1916, a number of overseas training venues started to produce pilots and observers. In April 1916 the W.O. decided to open a flying training school in Egypt. Three UK-based training squadrons each provided a flight to act as a nucleus for squadrons in Egypt and all were in country by August 1916.[112] The establishment of a technical school at Heliopolis followed what was eventually to become No.3 School of Military Aeronautics whilst in December, another flying training school was opened at Ismailia and a further school established at Suez in January 1917. From January 1917, Jones stated that 60 pupils per month were being sent to Egypt and after 15 hours solo, were returned to the UK for final training.[113] Pupil numbers increased yet again with the opening of No.3 Cadet Wing in October 1917 so that in 1918, the flying training system in Egypt graduated 2,164 pilots.[114]

Britain's other major overseas training facility was located in Canada and pilot training commenced there in January 1917.[115] Like Egypt, Canada had its own School of Military Aeronautics and Cadet Wing to provide basic military training and ground school instruction prior to the commencement of flying training.[116] This training was conducted from eight airfields but it was found that in the winter of 1917-1918, flying had to be curtailed which resulted in training being moved to three airfields in Texas. By the end of the war, Canada had graduated over 2,500 pilots and Jones stated that in 1918, 200 pilots per month were being sent to Britain from Canada.[117] Although this number pales when compared to the 131,500 aircrew trained in Canada during the Second World War as part of the BCATP, this early experience clearly provided a legacy that was revisited and exploited 20 years later.[118] Canada highlighted a major issue with Britain's 'haphazard' policy towards its air services. Unlike the RFC, the RNAS commissioned its pupils and so Canadians opted for the RNAS due to increased pay and status, instead of the much needier RFC. This, according to Jones, resulted in a glut of pilots in the RNAS and a shortage in the RFC.[119]

In a move to address directly the issue of the logistics needed to support the 'training pipeline', a Training Expansion Committee was established and this organisation held its first meeting on 19 June 1918.[120] The main task of the Training Expansion Committee was to find resources to increase flying training output to meet a need for 341 operational squadrons that were demanded by 30 September 1919.[121] At the inaugural meeting, Brigadier–General T. Hearson highlighted the need to match each operational squadron 'one for one' with a training squadron. As discussed above, by the end of the war, the RAF's training squadrons had parity in this 'one for one' goal but the lesson writ large was that training needed massive resources and

logistical support to enable it to maintain operationally effective service squadrons. Perhaps the parlous nature of generating such numbers of aircrew is highlighted in the minutes of the third meeting of the Training Expansion Committee held on 4 July 1918 which stated, 'that a separate mortuary building be provided at all Aerodromes, the building to be as inconspicuous as possible.'[122]

The Training Expansion Committee was replaced by the Accommodation Committee in October 1918 but the organisation had completed very valuable work in highlighting the shortfall in resources and logistics required to undertake training. In July 1918 for example, the committee reported a shortage of Schools of Aerial Gunnery and Fighting stating that 'four more are required'; that six day bombing and one night bombing school needed to be established; and that two additional 'Schools for Instructors' were required. The committee also required the building of new accommodation at Hythe, New Romney, Eastchurch and Manston to increase the throughput of observers.[123] This logistic experience provided a legacy that again reinforced the knowledge gleaned throughout the First World War that effective operational training demanded a massive investment in training.

Conclusion

In considering the operational training legacy left by the RFC, RNAS and RAF as the RAF expanded and then entered the Second World War there are clearly many aspects that provided direct experience and benefit. Perhaps the major legacy was recognition that to train sufficient aircrew to sustain a nation engaged in industrialised warfare demanded a fully functioning, well-resourced and robust training organisation. That training organisation should employ a systematic approach to training and here, albeit not initially as far reaching as many claim, Smith Barry's School of Special Flying provided the genesis for that change. The other major legacy that was not drawn upon during the inter-war years but that was recognised during the Second World War was that the 'training pipeline' was a dynamic environment and was affected by changing tactics, technologies, resources and wastage – both to personnel and aircraft. Given the small size of the RAF during the interwar years this was not surprising but like the First World War, the scale of the Second World War demanded increased emphasis on training and aircrew production. Unlike the latter stages of the Second World War when there was a surfeit of aircrew and where the curriculum provided phases such as elementary, advanced, operational conversion and increased numbers of specialist flying courses, the First World War training pipeline was always under pressure to address quantitative output to meet aircrew wastage rates and as a result, qualitative standards regularly suffered. Unfortunately, in a race to maximise output, initial training frequently had serious shortcoming and operational squadrons were forced to make up the shortfall in standards by closing the training-gap. The training process did fundamentally work during the First World War but as this paper has highlighted, there were serious shortcomings in the terms of the quality of output. Despite these problems, the RNAS/RFC/RAF had provided a large training legacy from its experiences that to a greater or lesser degree, established a basis for future training. It must be recognised that this was a major achievement considering the

nascent state of military aviation in 1914 and the major technological advances to aircraft during the First World War.

Notes

[1] TNA PRO AIR 10/5551, *Flying Training, Volume I, Policy & Planning*, is an AHB Narrative that provides an overview of training between 1939-1945.

[2] TNA PRO AIR 2/4168, *Memorandum Air Commodore R.P. Willcock, DSD to Air Vice-Marshal Babington, Director of Postings*, dated 25 January, 1940.

[3] TNA PRO AIR 14/10, *Aircraft Crews and Policy, Memorandum from AOC 6 Group to AOC-in-C Bomber Command* dated 13 January, 1942.

[4] C. Gibbs-Smith, *Aviation – An Historical Survey From its Origins to the end of World War II* (London: HMSO, 1970) pp.100-101, provides a description of Orville Wright's first powered flight on 17 December 1903.

[5] See for example, A. Clarke, *Aces High* (London: Fontana, 1974) p.15 and p.22.

[6] See C.H. Gibbs-Smith, *Aviation*..., p.153 for the Taube's wing-warping technology and p.167 for the Sopwith Tabloid.

[7] See for example, R. Grattan, *The Origins of Air War* (London: Tauris Academic Studies, 2009) Table 3.1, 'Improvements in Aircraft Performance, 1914-18', p.65.

[8] See for example, J. Terraine, *The Right of the Line* (Ware: Wordsworth, 1997) for a description of the different roles undertaken by RAF aircraft during 1939-1945.

[9] TNA PRO AIR 1/823/204/5/42, contains a series of correspondence between the W.O. and RFC on night flying training.

[10] D. Edgerton, *England and the Aeroplane* (London: Penguin, 2013) p.16.

[11] FAAM, *Royal Flying Corps Training Manual, Part II (Military Wing) 1914*. W.O.1893.

[12] F.H. Sykes, 'Military Aviation' in *The Aeronautical Journal*, July 1913, p.130. Interestingly, Sykes spoke about the importance of gaining 'command of the air' and that; 'The side which loses the command of the air will labour under the disadvantages of defensive action.'

[13] FAAM, *Naval Air Service Training Manual 1915* (London: HMSO, November 1914)

[14] P. Hart & N. Steel, *Tumult in the Clouds* (London: Hodder & Stoughton, 1997) p.xi.

[15] Colonel J.D. Fullerton spoke of the need to 'obtain command of the air' and the requirement for 'high-speed flying machines armed with light guns' as early as 1906. RUSI lecture, *Recent Progress in Aerial Navigation* delivered on 15 November 1906. TNA PRO AIR 1/725/114/2. For Trenchard's policy, see RAFM MFC 76/1/4, *Future Policy in the Air*, dated 22 September 1916.

[16] J. Morrow, *The Great War in the Air*, (Washington: Smithsonian Institution Press, 1993) p.116.

[17] Ibid.

[18] T. Davis Biddle, 'Learning in Real Time: The Development and Implementation of Air Power in the First World War' in S. Cox & P. Gray (eds) *Air Power History: Turning Points from Kitty Hawk to Kosovo* (London: Frank Cass, 2002) p.14.

[19] R. Grattan, *The Origins*..., p.85.

[20] P.Hart & N. Steel, *Tumult*..., p.108 discusses the arrival of the DH2 in early 1916 to challenge the Fokker Eindecker for 'supremacy'.

[21] J. Pugh, *The Conceptual Origins of the Control of the Air: British Military and Naval Aviation,*

1911-1918 (University of Birmingham: PhD Thesis, 2012) p.61.

[22] TNA PRO AIR 1/746/204/3/22, Brooke-Popham's report on aerial combat *Fighting Hostile Aeroplanes in the Air* dated 1 February 1915. Brooke-Popham wrote this report when he was CO of 4 Squadron.

[23] A. Clark, *Aces High*, pp.51-53.

[24] TNA PRO AIR 10/180, *RFC Training Manual Part II*, A.P.144.

[25] C. Cruttwell, *A History of the Great War 1914-1918* (Oxford: Clarendon Press, 1934) provides an overview of the battles and events of the First World War.

[26] R. Barker, *The Royal Flying Corps in World War I* (London: Robinson, 2002) p.73 and p.78.

[27] H.A. Jones, *War in the Air Vol.II* (Oxford: Clarendon Press, 1922) refers to pilot training measures in 1915 as 'inadequate', although acknowledging that by the autumn specialization in training had begun, pp.293-294.

[28] J. Morrow, T*he Great War...*, p.129. The author also states that 'technological and industrial mobilization...became crucial' to enable increased aircraft performance.

[29] H.A. Jones, *War in the Air Vol.II* (Oxford: Clarendon Press, 1922) p.293-294.

[30] TNA PRO AIR 41/4, *AHB Narrative, Aircrew Training 1934-1942*, pp.37-38.

[31] TNA PRO AIR 1/2161/209/4/26, *Memo Commander 2 Wing to Squadrons*, dated 18 January 1916.

[32] A. Clark, *Aces High*, p.45. *Jasta* is an abbreviation of *Jagdstaffeln* or fighter squadrons.

[33] TNA PRO AIR 1/718/29/1, Trenchard, *Future Policy in the Air*, dated 22 September 1916.

[34] R. Barker, *The Royal Flying Corps...*, p.223.

[35] J. Pugh, *The Conceptual Origins...*, p.264.

[36] During this three-year period, RFC/RNAS/RAF casualties killed, wounded and missing were: 1916 – 985, 1917 – 3,633 and 1918 – 4,580. TNA PRO AIR 1/39/15/7, *RFC/RAF Casualty Figures 1914 – 1918*.

[37] TNA PRO AIR 1/997/204/5/1241.

[38] R. Barker, *The Royal Flying Corps...*, p.220.

[39] A. English, *The Cream of the Crop* (Montreal: McGill-Queen's university Press, 1996) p.41.

[40] R. Morley, *Earning Their Wings: British Pilot Training, 1912 – 1918* (University of Saskatchewan: MA Dissertation, 2006) p.70.

[41] TNA PRO AIR 1/15/40/218 contains correspondence and affidavits from both pilots and from their commanding officers to HQ RFC.

[42] TNA PRO AIR 1/2306/228/11/1, 'War Experiences of Second Lieutenant C.F.A. Portal, September 1922'.

[43] TNA PRO AIR 1/1135/204/5/2224, Letter, 3 Bde to HQ RFC in the Field, dated 15 March 1917.

[44] TNA PRO AIR 1/1135/204/5/2224, Letter OC 22 Sqn to HQ 9 Wg, dated 14 September 1917.

[45] TNA PRO AIR 1/1135/204/5/2224, letter 3 Bde to 12 and 13 Wings dated 18 March 1918.

[46] R. Morley, *Earning Their Wing*, p.23 and pp.34-5.

[47] R. Barker, *The Royal Flying Corps...*, pp.210-11.

[48] Ibid. p.146 and p.211.

[49] R. Sturtivent, 'British Flying Training in World War I' in *Cross & Cockade* Vol.23, No.1, 1994, pp.18-19.

[50] H.A.Jones, *The War in the Air Vol.III* (Oxford: Clarendon Press, 1931) p.288.

[51] C.R.M.F. Cruttwell, *A History of the Great War 1914-1918* (Oxford: Clarendon Press, 1934) pp.7-11.

[52] Ibid, pp.293-294.

[53] P. Hart & N. Steel, *Tumult...*, p.92.

[54] R. Barker, *The Royal Flying Corps...*, p.109.

[55] Ibid, pp.67-68.

[56] R. Sturtivent, 'British Flying Training...', pp.18-45. The author gives details of the formation of 5th, 6th, 7th and 8th Wings that all formed in the UK during 1915.

[57] R. Barker, *The Royal Flying Corps...*, p.109.

[58] *Oxford Dictionary of National Biography*.**www.oxforddnb.com** (accessed on 3 November 2016). The ODNB biographer, Richard Smith, says Henderson found the challenge of his employment too much and returned to London because both roles 'placed a strain on his health.'

[59] Ibid, pp.87-88.

[60] Hansard, **www.hansard.millbanksystems.com/lords/1916/may/24/the-air-service** (accessed 11 November 2014). The Earl of Derby in the Lords Debate 23 May 1916, 'The Air Service'.

[61] Hansard and the War Cabinet minutes provide a valuable insight into the problems of aircraft production throughout the war. Problems centre on aircraft design, raw materials, production resources and industrial disputes. See for example CAB/23/2/41 and CAB 24/27/23, War Cabinet Minutes from meetings on 20 April and 22 September 1917 respectively on the problems of aircraft production.

[62] J. Pugh, *The Conceptual Origins...*, p.117-119.

[63] H.A. Jones, *The War in the Air, Vol III*, p.295.

[64] J. Morrow, T*he Great War...*, p.167. Morrow argued that this approach effectively doubled the number of training aircraft available to the RFC.

[65] H.A. Jones, *The War in the Air, Vol V*, p.449.

[66] H.A. Jones, *The War in the Air, Vol. III*, pp.297-298.

[67] TNA PRO AIR 1/678/21/13/2085, *Summary Notes on RFC Organisation and Training 1917*.

[68] TNA PRO AIR 1/28/15/1/132, Minutes of the first Training Expansion Committee, 19 June, 1918.

[69] TNA PRO AIR 1/678/21/13/2085, *Summary Notes on RFC Organisation and Training 1917*.

[70] R. Sturtivent, 'British Flying Training...' p.18.

[71] R. Barker, *The Royal Flying Corps...*, p.13.

[72] The Admiralty Circular letter in which the official creation of the RNAS was announced is reproduced in S.W. Roskill (ed), *Documents Relating to the Naval Air Service, Vol .I, 1908-1918* (Navy Records Society, 1969), p.156.

[73] TNA PRO AIR 1/686/21/13/2252.

[74] TNA PRO AIR 1/408/15/240/2, *Strength of 'Planes and Pilots, Middle-East Brigade from October 1916, Egypt*.

[75] www.hansard.millbanksystems.com/written-answers/1913/jan/14/royal-flying-corps (accessed 26 November 2014).

[76] H.A. Jones, *The War in the Air, Vol.III*, p.292.

[77] P. Hart & N. Steel, *Tumult...*, p.77.

[78] R. Sturtivent, 'British Flying Training...' p.18.

[79] M.C. Fox, *To Rule the Winds – Volume 1: Prelude to Air War – The Years to 1914* (Solihull: Helion & Company, 2014) pp.144-147. Fox describes the ban on monoplane aircraft as a 'crisis' due to

the number of accidents and mid-air disintegrations associated with design.

[80] H.A. Jones, *The War in the Air, Vol. V* (Oxford: Clarendon Press, 1935) p.425.

[81] Ibid, p.426.

[82] A. English, *The Cream...*, See Chapter 2.

[83] F.D. Tredrey, *Pioneer Pilot – The Great Smith Barry Who Taught The World How to Fly* (London: Peter Davies, 1976).

[84] R. Barker, *The Royal Flying Corps...*, see pp. 171, 189 and 301.

[85] P. Hart & N. Steel, *Tumult...*, see pp.89 and 92.

[86] Salmond commanded the RFC Training Brigade and later, the Training Division and provided senior officer support for Smith-Barry. Longcroft was GOC the Training Division after Salmond. Brooke-Popham was central in defining scout tactics.

[87] H.A. Jones, *The War in the Air*, Vol.V, p.434.

[88] F. Tredery, *Pioneer Pilot...*, p.95.

[89] Smith-Barry wrote two papers outlining his approach to flying training in November and December 1916 respectively. He took over command of 1 (Reserve) Squadron – also referred to as No.1 (Training) Squadron - at Gosport in January 1917 from where a number of student pilots graduated. In July 1917, 27 and 55 Training Squadrons merged with 1 Squadron to form a Training Depot Station that latterly became the Gosport School of Special Flying that mainly concentrated on the training of flying instructors.

[90] TNA PRO AIR 1/39/15/7 *RFC/RAF Casualty Figures 1914-1918.*

[91] TNA PRO AIR 1/2432/306/1, *Air Ministry Report No.9 Fortnight Ending 4th November 1918 – Summary of Work Carried Out by the Royal Air Force in Various Theatres.* This report shows the RFC's strength on the Western Front as 85 squadrons and five special duty flights. In addition, the Independent Force had nine squadrons.

[92] TNA PRO AIR 1/2045/204/374/9, *No.5 Fighting School, 38 Training Wing Royal Air Force, Casualty Reports 6th September – 21st November 1918.*

[93] TNA PRO AIR 1/969/204/5/1102, *Summary of Accidents Royal Air Force.*

[94] O. Thetford, *Aircraft of the Royal Air Force since 1918* (London: Putnam, 1976) pp. 44-47. Thetford said that the Avro 504, 'laid the foundations of systematic flying instruction...evolving methods which became the basis of the R.A.F.'s Flying Training School syllabus for many years afterwards.'

[95] NAL, AP1308, Sqn Ldr J.J. Breen, 'War Experiences' in *A Selection of Lectures and Essays from the Work of Officers Attending the Fifth Course at the Royal Air Force Staff College 1926-27*, April 1928.

[96] Ibid.

[97] FAAM, Flying Log Book of Flt. Sub-Lt. T.V. Lister.

[98] L. Kennett, *The First War in the Air*, 1914-1918 (New York: The Free Press, 1991) p.122.

[99] NAL, C. Napean Bishop, *Smith-Barry and the Gosport School of Special Flying, 1917/1918.* This was a lecture presented to the Royal Aeronautical Society on 26 November 1962.

[100] AHB, *The Royal Air Force in the Great War* (London: IWM, 1996) p.74. This book is a reprint of the original AHB *AP125 A Short History of the Royal Air Force in the Great War* that was published in 1936.

[101] TNA PRO AIR 1/683/21/13/2234, War Office letter nominating 10 officers for specialist

observer training dated 6 July 1916.

[102] H.A.Jones, *War in the Air, Vol.II*, p.293-294. Jones refers to Reading as the School of Instruction.

[103] NAL, AP1308, *A Selection of Lectures and Essays from the Work of Officers Attending the Fifth Course at the Royal Air Force Staff College 1926-27*, issued April 1928. Flight Lieutenant P.S. Jackson-Taylor, 'War Experiences 1914-18' pp.37-42.

[104] TNA PRO AIR 1/678/21/13/2085, *Summary Notes on Training – RFC and RAF*.

[105] South East, South West, Midland, North East and North West areas.

[106] TNA PRO AIR 1/678/21/13/2085, *Summary Notes on Training – RFC and RAF*.

[107] TNA PRO AIR 1/2432/306/1. These airfields covered a combined land area of 55,821,830 acres.

[108] H.A. Jones, *The War in the Air, Vol.VI Appendices* (Oxford: Clarendon Press, 1937) Appendix XXXV, *Strength of British Air Personnel August 1914 and November 1918*.

[109] TNA PRO AIR 1/2432/306/1, *Summary of Work Carried out by Royal Air Force in Various Theatres of War – A.M. Report Fortnight Ending 4th November 1918*. There is much confusion about the total number of RAF squadrons available at the end of the war. The figure of 108 comes from 85 former RFC squadrons and five independent flights, three former RNAS squadrons in the Dunkirk Wing plus nine squadrons from the Independent Force at Ochey.

[110] www.airwar1.org, accessed on 20 February 2015.

[111] TNA PRO AIR 1/678/21/13/2085, AHB - *Summary Notes on Training of R.N.A.S. Personnel 1914-1918*.

[112] R. Sturtivant, 'British Flying Training...' pp.18-45. pp.20-21. Aboukir is often referred to as Abu Kir.

[113] H.A. Jones, *The War in the Air, Vol.III*, p.450.

[114] H.A. Jones, *The War in the Air, Vol. V*, Appendix X 'Statistics for the Training Brigade in Egypt, 1918'.

[115] R. Morley, *Earning Their Wings...*, p.89.

[116] AHB *The Royal Air Force in the Great War*, p.249.

[117] R. Morley, *Earning Their Wings...*, p.89. See also H.A. Jones, *The War in the Air Vol. V*, pp.466-7.

[118] www.rafmuseum.org.uk/research/online-exhibitions/taking-flight/historical-periods/first-world-war-flying-training.aspx. Accessed on 18 March 2015.

[119] H.A. Jones, *The War in the Air, Vol. V*, pp.458-9.

[120] TNA PRO AIR 1/28/15/1/132, The Committee held its ninth and final meeting on 30 September 1918.

[121] TNA PRO AIR 1/28/15/1/132, *Minutes from the Training Expansion Committee fourth meeting held on 12 July 1918*.

[122] TNA PRO AIR 1/28/15/1/132, *Minutes from the Training Expansion Committee third meeting held on 4 July 1918*.

[123] TNA PRO AIR 1/28/15/1/132, *Minutes from the Training Expansion Committee fourth meeting held on 12 July 1918*.

**ROYAL AIR FORCE
Centre for Air
Power Studies**

Communicating to Win

By Air Commodore Simon Harper and Wing Commander Jim Beldon

Biography: Air Commodore Simon Harper joined the Royal Air Force in 1988 as a Personnel Support Officer. A former Station Commander of RAF Halton, in 2015 he co-authored a paper, '*The Military Instrument in the 21st Century*', for the Churchill 21st Century Leadership Programme. He is currently Assistant Chief of Staff Personnel Policy at Headquarters Air Command.

A Tedder Fellow, Wing Commander Jim Beldon is a navigator and ISTAR specialist who works as a strategist in the Directorate of Defence Communications. His previous essay 'Lethal Autonomous Weapons Systems – Warfare's Best Humanitarian Hope?' was published in *APR* in Autumn/Winter 2015, and earned him the Gordon Shephard Memorial Essay Prize at the 2016 Air Power Conference.

Abstract: Recent operations have highlighted the primacy of influence and the role of communications in achieving it. No longer performing just a supporting role to 'kinetic' operations, communications operations are increasingly important in their own right, especially in an information environment in which audience perception is fed by instantaneous digital feeds from a multiplicity of sources. This article examines the challenges that this new communications environment presents to air power professionals, and explores how the RAF can survive the threats and exploit the opportunities the new era of communications presents. The article studies how, in particular, factors surrounding offensive air power and the use of Remotely Piloted Air Systems might best be communicated in the future.

Introduction

'Conventional bureaucracies and military establishments are uncomfortable with modern means of communication and need to understand and exploit them…'[1]

While Western democracies continue to be engaged in a battle of ideas, identities and values, the digital space and information age have provided a new dimension to conflict and competition; instant perception has become the new reality as non-kinetic activity and 'soft' power play an increasingly important role in the delivery of objectives and outcomes. The RAF has been reasonably successful in communicating *how* it delivers air power, but it has been less successful in communicating *why*. However successful the RAF has been tactically, in an era in which the narrative is king and is delivered digitally across the globe, we need to adopt a new approach to communications which levers tactical advantage into strategic success. Communicating is no longer a minor supporting activity; it is, at the very least, an intrinsic component of every military line of operation, and is increasingly becoming a supported component in its own right. This has a potentially profound effect on the role of communications as part of the air power panoply. Simply put, unless we change our mind set and approach to communications in the digital age, we risk ceding the information environment to our detractors and adversaries, which is the strategic critical ground both at home and abroad.

This paper examines the new digitally-driven communications operating space and considers its implications. It sets out the case for being appropriately configured – conceptually and physically – in order to understand the new digital age and how best to survive the threats and exploit the opportunities it presents. Finally, the paper studies how, in particular, factors surrounding offensive air power and the use of Remotely Piloted Air Systems might best be communicated in the future.

Context

Much has been written about the modern 'digital' communications revolution and the impact of the information age. Not only has the character of communications changed almost unrecognisably in the past 20 years, but it could be argued that its nature has also been transformed. Speed, connectivity, accessibility, and increasing bandwidth provide seemingly unlimited opportunity to comment on any matter, from any location and at any time, often without the constraints of accuracy, understanding, legality or legitimacy; it is essentially an anarchic environment. The basic principle of communications – transmitting and receiving – has been redefined by social media, whose networks are increasingly used as the gateway to the traditional news sites. YouTube routinely attracts 1 billion visitors per month and, within the USA, 30% of on-line adults use Facebook as the primary means to access news,[2] albeit data analytics tend to highlight stories that are most likely to interest the user.[3]

As a result, communications are now immediate, more personal, often emotive, increasingly interactive and predominately visual. Already, 2.4 billion users worldwide access the web and

the speed of technological adoption is accelerating. For example, while there are 20 billion devices connected to the internet today, this is estimated to increase to 40 billion by 2020.[4] Social media drives information and disinformation to a world-wide audience instantaneously, and a well organised campaign can change behaviours and perception.[5] Increasingly, conflicts, their root causes, culpability and even outcomes are being shaped by the instant perceptions cultivated and disseminated in the digital space. Social scientists such as Manuel Castells argue that, '*the conflicts of our time are fought by networked social actors aiming to reach their constituencies and target audiences through the decisive switch to multimedia communication networks.*'[6] This reality has not been lost on our adversaries, whose exploitation of the 'potent narrative'[7] has changed the character of conflict and will increasingly be used in '*more sophisticated and unpredictable ways in the future.*'[8] Warfare, conflict and competition now come with a digital component.[9]

For example, Daesh deploys social media in 23 different languages[10] as a means both to instil fear and subversion in the West and as a means to inspire and attract new followers. In the latter respect, tweets, blogs and imagery are designed to demonstrate an overtly positive view of life under Daesh and the web supplies an online library of information for potential recruits covering subject matters as various as how to enter Syria, mounting a bomb attack in the West and which toiletries to pack for a one-way trip to Raqqa.[11] Similarly, the conflict in Ukraine demonstrates the effect Russia achieved through a digital narrative-driven social media campaign targeted at undermining regional and international cohesion.[12] The deployment of the Russia Today (RT) news outlets into NATO capital cities and the fact that Russia spends between US$600 million to US$1 billion annually on RT[13] and other outlets underlines not only the scale of the Russian operation, but the manner in which information and propaganda are integrated into a wider campaign. One of this article's authors was temporarily trapped in a Paris café as an anti-capitalist rally carried on outside, exclusively covered by RT.

However, while the digital age has enabled disinformation and propaganda to reach a wide audience in a very short period of time, it is also providing an environment in which so-called 'official' versions of the truth can be rapidly challenged and undermined. In 2014, the investigative website Bellingcat investigated the loss of Malaysia Airlines MH17 over Ukraine and instigated new levels of scrutiny to so-called deniable military actions.[14] Using open source material, including social media feeds, photographs and YouTube clips, it concluded (and alleged) that MH17 was downed by a surface-to-air missile fired from a SA-11 Buk (NATO: GADFLY) missile launcher of the Russian 53rd Brigade. The report's findings were denied by the Russian authorities and publication initiated a period of claim and counter-claim over the accuracy and relevance of the evidence presented. The truth, presumably, is buried among the narratives and counter-narratives that flowed freely in the weeks and months following Bellingcat's claims. The key point is that the digital age is a powerful and accessible tool. However, we can also expect our adversaries to learn the lessons of Bellingcat and to work harder to protect their actions from scrutiny and challenge. Whether they are successful or

not remains to be seen, but we should also be mindful that our actions will also come under scrutiny both at home and abroad. In the modern era, there may be no perpetual friends, but there are certainly no eternal friends, which makes OPSEC and PERSEC[15] factors as vitally important as ever.

In an era where the narrative is strategically vital, the domestic audience is also a key consideration. In his 2014 Lord Trenchard Memorial Lecture, the then CAS, noted that, '*In the Second World War the British public had a good understanding of what their air power was doing and why, across all of its roles. That is much less true today even though those same roles, such as protecting the nation's airspace, remain just as vital*.'[16] Delivering air power in a democracy requires both parliamentary and public understanding and support. In April 2016, the UK Government rejected the need for a War Powers Act that would enshrine in law the requirement for Parliament to be consulted before military action is taken. However, while the decision to conduct military action still rests with the Prime Minister, it has become convention that Parliament will retain a role in any decision to engage in combat operations. This is unlikely to change in the near future given the fall-out from the Chilcot Report. As a result, communications must also set the conditions for the delivery of air power so that the RAF is in the best position to inform parliamentary debate and secure public support with accurate and timely information, such as it did ahead of the vote to extend air strikes to Syria in late 2015.

More broadly, recent ICM polling within the UK public indicates that while favourability towards the RAF remains high at 87%, only 69% consider themselves familiar with the role of the RAF and 30% claim to know little or nothing about the RAF. These figures reduce further among Black Asian Minority Ethnic (BAME) audiences and those within the key recruiting audience of 16-24 year olds. When asked, a clear majority (68%) of the wider UK Public recognise that the role of Defence is to '*protect and defend the UK and its economy*'. Of these, only 14% specifically identified '*protecting and securing the skies*' as part of this role.[17] The good news is that the image and reputation of the RAF is consistently and exceptionally positive. The bad news is that there remains a lack of understanding on what the RAF does and why, particularly among key youth and BAME audience groups. This is an unsatisfactory position. In a recent article, the strategist Professor Sir Hew Strachan opined that the MOD's priorities are '…governed by fear of the media and they are focused on damage limitation, control, and sticking to a consistent story. This means it is failing to engage properly with society. I really do fear there is a democratic deficit there…..The MOD and the Armed Forces seem keen not to get pulled into what might be construed as a political debate, and so it does not enter the discussion at all, which is very damaging.'[18] In the age of instant perception, it could be argued that favourability cannot be guaranteed indefinitely and is at risk unless we secure broad public support and understanding particularly among those audiences where hitherto we have little or no success, and that this needs considerable proactive effort. It could be concluded that we are good at preaching to the converted. We now need to get better at evangelising.

The Planning Mind-Set

To respond successfully to the challenges of the digital age requires a conceptual shift in communications planning that places target audience analysis (their needs, perceptions, values and ideas) and clarity of what is to be achieved at its core. To fully realise its potential, targeted communications need to be considered and planned as a key enabler in the delivery of air power rather than as a discretionary luxury. The aim must be to provide the right information, at the right time and in a way target audiences choose rather than how we would like them to receive it. If ambition is limited to only communicating tactical actions, strategic objectives are unlikely to be achieved. At a more fundamental level, if the communications mind-set remains fixed, overly deliberate and too narrowly focused, appetite for risk and opportunities for innovation are diminished. A new and more adaptable approach to communications is required to gain the initiative in the digital age, translate objectives into communications activity and deliver behavioural outcomes.[19] It requires a mind-set that places insight-driven and targeted communications at the heart of planning and a delivery scheme that is primarily digital by design, instinctive and delivered at a rapid tempo. At its core is the ability to act and respond in real time, learn quickly, stimulate creativity, and accept that risk is an inherent part of communicating.

James Corum argues that, '*Speed is essential….and a traditional bureaucracy, which waits cautiously for details, does not help counter exaggerated or confusing reports.*'[20] However, the speed and ubiquity of communications reduce the time that can be spent on reflection, consideration and planning. The window of opportunity to decide and act is small and will reduce still further. This leads to the question: 'Do we have the agility and imagination to react at speed and, perhaps more fundamentally, are we prepared to take the necessary risk in order to gain and maintain the initiative?' At present, we probably do not. While being imaginative and adaptable is important, and can often provide an important 'edge', they are not on their own decisive and a balance between speed and accuracy needs to be found. This can only be provided when: communications are integrated as early as possible into the planning cycle and there is coherence between comms and policy staffs from the outset; there are clear and consistent communications objectives supported by a credible narrative; targeting is informed by a robust analysis of key audiences and a clear measurement and evaluation of communications outputs; communications are used as a means to deliver effect rather than merely reporting activity; and, communications are delivered by trained and qualified professionals.

Professionalising the Communicator

However, this mind-set cannot be delivered without a professionalised and trained cadre in place to take advantage of the opportunities presented by the digital age. For example, do we have the skills to adequately understand the importance of insight in identifying key audiences and their motivations, how to target audiences and how to sustain a communications campaign to deliver the effect we require? Under the direction of the Government Communications Service, UK Defence Communications is investing significant

time and resource in the professional development of civil servants and military personnel in communication roles. Based and formulated around the Civil Service career stream and Government Communications Service models, the intent is to 'professionalise' Defence's communications cadre through continuous training and formal links to professional bodies in order to increase capability, capacity, and credibility of output. While welcome, it highlights a fundamental gap in the skills and competencies of professional communicators across Defence that needs to be addressed. In the digital age, communicators will increasingly require different and more technical skillsets.[21] Within the RAF there is no formal career path for those in communication roles and through-life professional development is at best *ad hoc*.

As a minimum, we should look to provide greater structure and clarity to media and communications training and career development. This should include a focus on developing deeper digital skills (and regular reinforcement) and understanding in order to operate in the modern communications environment as well as the traditional broadcast methods. Concurrently, we also need to develop a pool of expertise in foreign cultures, traditions and political affairs so that we can better understand our target audiences abroad and provide the necessary insight in what they think, feel and do. Over time, the aim should be to create a cadre of qualified and professionalised personnel that have the knowledge, capability and confidence to deliver practically, as well as providing considered advice and guidance to our senior Commanding Officers and policy staff. However talented, our reliance on 'enthusiastic amateurs' will not suffice. To use the sporting parlance, we are not 'match fit' in the delivery of communications, but we need to be. As a recent NATO report on Strategic Communications in Afghanistan noted, it is insufficient to rely on, '*willing....officers eager to learn on the job*' and move to a position which is based on '*qualified, trained and experienced practitioners in all disciplines at each rank level*'.[22] We do not expect a Private Pilot Licence (PPL)-qualified pilot to jump into a Typhoon on a Quick Reaction Alert (QRA) air defence mission, so why should it be acceptable to do something analogous in the communications sphere?

Educating the 'Undecided'

During his Trenchard Memorial Lecture, the then CAS observed that, '*Collectively, airmen are very good at describing what they do - we fly aircraft - but we are much less adept in explaining why. Everyone in the military aviation business has a responsibility to address this lack of public awareness.*'[23] Notwithstanding recent positive developments in the RAF's educational courses such as its Junior Officer Development Programme (JODP) and Intermediate Command and Staff Course (Air) (ICSC(A)), it could be argued that the training and education delivered throughout a RAF officer's career is often role-focused, without an appropriate wider view of the role of communications in the strategic context. As a result, personnel who have not worked directly in modern communications remain undecided on its utility and yet to be convinced on its overall value to the delivery of air power. Arguably, the 'undecided' fall into 2 distinct groups: those personnel who have little or no understanding of communications and therefore (understandably) only consider it a discretionary task at best; and those personnel who have little or no understanding but act as if they do. Neither is ideal.[24]

As the digital environment has transformed and the pace of change accelerated, the deficit in understanding and appreciation of how best to utilise modern communications has also widened. The gap can be closed, but only by investing in the skills required to understand the new digital space and appreciate the role that communications can play in delivering objectives. A quick examination of the training provided for senior command appointments provides an interesting illustration. Media training concentrates on how to prepare and deliver a 'traditional' TV or radio interview. While important, we revert to the 'how to communicate' (i.e. 'What do you do with your hands?', 'Should you wear a hat?', 'How can you best bridge to your message?') rather than focussing on the 'why' and 'what to communicate' and how to develop the necessary insight, identify target audiences, and evaluate activity. Furthermore, there is little if any training available on the opportunities and reach of social media. As a result, there is a risk that the 'undecided' remain overly fixed on the traditional media space and are unable to recognise and adapt to the impact and potential of the digital space, in which our key young audiences are natives.

The RAF, and Defence more broadly, are not providing the 'undecided' with either the broader understanding of what communications is or what it can achieve when used to its full capability. The current approach to training and education delivers an implicit message: communications is a discretionary luxury and it remains secondary in comparison with other outputs and activity. The key point is everything we say and everything we do (or do not do) sends a message; our training and education interventions need to adapt accordingly to inculcate a broader understanding of the vital role that communications can play in addressing the challenges facing Air Power now.

Air Power's Communications Challenges
Offensive Application of Air Power

'Air strikes' and the offensive application of air power generally has arguably become the most controversial facet of the military instrument in the post-Cold War era. Ironically, it was air power's much vaunted ability to deliver exquisitely precise and apparently risk-free (to the deliverer at least) 'kinetic effect' during the 1991 Gulf War that inculcated a perception of near perfection. General Norman Schwarzkopf's swashbuckling press conferences did much to amplify this notion, even though fewer than 9% of bombs delivered by the USAF during the conflict were 'smart'.

As a result of the highly effective use of laser-guided bombs and cruise missiles, and the even more successful public relations operation that accompanied their employment, an all too eager coterie of air power proponents were swift to declare that air power had at last come of age. Expectations were falsely raised – and almost as quickly dashed – as the limitations of such systems began to be realised. As the RAF found in 1999, laser-guided bombs which had been employed so successfully in the clear skies above Iraq and Kuwait in 1991 were to a large extent neutralised by cloudy skies above Kosovo, demanding a reversion to 'dumb' cluster bombs. The integration of satellite navigation into more modern weapons systems has largely addressed the limitations imposed by weather, dust and smoke and with it public and political

expectations of perfection have continued to soar. Consequently, when things go wrong, such as the erroneous US air strike on a hospital in Kunduz in October 2015, the public (provoked by an outraged media) is incensed.

The principal issue is that when tragedies occur, air power is presented as clumsy or, very often, a 'blunt instrument'. Western public and political appetite is staunchly set against the use of 'dumb' weapons, resulting in a near-total reliance on precision weapons, which are not always the best weapons to use against all targets. Invariably, our adversaries will target this fault line to weaken the resolve to employ air power. Corum argues that if the adversary cannot win in the air, they are more likely to *conduct information campaigns that categorise the use of air power as an inhumane means of waging conflict…*'[25] Consequently, the physical battlespace has ceded much of its importance to the information domain, where our adversaries exploit our own-goals to sap our resolve and stoke negative sentiment among those whom we seek to support. For instance, former President Karzai's outspoken criticism of air strikes in Afghanistan did much to undermine the Coalition's credibility as a 'force for good' in that country, all to the Taliban's benefit. In 2008 and again in 2009, the use of kinetic air power in Afghanistan was progressively constrained by the rules of engagement in order to redress the perception among the Afghan population that air operations were resulting in excessive casualties. While these constraints potentially increased the risk to ISAF[26] ground forces, it also sought to weaken and undermine the Taliban's means to 'attack' ISAF though the 'hearts and minds' of the Afghan population.[27]

In the West too, given the celebrated accuracy of modern weapons systems, the public can be confused when accidents occur. Russia, by contrast, appears not to be afflicted by a similar level of squeamishness, and, as has been demonstrated in Syria, has no compunction in the wholesale use of dumb weaponry in urban areas. That is not to argue that we in the West should not aspire to perfection in the application of air power, but the acceptance in Russia that war is a bloody business in which tragedies are inevitable makes them relatively resilient to the attempts of their enemies to undermine their resolve on humanitarian grounds. Russia makes no bones about the ruthlessness with which it exercises its military instrument – it does whatever it believes is in Russia's national interests, and the tightly controlled media and public in Russia remain supportive.

Russia's attitude does not get the West off the hook, and it is inconceivable that there will be a loosening of constraints on the application of air power, which would debase the moral standing of our strategic case. As a result, we need to get better at persuading the public, politicians and media to understand the advantages and shortcomings of such systems. The notion, as cultivated during the first Gulf War, that precision weapons are a 'silver bullet', continues to carry political currency. Arguably, the UK Government's success in 2015 in persuading Parliament to extend air strikes into Syria was seductively swung in its favour by the touted unparalleled abilities of the Brimstone missile, a capability uniquely offered by RAF Tornados.

Short of a war of national survival, Western appetite for the use of offensive air power is unlikely to become more relaxed, but greater pragmatism needs to be shown in the way in which the subject is dealt with. Perfection is expected, and is rarely newsworthy. By contrast, rare tragic failure risks undermining our strategy. The UK's armed forces have an enviable reputation for accuracy and target discrimination, but it has to realise that some future catastrophe involving UK air-delivered weapons is more likely than not. If we are to withstand such an event, we should do well to have communicated beforehand a credible narrative that there is always risk that something could go wrong and, where high explosives are concerned, the consequences can be tragic. It can be argued that successes are overhyped and this further lowers resilience to disasters when they happen. Silver bullets simply do not exist beyond the realms of fiction, and we would do well to help insure air power's reputation by communicating a narrative that although smart weapons are in many ways exceptionally capable, they are not without risk.

Remotely Piloted Air Systems

Another area in which our adversaries have sought to undermine our moral authority concerns the use of Remotely Piloted Air Systems (RPAS), or 'drones'. 'Drone' has become the common shorthand for such systems, implying that they operate autonomously beyond the hand and mind of humans, a notion that our enemies (and anti-war lobbyists at home) have sought to promote. Indeed, the same rationale is used in their arguments against the use of air strikes more generally – that is to say that drones are unethical and cowardly. Added to this is a view that because human operators are not at risk, the threshold for the employment of lethal force from drones is lowered. But arguably the biggest issue concerning drones is the perception by some commentators that they have been used for extra-judicial activity in third-party states. In the UK, anti-drone lobbyists project a similar narrative. The fact that drones are used by conventional military forces (including the RAF) hardly discourages this perception, nor does the name of the most widely used drone: 'Reaper' (a name inherited from the US). Prime Minister Cameron's pre-SDSR announcement that the RAF's next generation of armed RPAS would be called 'Protector' redresses this public relations own-goal.[28]

As the words 'Reaper' and 'drone' demonstrate, nomenclature matters, but they are but a part of a much greater need to wrest the narrative back from our adversaries and detractors closer to home. At the MOD's first RPAS-focused media event held at RAF Waddington in December 2013, the then Defence Secretary, Philip Hammond MP, observed that '*Much of the criticism of unmanned aerial systems is based on misunderstanding. This event provides a great opportunity to better inform people about these life-saving assets and their variety of purposes.*'[29] However the fight for public opinion is not straightforward.

In 2013, a YouGov poll indicated that the UK public was divided on the use of drones and that attitudes change depending on the way they are used.[30] A certain amount has since been achieved in the UK in demonstrating the utility and efficacy of RPAS, and even the politically controversial strikes against British jihadists in Syria in August 2015 met with a generally enthusiastic response from the media and public. Radio and TV has been used to good effect

in promoting the case, with a greater readiness of ministers and senior military officers to converse on the subject. But an air of mystique continues to pervade the RAF's operations and embellishes negative perceptions. More recently, the House of Commons' Joint Committee on Human Rights called for clarification on the legal basis for strikes against British jihadists in Syria and raised wider concerns about 'drone' use in other parts of the world where Daesh is active.[31] While the Committee focused on the use of 'drones' to deliver lethal force in a counter-terrorism scenario, there is more to be done if the RAF is to address not only the arguments of our detractors, but to exorcise the perception that there is something underhand going on. The arguments at our disposal are concrete and largely indisputable, but we have to be more determined in making them over the long-term in order to promote the morality, legality and accountability on which such arguments are founded.

Conclusion

The nature and character of communications is transforming rapidly in a world where instant perception is the new currency in the battle of ideas, values and identities. Arguably, we have been slow to adapt and continue to view our communications effort as a supporting process rather than supported activity. We have become overly comfortable in communicating our actions rather than communicating why we act, and we have yet to make the conceptual shift that considers communications activity as part of the wider strategic toolkit. At the heart of communications is the audience – their needs, perceptions, values and ideas – and audience analysis needs to be incorporated into our planning with as much detail, deliberation and discrimination as we would with more traditional kinetic targeting.

The delivery of air power has not been immune from treating communications as a discretionary adjunct rather than as an integral element, which is critical to strategic success. To address adverse criticism and comment on the offensive use of air power and the use of RPAS, our combined moral, conceptual and physical approach needs to adapt accordingly. The case for air power needs to be made with a credible, consistent and enduring narrative, both at home and abroad and to allies and adversaries. Abroad, our adversaries have already recognised the potential effect of the 'Potent Narrative' and we need to recognise that warfare, conflict and competition now come with a very large and influential digital component. At home, informing parliamentary debate and securing public understanding and support are also critical.

To address these challenges successfully requires a professionalised cadre of personnel with the necessary communication skills, experience and training to operate in the digital environment. Combined with a greater understanding of foreign cultures, traditions and political affairs, the result is enhanced capability, capacity and credibility of output. We are not 'match fit' and we need to be. Above all, there has to be a better understanding and appreciation of the role of communications in the current digital space across the many 'undecided' who have yet to be convinced about its overall utility. This will take time and training and education interventions need to adapt accordingly. Only then can we fully meet

the challenge to communicate what air power does, and also why, with confidence, clarity and credibility. In doing so, we will be able to lever our tactical advantages into strategic success: in short, communicating to win.

Notes

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Viewpoints

Inner Lights: The Sources of Insight and Innovation Within Air Forces

By Dr Robert C Owen

Biography: Dr Robert C Owen is a retired USAF Colonel and currently a professor at Embry-Riddle Aeronautical University (ERAU). Half of his 28-year Air Force career was as a C-130 pilot and instructor, and the remainder in education and planning assignments that included Dean of the School of Advanced Air Power Studies and chief of the doctrine and transformation planning division at the Air Mobility Command. At ERAU he teaches courses in manned and unmanned commercial aviation history, law, and regulation; and conducts research in national security affairs.

Introduction

The organisers of this conference have done a nice job of packaging the question I am addressing in this short talk. Their question is *whether or not* our historical experience suggests that "fighting systems" have been the key inspirational factor for air power practitioners that encourage innovation from within. By narrowing the focus down to what I presume to be *uniformed* "air power practitioners" and innovations directly affecting the operational effectiveness and sustainability of air forces, they have framed an important question we can deal with sensibility in a short discussion.

So, let me clarify my purpose for the next few minutes. First, I'm going to draw some insights from a discussion of the basic question about fighting systems and innovation. Second, I'll step out of my sand box a little to answer the "so what?" question; what air forces might do in response to those insights.

I should also tell you what I am not going to do; I'm not going to discuss the barriers and hindrances to innovation. There are a lot of them to discuss; including intellectual repression, senior leader dogmas and wooden headedness, institutional self- protectionism, corruption, over structured innovation cultures, and poor identification and incentivisation of innovators. I am also not going to say much about how to get people to really stick out their necks and innovate. Both of those topics are really seductive, but incorporating them would make my presentation unwieldy. So, in an amazing display of scholarly self-restraint, I will actually try to stay on topic and rely on others to start up those conversations.

Definitions

To begin, let's be clear about or at least arrive at a working agreement about the meaning of "fighting system." Frankly, I like the Air Chief's definition of fighting system as something that "harnesses technology, people and the organisation to deliver a decisive military output." On its face, this definition is more *operationally* focused than the more traditional and *logistically*-focused notion of "weapon systems" found in the U.S. Dictionary of Military Terms, which describes them as "a combination of one or more weapons with all related equipment, materials, services, personnel, and means of delivery and deployment required for *self-sufficiency*." Put another way, "weapon system" encompasses the things needed to make a particular weapon, such as a fighter, usefully operable; while "fighting system" is more about bringing together the wide range of things necessary to accomplish an important mission.

The Royal Air Force's creation of the world's first comprehensive integrated air defence system (IADs) on the eve of the Second World War exemplifies the meaning of "fighting system" and its difference from "weapon system." The RAF IADs, sometimes called the "Dowding System" after its chief proponent, Air Chief Marshal Sir Hugh Dowding, met all the definitional elements of a "fighting system." It had a clear deliverable; blocking or at least blunting air attacks on the British homeland. It was an amalgam of many weapon systems; each distinct, logistically

self-sufficient, and justified by its ability to perform a specific task within a broader operational system. Indeed, the Battle of Britain IADS was the consequence of a whole-of-nation effort to fight an air campaign on the RAF's terms. Its primary weapon systems included aircraft, perimeter surveillance radars, an extensive ground observer system, operational command centres, specialised bases, dedicated communications networks, balloon barrages, and anti-aircraft artillery. Each of these systems was supported by its own network of scientific, manufacturing, logistics, and personnel systems. In sum, the root systems of these support networks spread throughout Britain and in fact the world.

It is also important to recognise that, as an amalgam of components, a fighting system is a flexible and often transient thing; its pieces can be reshuffled to accomplish other missions or outputs. The Hurricanes and Spitfires rising to meet Luftwaffe bombers, for example, could on other days be used to strafe invasion barges along the French coast. Such a mission shift also would entail reorienting other support elements (coastal radars, air intelligence units, armourers, etc.) to accomplish the new mission. In some cases, these mission shifts will be rapid, short-lived, and even reciprocating as organisations shift back and forth between roles and missions. As a conflict evolves over time, these shifts might be more basic and longer lasting, as in the case of England-based RAF forces shifting from a primarily defensive posture in the latter half of 1940 to an offensive one from 1941 and onwards. Indeed, a competent air force's ability to quickly shift its orientation and structure from one fighting system to the next is the foundation of one of air power's key attributes – flexibility.

The Sources of Insight and Innovation
Fighting Systems

It requires only a shallow reading of the history of air warfare to see that efforts to accomplish missions have resulted in visualisations and creations of fighting systems. These can be pre-planned and centrally-directed efforts, such as the creation of the USAF Strategic Air Command in the 1950s. They can be done on the fly (pun recognized) such as the organization of the British power-projection fighting system during the 1982 South Atlantic War. But, once they are in existence, the ends of preserving and improving fighting systems can and do inspire innovation themselves. Most of my recent writings on air mobility force structure and applications, for example, have been driven by the importance of preserving U.S. power-projection capabilities in the face of enemies possessing significant anti-access/area denial (A2/AD) capabilities. The F-35, as another example, represents a logical step to preserve combat capabilities in ever more lethal operational environments.

But, as leaders and planners, we should also recognize that other factors have and likely will continue to inspire and shape innovation within our air forces. **The more salient of these factors include looming threats, technological opportunities, credible theories, and innovation culture.** Any useful discussion of innovation in air forces, consequently, should consider the individual and interrelated influences of these factors.

Looming Threats

Perceptions of threat and risk probably have been and remain the universal backdrop of all successful operational and strategic military innovation. It's hard to get senior leaders and taxpayers excited about alien invasions or zombie apocalypses – they want real threats in real timelines. When real and imminent threats do emerge, the military and the public, hopefully, get excited.

As an illustration, early air warfare thinkers like Billy Mitchell, Giulio Douhet, William Sherman, and Jack Slessor were all driven by the threat of repeating the attritional slugfest of the First World War. They saw strategic bombardment and what we would now call joint air-land warfare as the best means to return quick decision and mobility to military operations. Likewise, it was the threat of nuclear war that spurred the development of doctrines and weapon systems to conduct intercontinental strikes and to blunt those of potential enemies. Fear of a nuclear Armageddon drove the development of long-range bombers, computerised command and control systems, deterrence theories, ballistic and long-range cruise missiles, and so on. Once recognised, the reality of nuclear stalemate also prompted many developments in areas like conventional forces and warfighting concepts, insurgency and counterinsurgency theories, and arms control. At present, the proliferation of states and non-state entities able to strike with precision and in depth is driving much air warfare thought and innovation. We are confronted by circumstances where potential enemies can attack our networks, degrade our space systems, and strike our forces from their forward bases clear back to the front doors of their personnel. Those circumstances have obliged and continue to oblige air warfare thinkers and leaders to visualise new or refined weapon systems to keep *fighting* systems viable.

The interaction of threat and innovation obliges senior commanders and planners to take great care in how they articulate the particular threats their air forces face. Their articulations should be specific enough to focus and resource innovation on the most pressing problems faced by their services. The importance of specificity should be obvious to any air leader dealing with a combination of unlimited potential threats and finite resources; which likely will include everyone in this room. But, for those wishing a historical perspective, I would suggest the RAF's experience in the latter 1930s and NATO's experience in the 1970s and 1990s as instructive examples of the inseparable connection between well-articulated threats and on-target and affordable innovation. In the first instance, Britain built up its air defences as a counter to Nazi air power and the threat of bombing raids employing high explosives, incendiaries, and poison gas. In the second case, NATO responded to the continued improvement of Warsaw Pact mobilisation and offensive manoeuvre operations by moderately expanding forces, hardening the sheltering of aircraft and other key assets, and developing deep manoeuvre capabilities of its own.

But, threat articulations should not be so focused that they choke thought and innovation in operational areas of secondary but potentially significant importance in future operations. The U.S. Strategic Air Command's chokehold on aerial weapons development in the 1950s, for example, left USAF tactical air forces poorly equipped in the 1960s and 1970s for unconventional

war and for blunting a Warsaw Pact offensive into Western Europe. More recently, the 2009 U.S. Defense Department decision to limit F-22 production to 183 aircraft stands out as an example of an overly restrictive threat construct squelching important innovation. Publically unwilling to think beyond current events, the Secretary of Defense (SECDEF) built political support for reduced production with arguments that the aircraft wasn't relevant to ongoing counterinsurgencies and would not face equivalent aircraft anytime soon. In pressing its case, the SECDEF missed or dismissed important arguments for acquiring a stronger fleet of these unmatched combat aircraft. These arguments included the need for a performance pad to handle technological or tactical surprise, the challenges posed by networked 4th-generation fighters, the almost certain emergence of equivalent fighters in the hands of potential enemies, the aircraft's value as a medium-range, stealth bomber and ISR platform, and the diplomatic and military advantages of being able to take air control from any enemy almost instantly rather than over time. Thus, because it did not fit a policy of focusing on the threats at hand, F-22 production ended at less than 25% of the U.S. Air Force's original plans and 50% of its adjusted estimate of need.

Technological Opportunities

It is hard to overstate the relationship of technological opportunity and innovation in the history of air warfare. Indeed, this realm of conflict emerged with great suddenness in the early 20th Century in response to a single invention – the airplane. From that point on, air warfare has been shaped by incremental and sometimes revolutionary advances in aircraft designs and supporting technologies. Many milestone technologies are well known. They include radar, turbojet engines, nuclear weapons, aerial refuelling, air-to-air missiles, satellite-based surveillance and communications, and web-based command and control. Some developments were revolutionary in their times, but have faded from common memory or have lost their ability to excite wonder today. These included engine turbo-charging, lightweight very high frequency radios, high-octane aviation fuels, guided air-to-ground weapons, helicopters, solid-state electronics; pallet-based air cargo handling systems, turbofan engines, pulse-doppler radar, and others.

At any point in the timeline of air warfare, the most successful air forces usually were the ones that integrated new, existing, and refining technologies into fighting systems focused on achieving immediate and critical objectives. The 1982 South Atlantic War provides a prime example of an air force making the most of its limited technology options to play a critical role in a one-off joint fighting system able to retake a distant group of islands. Working with greater resources barely a decade later, air planners and coalition air forces in the First Gulf War combined several new technologies; notably stealth, precision-guided munitions, and advanced sensors, to push back an invader and, in the process, usher in a new era of air warfare.

One cautionary note from the history of air warfare, however, is the danger of demanding too much from even the most advanced systems. The fate of the multi-mission Lightning Bug is an

instructive example of this innovation error. As described in Tom Ehrhard's history of U.S. Air Force UAVs, the multi-mission Lightning Bug project foundered on the challenge of making a successful but simple aircraft do a complex job that pressed the limits of subsystems and available systems-integration technologies. After years of development and operational use, the basic Lightning Bug system (Figure 1) had achieved significant success performing in-and-out reconnaissance and dwelling ISR missions during the Vietnam War. But, when the Air Force attempted to repurpose the aircraft to search for Soviet ballistic missiles deep within the lethal air defence environment of Eastern Europe, it wound up with a system that was too complex and expensive to operate reliably and in appropriate numbers. Consequently, the project died because it was gold plated technologically, of questionable reliability, and not competitive with other pressing Air Force projects.[1]

Figure 1: USAF Lightning Bug. (Photograph courtesy of the U.S. Air Force)

Credible Theories

At the level of operational and strategic thought, clearly articulated and credible theoretical discussions were more important to early air power development than they are today. Between the world wars, famous and long-forgotten air warfare theorists provided rationale and direction for air power innovation and investment. From a contemporary perspective, their writings were preliminary, but they were sufficient to convince a lot of important civil and military leaders that strong air forces were necessary to win wars or at least to protect their homelands. Since the Second World War, theoretical discussions of air power generally have lost their influence, except as readings in the halls of professional military education. In the first place, apart from discussions of deterrence theory, air mobility, counterinsurgency operations, drones, and cyberwarfare, a high percentage of air warfare theories published since the Second World War are little more than rehashes of concepts raised before 1939.

Consequently, the main contributions of modern theory and doctrine studies have been to contemporise the language and context of mainstream ideas. More importantly, a century of operational experience and particularly events since the mid-1970s supersede theory as justification for continued investment and innovation in air power.

This is not to say that air force leaders should discontinue support for their air power studies centres and the like. In the first place, contemporised theoretical discussions are essential to the education of officers and sometimes as outreach media to influential individuals and groups. In the second place, theoretical discussions have great value, particularly if they are anchored on after actions reports on recent conflicts, unfolding technological and geopolitical trends, evolving historical appreciations of past events, and changes in the cognitive and learning patterns of new generations of officers. Such discussions keep air warfare thought alive and fresh, rather than dead memories in dusty books written in odd styles.

Innovation Culture

Just defining the meaning of innovation culture is a matter of wide interpretation. Cultures, all cultures, are composed of material and immaterial elements. The material elements of innovation cultures include innovative people, learning and knowledge management processes, educational institutes, study groups and centres, and organised channels for identifying issues and managing and exploiting innovations. The immaterial elements include the cognitive and learning characteristics of military institutions and their parent societies, the individual risk factors involved in voicing innovative ideas that challenge dogmas and interest groups, the individual incentives and rewards of innovative thought, the resources available to support thinking about and communicating new ideas, and the willingness and ability of leadership groups to understand and act upon new ideas. At the borderline between the material and immaterial realms of innovation are the career and informative cognitive "spaces" provided to allow creative individuals to do what they do on timelines comfortable to them. Traditionally, these "spaces" included officers clubs, squadron "bull sessions," and now they include things like blogs and online publications. A recent TED Talk by author and speaker Steven Johnson on "liquid networks" suggested creativity needs for informal channels of discussion working alongside or even within institutional and formal processes.[2] All of these and other elements are essential to producing a living innovation culture, one that produces and acts upon good ideas and that perpetuates itself. Creating and sustaining such a culture, consequently, is a resource and character challenge for any air force leadership group. But, there is plenty of historical evidence showing that air forces that rise comprehensively to that challenge do far better than those that do not.

To return momentarily to our old friend, the Battle of Britain, the impact of innovation culture on the way the Royal Air Force and Luftwaffe approached radar is well documented. Alan Beyerchen, an American historian specialising in the history of Germany and of science and society, argued some years ago that the two air forces viewed the new invention through different cultural lenses. The "offensive-minded" Germans "underrated the importance of

radar, because they perceived it as a defensive weapon." The Luftwaffe's commander, Ernst Udet, a First World War fighter ace and later stunt pilot also derided radar as something that would "take the fun out of flying." The Royal Air Force's Fighter Command, in contrast, was under the hand of the decidedly un-flamboyant Air Marshal Dowding, whose pragmatic mind immediately grasped the defensive value of radar and focused his financial, military, and scientific resources on developing it and its supporting systems. As a consequence, the Germans, who had first experimented with radio detection in 1904 and possessed radar systems equivalent to those of Britain, entered the war well behind their opponent in development of a comprehensive IADs.[3]

RAND analyst David Johnson's book on the development of tanks and heavy bombers in the interwar period provides a useful look into the impact of innovation culture differences *within* a service. In this case, U.S. Army tank development between the world wars was in the hands of the infantry and cavalry branches, each of which approached the tank as an extension of their tactics and institutional interests. The leaders of both of these branches were quick to censure any officers, including Lieutenant Colonels George Patton and Dwight Eisenhower, who proposed independent, tank-centric operations.[4] As a consequence, the Army entered the Second World War with agile but lightly armoured and gunned "cavalry" tanks and heavier and more ponderous "infantry" tanks. It had no battle tanks with the combination of speed, armour, and armament needed to fight it out with other tanks and to exploit breakthroughs. In contrast, Army airmen were in an independent branch focused on exploiting the potentials of military aviation, and they were largely free to focus their innovations where they thought appropriate. In part, their innovative freedom derived from the conjunction of their strategic bombing theories of what Mark Clodfelter calls "beneficial bombing," and the progressive ideals of humanity and efficiency prevalent in American popular culture at the time.[5] Consequently, the Army Air Corps entered the war with first-rank bomber and transport aircraft, and fighter types nearly equivalent to those of belligerents who had been fighting for two years. Summarising these different results, Johnson wrote, "the future of U.S. Army aviation was in the hands of advocates; the potential of the tank was controlled by traditionalists."[6]

Finally, defence scholar Dimetry Adamsky provides a more contemporary but equally convincing example of the impact of military innovation culture in his study of Soviet, American, and Israeli doctrinal response to the stealth-precision-control revolution in military affairs (RMA) of the 1980s and beyond. Essentially, he argued that the "technologically inferior" but conceptually-minded Soviets were the first to articulate a comprehensive vision of warfare shaped by the RMA, even though they lacked the technology to put it into effect. The Americans, who developed the technology but were slow to articulate its revolutionary impact, "discovered" and then adopted the Soviet vision, refined it, and then passed it on to the Israelis. Ironically, the Israelis had been practicing precision warfare since the early 1980s, but their tendency to promote practitioners rather than theoreticians to their higher ranks made them the last to grasp the full meaning of the RMA.[7]

Implications

So, the answer to the original question posed for this talk, *whether or not* historical experience suggests that "fighting systems have been the key inspirational factor for uniformed air power practitioners seeking innovations that directly affect the operational effectiveness and sustainability of air forces" is "yes," *generally*. But, fighting systems are rarely the only factors influencing innovation and, if all of the relevant interest groups and cultural forces are factored in, there are times when the operational and sustainability considerations of fighting systems are secondary, even minor considerations. But, our job as airmen ultimately is to fight and accomplish missions, to deliver decisive outputs. So, to the degree that we control our own innovation processes, we should at least try to keep fighting system requirements at the forefront of military policies and innovations.

Perhaps the most important step we can take toward controlling our innovation process will be to approach our innovation *cultures* as fighting systems in themselves. Just as we all know that acquiring a new fleet of aircraft is only the beginning of building a weapons system that can employ them usefully, we should also know that acquiring bits and pieces of innovation culture will not result in a system that produces and acts on good ideas in a timely manner. Such a system requires hardware, in the form of schools, journals, organisations and such. It also requires a full-up personnel plan for selecting, preparing, advancing, and retaining the right people at all levels and stages of the innovation culture. Finally, like any fighting system, our innovation cultures should be supported by doctrines, exercises, competitions, liaison, and exchange programs. Doctrines of innovation will be essential to clarifying and disciplining innovation processes in ways that do not stifle creativity or undermine the general order and discipline of our services.[8] Additionally, by diversifying the sources, opinions, viewpoints, and cognitive patterns in our service innovation centres, liaison and exchange programs will nurture their creativity and intellectual accountability.[9]

Perhaps the hardest challenge will be to infuse life and energy into our innovation cultures. People will be key to this, of course. So, air forces seeking timely and actionable innovations must learn how to reward their thinkers and innovators in tangible ways, particularly in terms of recognition and promotion. Remember, all good people ultimately are volunteers who can take their talents elsewhere. Many of your brightest and most creative people will come into the military because they are attracted to the mission and the military community, at least as they perceive it. They will leave if they feel under-appreciated, dealt with unfairly, or placed under bad bosses who just don't understand or value what they are doing. If we are smart, we won't let that happen very often.

Notes

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[2] See Steven Johnson, "Where Good Ideas Come From," TED Talk, retrieved May 5, 2016 from **http://www.ted.com/playlists/20/where_do_ideas_come_from**; and Adam Grant, "The Surprising Habits of Original Thinkers," Ted Talk, retrieved May 5, 2016 from

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[3] Alan Beyerchen, "From Radio to Radar: Interwar Military Adaptation to Technological Change in Germany, the United Kingdom, and the United States," in Williamson Murray and Allan R. Millett, editors, *Military Innovation in the Interwar Period* (Cambridge, UK: Cambridge University Press, 1996), 265-291.

[4] David E. Johnson, *Fast Tanks and Heavy Bombers: Innovation in the U.S. Army 1917-1945* (Ithaca, NY: Cornell University Press, 1998), 75.

[5] Mark Clodfelter, *Beneficial Bombing: The Progressive Foundations of American Air Power*, 1917-1945 (Lincoln, NB: University of Nebraska Press, 2011).

[6] Johnson, Tanks, 220.

[7] Dima Adamsky, *The Culture of Military Innovation: The Impact of Cultural Factors on the Revolution in Military Affairs in Russia, the U.S., and Israel* (Stanford, CA: Stanford University Press, 2010), 3-5, 131-4, and throughout. See also Avi, Kober, *Practical Soldiers: Israel's Military Thought and Its Formative Factors* (Leiden, The Netherlands: Koninklijke Brill, 2015), 53-55 and throughout.

[8] For a useful and concise discussion of the value of innovation doctrine, see Thomas M. Williams, "Understanding Innovation," *Military Review*, July-August, 2009, 59-67.

[9] For insights into how diversity enhances performance in another realm of endeavor, see Sir Ken Robinson, "Building a Culture of Innovation," Alternative Education Research Organization *Education Revolution* presentation, January 28, 2013, retrieved May 5, 2016 from https://www.youtube.com/watch?v=6XqJ36xJEm4.

Viewpoints

Assessing Assessments: How Useful is Predictive Intelligence?

By WO2 John Hetherington and Wing Commander Keith Dear

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Biography: Warrant Officer Class 2 John Hetherington serves in the British Army's Intelligence Corps. Currently an Arabic and Pashto linguist, he has served in Northern Ireland, the former Yugoslavia, Iraq and Afghanistan, as an analyst in the combat and operational intelligence roles. He has a long standing interest in psychology and war, presenting on psychology's application to tactical planning and execution.

Wing Commander Keith Dear is an RAF intelligence officer, CAS Fellow, DPhil candidate at Oxford University's Department of Experimental Psychology, and Research Associate at Oxford's Changing Character of War Programme. His professional experience is in Intelligence, Surveillance and Reconnaissance (ISR) analysing human behaviours and systems. His current studies examine the effect of surveillance on behaviour.

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Introduction

"Tell me what you know, tell me what you don't know, tell me what you think, always distinguish which is which"[1]

General Colin Powell, Chairman US Joint Chiefs of Staff

This article suggests that the failure to retrospectively evaluate the accuracy of British military intelligence predictions limits its effectiveness as an aid to commanders. It argues that it must begin to include accuracy of prediction as a metric in the assessment of the professional effectiveness of our individual analysts and our intelligence organisations and process as a whole. Doing so will provide the feedback needed to improve and may also help to more carefully delineate the limitations of prediction.

A central responsibility of military intelligence staff is to predict the future actions and intentions of enemy, neutral and allied parties. But how accurate and useful are these predictions? At present, the British military would be hard pressed to answer this essential question with any rigour. No mechanism looks at how often an analyst's or analytical team's predictions are right or wrong. A retrospective evaluation of British military intelligence assessments in order to judge their accuracy would be the first step in improving future performance. This is no more than would be expected in any other domain from flight safety to a patrol debrief. In the absence of any work examining how accurate British intelligence prediction has been, this article looks at US and Canadian efforts to understand the accuracy of their predictions. It focuses first on identifying practical barriers to accurate prediction, and then on the theoretical aspect of prediction – what can be successfully predicted, or what are the boundaries of prediction?

The term assessment is sometimes used to indicate an analytical curation of available intelligence and other information to give a general picture to a commander. In order to remove any ambiguity, this article will use the term assessment to mean the summarised intelligence picture delivered to a commander – it is a retrospective or current perspective on events. The term prediction indicates that portion of an assessment which is an analyst's estimate of future enemy or third-party activity. This article covers predictions pertaining to the tactical, operational and strategic levels largely without distinction as what is at issue here resolves to one or more intelligence personnel making a prediction about the future, and in this dimension the similarities between the levels of war outweigh the differences.

US-funded research (the so-called 'Superforecasters' project) examining the accuracy of those it employs to make intelligence[2] predictions found that external forecasters without access to classified information were 30% more accurate in their predictions than the professionals with access to classified materials.[3] It appears that the base prediction accuracy has still not been published. However, an earlier study found that the average expert was "no more accurate than a dart-throwing chimpanzee".[4] The best forecasters in the first round of the project, those that had contributed the most in the 30% victory were grouped together as a 'Superforecasters'

team. They beat American intelligence analysts in accuracy of prediction by 60% in the following round of the project and, after a further round of selection, by 78% in the third. There was clearly great room for improvement amongst the professional predictors in the US intelligence community.

In contrast to the US results, David Mandel's subsequent work with Canadian intelligence showed that Canadian analysts achieved very high accuracy in their predictions.[5] Mandel's work is thought to have been more accurate for the following reasons: the predictions were on shorter timescales (e.g. 6-12 months, rather than 12-36 months), the analysts were not given anonymity and they were not necessarily acknowledged experts in the theory of their subject.[6]

Unless the various UK intelligence agencies and staffs know empirically or rigorously how right, or how wrong, they are, it is very difficult to *systematically* improve the systems and processes that lead to those successes and failures. Former British military intelligence officer Sean Ryan[7] summarizes the current situation within UK military intelligence admirably, writing that "… success rarely influences official appraisals of intelligence professionals. It would be impossible, as no records compare the end result to the prediction. Formal 'lessons learned' processes limit themselves to broad-stroke impressions, generic issues and localised procedures. No metrics record the accuracy of intelligence analysis on an individual, team or organisational level. Rarely is the question asked: 'why did we get that wrong?' Intelligence analysts are structurally divorced from responsibility for the accuracy of their assessments."

It is critical to know how accurate these predictions are, if they are to be improved.

Preliminary Diagnosis

There are a number of practical and theoretical issues with how UK intelligence staffs currently approach prediction. This article deals with the practical first. It shows the need for systematic review of predictive accuracy. It discusses the importance of language, the difficulty of assessing the probability of singular events, the overweighting of confidence in military culture and the possibility that analysis is valued too highly over the more clerical aspects of intelligence: processing and exploitation.

Assessment and prediction are at the heart of British Military Intelligence training and practice. From the commencement of phase 2 training, through every exercise and operation, intelligence staffs are obliged to predict the future actions and intentions of enemy or neutral forces and parties. Whether working at the tactical or the strategic level, prediction is central to the intelligence analyst's role.

It matters that the British military does not know how good it is at prediction. Giving a prediction, whether in a written or oral brief, has the effect of creating a position which the intelligence staff, the command staff, and the operators, may all buy into. They will see future intelligence through the prism of the first assessment, being reluctant to give it up and,

through confirmation bias, search for evidence to support it. Inaccurate predictions result in poor decisions and blindness to other threats and opportunities.[8] The psychological effects are well understood: by letting an incorrect assessment into collective understanding, the ability to perceive reality and predict correctly is reduced. In the jargon, the prediction becomes the baseline while the 'public commitment' makes it hard to get it out of the collective brain.

Precision of Language

Clarity of language is critical. Tetlock's findings were unambiguous on this: increased precision in outcome was correlated with increased precision in prediction; loose language must be avoided. This problem is formally recognised in doctrine. JDP 2-00 para 343 provides us with an uncertainty yardstick which applies numerical values to probabilistic language.

Qualitative Term	Associated Probability Range
Remote *or* highly unlikely	Less than 10%
Improbable *or* unlikely	15-20%
Realistic probability	25-50%
Probable *or* likely	55-70%
Highly probable *or* highly likely	75-85%
Almost certain	More than 90%

Figure 3.7 from JDP 2-00 – Defence Intelligence Uncertainty Yardstick.

This precise approach is critical and must be taught and applied at all levels. In practice its routine application appears confined principally to the higher Strategic and Operational levels only.

When prediction is hedged around with 'may', 'could' or 'possibly' without such a clear framework the results can be devastating. Tetlock shows how this phenomenon contributed to a number of poor decisions. When military and political staffs discussed the possibility of a Soviet attack on Yugoslavia (1951) or the chances of the Bay of Pigs operation succeeding (1961), those present understood radically different numerical chances for the same words. UK Defence Research recommended the adoption of these measures in 2002 to allow Commanders to better evaluate the weighting of risk.[9] Retrospective analysis of predictive accuracy would provide feedback on how widely this direction has been followed.

There is some evidence that the British Military may not be quite as committed to precision in intelligence analysis as it might like to claim. For example, one of the few publicly available intelligence predictions in the UK is that of a terrorist attack. MI5/the Security Service tells us

that the UK threat level for international terrorism is currently at SEVERE, meaning an attack is highly likely. The threat level has been at SEVERE or SUBSTANTIAL for 10 years, since 2006.[10] The agency explains that SUBSTANTIAL means an attack is a strong possibility while SEVERE means an attack is highly likely. There is no read-across to the DI Yardstick for 'strong possibility' which leads us to suggest this is a linguistic fudge masquerading as a prediction, a public exercise in risk aversion. This view is reinforced by reading across the SEVERE probability to the Yardstick. If SEVERE does mean an attack is *highly likely*, which the DI Yardstick tells us is a 75-85% chance of being attacked, no timeframe for the UK threat level from terrorism is given, which is itself a significant problem. It makes it impossible to judge whether the prediction was accurate. If the predicted timeframe is taken to be 24 hours, then the UK has had a greater than 75% chance of experiencing a terrorist attack every day since 2014. This is plainly absurd given the evidence of how rare terrorist attacks are in the UK. If politics is driving the prediction this must be opposed. It misleads the public, acts as a poor guide to policy and indeed it might be argued that in overweighting the strength and effectiveness of terrorist groups it serves to amplify the fear, the terror, they seek to create. If the risk aversion lies within the intelligence agencies, it must be addressed. It is in such highly charged times that rigour in predictions is most important.

Mandel's analysis of Canadian intelligence showed that there exists within the group a relatively clear shared understanding between commanders and analysts of what the less precise verbal formulations mean. It is highly likely that this understanding exists in the British military too and also highly likely that it is increased over time amongst individual intelligence and command staffs. But if accuracy in prediction is to be assessed, more precision is needed in saying what is meant by giving a clear numeric probability against which the analyst can be examined. Clearly, if multiple predictions are made with 90% accuracy, they should be right 90% of the time. Examining this would help analysts to recalibrate their predictions for habitual over- or under-confidence, and enable organisations to see and correct systematic biases or failures. Furthermore, in large, complex international coalitions the shared understanding between commander and staff in one area is unlikely to extend to other commands and staffs across the coalition. Rigour becomes ever more important as complexity and scale increase.

Predicting singular events against a numerical probability is more complex than predicting multiple events by extending an existing pattern or trend. Suggesting that there is a 35% chance of an event occurring may help a commander plan the disposition of his forces, but if the event subsequently happens it can't be known if it was random chance or a bad prediction. However, the given probability can be used as part of an evaluation of the totality of an analyst's or section's predictions. Even for singular events: if 70% of predictions only come to pass 33% of the time, there is a systemic or individual problem with the approach taken (or an extraordinary run of bad luck – possible, but little harm is done by a close examination of process and procedure even when it is erroneously cued by statistical improbability). It is more helpful then for a commander to know how good his or her intelligence staff is in making predictions, than it is for him or her to know the probability assigned to the prediction of a singular event.

Analysts' Behaviour and Skills

It may be that the wrong habits are encouraged in our analysts. To quote *Superforecasting*: "...people equate confidence and competence, which makes the forecaster who says something has a middling probability of happening as less worthy of respect". As one study noted, people "took such judgements as indications the forecasters were either generally incompetent, ignorant of the facts in a given case, or lazy, unwilling to expend the effort required to gather information that would justify greater confidence". The plausibility of the analyst may be more likely to convince the listener or reader that they are right, but they are not necessarily more likely to actually be right. Pioneering behavioural psychologist Daniel Kahneman notes that "declarations of high confidence may just tell you that an individual has constructed a coherent story in his mind, not necessarily that the story is true".[11] This preference for expressing certainty rather than doubt – added to group-think – was a key element in the Iraq intelligence failure. At a lower level, Ryan notes that: "In OPINT exercises, students are primarily graded on their delivery and plausibility. Rarely is there a mark for accuracy. Many exercises are deliberately scripted without a right answer. The instilled effect is a focus on presentation over content, because presentation is the tangible metric on which individuals are graded. Intelligence operators are incentivised to become salespeople rather than analysts, judged not by performance but by plausibility". Prediction should nearly always be tentative so that both analyst and commander keep the right mind-set about such intelligence predictions: they are often assessments of very difficult and dynamic situations based on incomplete information and error, and the unexpected should be routinely expected.

Finally, it is possible that prediction is over-emphasized in intelligence circles because it is a difficult and perhaps even "illusory skill". Kahneman uses this term in connection with stock market traders, describing them as highly skilled and hard-working professionals using every scrap of information to improve their predictions but still unable to consistently beat or match the stock market. This is because despite the high-level skills being employed, the task is usually impossible. If intelligence prediction is, indeed, an illusory skill then its importance is systemically over-rated in comparison with the more clerical aspects of intelligence work such as collection and dissemination, which are seen as more pedestrian. A full systematic review of how accurate and useful our predictions are may teach that displaying accurate information clearly and quickly has far greater value to all staff, from command to field.

The Boundaries and Value of Prediction

Some important conceptual challenges to analysts' ability to predict must be considered. Are the answers to the questions that the UK asks its analysts to predict even theoretically routinely predictable? 'Routine' is important here: everyone will get lucky sometimes. The difficulties in successful prediction in military contexts are legion: incomplete and incorrect information, a dynamic situation receiving constant new inputs, a very large number of possible states for each actor, with many actors and parties involved, a wide range of possible outcomes, and complex interactions of friendly and enemy forces. This leads

to frequent 'black swan' events (possibly more common in lower-intensity warfare): rare, inherently unpredictable and retrospectively rationalised to make them *appear* predictable – the narrative fallacy. However, even in high intensity warfare there are parallels in the attempts to predict singular events, like the day of an invasion.[12]

Professor Jim Storr suggests that high-intensity combat consists of a large number of elements in (1) a large number of different states (attacking/defending/delaying/regrouping etc); in (2) a large number of different spatial positions, which (3) change often in time, while (4) continuously interacting with other friendly and enemy elements dynamically and lethally. All this occurs in an environment in which decisions (i.e. future intentions) will be made in conditions of great – sometimes mortal – danger. In addition to all of this, each side will have imperfect information about both itself and the enemy. Although describing high-intensity combat, all the situations and levels of combat that our intelligence staffs must assess will share these attributes to a large degree. In these circumstances, which Storr categorises as "unutterably complex and [which] do not appear to be heavily determined", some might argue prediction is impossible. It is certain that it is very difficult.

Military intelligence staff training tends to be scenario based. In such an approach a 'GENFORCE mentality' can creep in: this is where an exercise enemy is used, which has stereotyped tactics and operates in an unrealistic 'zero-friction' environment. Accurate 'prediction' in these circumstances is analogous to solving a puzzle: finding the key bit of information will unlock the solution. Unfortunately, this tells us little about the ability to predict a real enemy operating in a dynamic and uncertain environment.[13]

Lieutenant Andy Mellows' excellent paper published in the Int Corps Journal *Cognito* examining intelligence and decision making contains a suggestion for improving scenario-based training. Mellows suggested that exercises are created which give real situations from the past and then testing intelligence staffs' ability to predict the outcomes, measuring their performance against actual outcomes.[14] Such a thoughtful approach to improve and further professionalising intelligence assessment and prediction is precisely what is needed and we could provide part of the answer. However, if Professor Storr is correct, caution is necessary in how this idea is implemented. Even the attempt at retrospective prediction based on clear historical example may fall victim to the narrative fallacy – assuming the outcome observed was the most probable, or even inevitable.

If the limits of what *should* be predicted are unknown, and the ability of our analysts and organisations to make accurate predictions is similarly unclear, the value of intelligence predictions is equally uncertain.

As a second order effect, this uncertainty calls into question the usefulness of IPB/IPE and doctrinal templates and similar products in real warfare. Professor Storr suggests that such products are rarely updated or even referred to after initial planning, so there is no way of

knowing if they aided accurate prediction.[15] Even more damningly, Major General Michael Flynn, senior military intelligence officer in Afghanistan, said in 2009: "The intelligence community's … culture is strangely oblivious of how little its analytical products, as they now exist, actually influence commanders. It is also a culture that is emphatic about secrecy but regrettably less concerned about mission effectiveness".[16]

With such enormous difficulties the intelligence community must do everything it can to improve accuracy in prediction. It cannot afford not to.

This article has attempted to diagnose some of the practical and theoretical problems that inhibit or prevent accurate intelligence prediction. It will briefly examine some objections to the diagnosis, answering them before turning finally to some recommendations.

Objections

Certain objections could be made to various aspects of the diagnosis. On the more practical side it might be argued that there is (1) no discontent with current intelligence practices and therefore no problem; or (2) that there is a shared understanding at all levels regarding the language used, both in the operations and intelligence staff making and using predictions, and with the audience for these predictions. Some may argue that (3) confident delivery is not the same as the analyst's confidence in the prediction, and does not lead deterministically to a commander's confidence in the prediction. All of this could be determined by a systematic retrospective analysis of intelligence predictions and the command and tactical decisions based on them, or made in contradiction of them.

Others might suggest that command and intelligence staffs are both happy to deal in uncertainty and neither is unduly concerned to over-defend stated positions. Again, an audit would reveal how true this. A brief acquaintance with psychology would suggest that it is unlikely to be true.

Some have suggested that there is not time to be more precise in making intelligence predictions and/or there is insufficient time to go back and analyse their accuracy. It was noteworthy that neither Tetlock nor Mandel suggest more accurate predictions take longer to make but in fairness it must be considered that the conditions in which the predictions were made were different. It is possible that the extra linguistic and probabilistic precision requires a change of habit rather than a longer time in formulation of the prediction. Making sufficient time for the retrospective analysis of predictive accuracy may be more difficult. Staffs may genuinely not have the capacity to do this. It may be advisable therefore for an outside agency or a different staff to carry out the analysis.

A notable challenge is that a prediction can be confounded by being right. That is, an analyst may be thought to have made an incorrect prediction when the action was in fact prevented by friendly activity, perhaps activity directly cued by the commander's desire to prevent the

predicted outcome occurring. The difficulty of friendly operations changing future enemy activity and so invalidating earlier predictions is clearly a valid objection, to a degree, however, this could be incorporated into the evaluation of the prediction e.g. was any action taken based on the prediction? Surely one of the most powerful indicators of the utility of our predictions is how frequently they cue action to forestall the predicted outcome. Thus this might be a key metric of the utility of the predictive intelligence. Again, it is a metric that is not currently tracked. Furthermore, any action taken should yield further information to confirm or refute the prediction's accuracy – again providing feedback to allow the analyst to improve in future.

This article notes a final practical objection: some suggest the last decade of war has redressed the balance between assessment and the other parts of the intelligence cycle. While a theoretical objection might argue that given sufficient current and doctrinal information, and sufficient analytical power, complex tactical movements can be predicted.[17]

The truth is, that most of these objections are impossible to completely refute and are equally difficult to uphold – the answers are unknown and are worthy of discovery through examination of our predictive accuracy. At best, commanders may gain greater confidence in their intelligence staffs; at worst, it may be discovered that some working assumptions are fundamentally unsound.

How do intelligence predictions improve?

Some recommendations arise from this article's analysis. First and foremost, **predictions must be subject to systematic, continuous review both on a collective and individual level**. Such a review might be most effective if impartial and thus should be led by a neutral third party – another staff, a commercial organisation or an academic partnership. The UK needs to know how good its intelligence staffs are in order to adapt its training and its approach, and analysts need to know how good they are as individuals in order to improve their individual performance.

To do this, the Yardstick must be applied universally, and the UK must begin to look at the accuracy of intelligence organisations, sections or individual analysts' predictive performance as part of such an assessment of their professional effectiveness. The simple measure of recording and then subsequently verifying the accuracy of each analyst's, section's and organisation's predictions should begin to bring a number of 'quick wins'. For example (1) the accuracy of the forecasts of the intelligence staffs will be known, in itself a useful aid to planning; (2) once they are known there will be a measurable incentive to improve the accuracy of the forecasts, (3) this baselining will create an incentive to minimise over-confident predictions and the subsequent damage they do to the commander's mental picture of events, and (4) Command staff may become happier with less certainty in their intelligence staffs' assessments and will gain greater confidence in analysts based on accurate results, not plausibility of presentation. Additionally, (5) intelligence and command staff will be better

able to understand broadly what can be predicted and to what level of accuracy while certain things may be ruled out as definitively unpredictable – in the jargon, the boundary conditions for successful prediction in military contexts will be discovered. Finally (6) the utility of certain staff procedures can be tested by how much or how little they contribute to the accuracy of subsequent predictions.[18]

The Operational Record from Ops TELIC, HERRICK, ELLAMY and perhaps even SHADER, as currently stored in electronic format, could readily enable an analysis of the accuracy or otherwise of recent intelligence predictions at given levels of detail and time period. It might also enable the intelligence community to understand the differences in outcome when predicting events at the Tactical, Operational and Strategic levels. It must be independent and would be well suited to a military-academic partnership.

The successful approach of Tetlock and the Intelligence Advanced Research Projects Activity (IARPA) programme could be adopted by identifying who the British 'Superforecasters' are and grouping them together, creating a sort of 'special forces' of forecasters.

Some recommendations emerge from the studies of Canadian and US intelligence which the British military would be wise to adopt. While Tetlock's research found most professional forecasters to be unreliable, he did find certain people who reliably made accurate predictions and identified the personal characteristics they possessed. These may be listed for simplicity:

- They made specific measurable forecasts.
- They constantly adjusted those forecasts in the light of new information. This information might only shift their prediction a few percentage points (the best forecasters were the most granular).
- They were not emotionally tied to their predictions.
- They were not adherents to a big over-arching political ideology which explains everything.
- They broke down problems into constituent elements.
- They were comfortable with basic mathematics.[19]
- They improved as forecasters as they gained experience.

These might form the spine of any future analytical training and/or assessment of individual or collective competence.

In response to the conceptual challenges to prediction, its conditions must be made easier by reducing the number of elements and thus increasing the degree of accuracy in space and time. Broad patterns will generally be a lot easier to predict than anything which requires detail and precision, and Storr[20] says that this is what expert military decision makers, i.e. good commanders, actually do.

Summary

This article suggests that the UK must seek to replicate, expand and institutionalise nascent efforts in the US and Canada to improve the accuracy of intelligence staffs' predictions. The first task must be to establish how good intelligence staffs are at making predictions. The second must be to make adjustments to training, processes and procedures based on what we have learned. Tetlock and Mandel have provided an invaluable pointer to where we need to go. It's up to the intelligence community to take the actions to get there.

Notes

[1] General Colin Powell, Chairman Joint Chiefs of Staff, "Intelligence Reform" 2004, http://fas.org/irp/congress/2004_hr/091304powell.html.

[2] These were strategic/geo-political assessments.

[3] David Ignatius "More Chatter Than Needed" 2013, https://www.washingtonpost.com/opinions/david-ignatius-more-chatter-than-needed/2013/11/01/1194a984-425a-11e3-a624-41d661b0bb78_story.html.

[4] And in the case of media pundits, worse...

[5] David Mandel, *Accuracy of Intelligence Forecasts From The Intelligence Consumer's Perspective*, Defence Research and Development Canada 2015.

[6] Tetlock & Mellers, *Judging Political Judgement*, Proceedings of the National Academy of Sciences of the United States of America July 2014.

[7] Sean Ryan, "Finding the Right Answer," *The RUSI Journal* vol.160 iss.4 (2015); 50-58.

[8] Storr, *The Human Face of War*. Professor Storr, former soldier and military scholar mentions an example of a J2 cell literally making up an attack and the authors have personally witnessed similar phenomena several times.

[9] Desimone and Charles, "Towards an Ontology for Intelligence Analysis & Collection Management", Qinetiq 2002 https://www.aiai.ed.ac.uk/project/ksco/ksco-2002/pdf-parts (paper 11).

[10] https://www.mi5.gov.uk/threat-levels.

[11] Daniel Kahnemann, *Thinking Fast and Slow*.

[12] There is a good example from the Yom Kippur War: http://gladwell.com/connecting-the-dots/.

[13] Ryan, "Finding the Right Answer", is similarly sceptical.

[14] Mellows, *Embracing intuition: how an understanding of Naturalistic Decision Making research can improve the provision of tactical intelligence*, 2015 Cognito.

[15] Storr, *The Human Face of War*, identifies targeting Boards, IPB and synchronization matrices as falling into this category.

[16] Flynn, Pottinger & Batchelor, *Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan*, (Voices From the Field Series, Center for a New American Security, 2010) quoted in Ryan, "Finding the Right Answer".

[17] The difficulties encountered in more general political, economic, climatic and even sports forecasting invites a certain scepticism here.
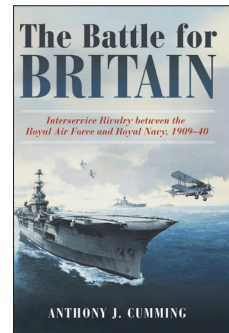
[18] Tetlock, *Superforecasting* is useful for its scoring system for those interested.

[19] Mathematical awareness appears to have a basic function in preventing an analyst holding logically incompatible views
[20] op. cit.

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Book Reviews

The Battle for Britain: Inter-service Rivalry between the Royal Air Force and Royal Navy 1909-1940

By Anthony J Cumming
Publisher: Annapolis, Naval Institute Press, 2015 (**ISBN:** 978-1612518343), 224 pages

Reviewed by Mr Colin McHattie

Biography: Colin McHattie is a PhD student at the University of Birmingham. His research topic examines policy debates between the three Services in the 1920s.

Introduction

Previous histories have dealt with the development of air and naval policy in the inter-war period, most notably Montgomery Hyde's '*British Air Policy between the Wars*', (London, Heinemann, 1976) and Roskill's '*Naval Policy between the Wars*', (London, Collins, 1968/1976). Given the background of these authors there is clearly an opening for a book which critically investigates the relationships between the two services, especially considering that much government time was spent adjudicating the intense rivalry between the two factions which developed.

Cumming's book is a continuation of his thesis that the Royal Navy and not the Royal Air Force was ultimately responsible for victory in the Battle of Britain. These ideas have appeared in his PhD thesis '*The Navy as the Ultimate Guarantor of Freedom in 1940*' and in '*The Royal Navy and the Battle of Britain*' (Annapolis, Naval Institute Press, 2010).

From the title one would assume that the central focus of this new volume would be the inter-service rivalry between Admiralty and Air Ministry in the interwar years, but the first half of the book is taken up with a rather selective review of developments in air and sea power looked at without reference to the broader inter-service perspective. Cumming presents an excessively one-sided view of air and navy responses to economic constraints and strategic requirements, with little examination of the causes and response to the genuine rivalry which existed. Cumming uses a number of secondary sources which cannot be described as representing the high ground of academic debate. In consequence the book adds little to the historiography. In the introduction to his doctoral thesis Cumming states that:

> 'It is perhaps my own irrational irritation with the eternal emotional bombast obstructing rational debate on these matters that motivates me to challenge some of the most cherished assumptions of 1940 and to ask who saved Britain in her finest hour.'

Clearly then there is a case for following E.H Carr's advice to study the historian before you begin to study the facts. Even the publisher's cover notes begin with the comment that the content is a provocative reinterpretation of British air and naval power.

Rather than focusing on the conflicts between the Royal Air Force and the Royal Navy three chapters are devoted to an aggressive critique of Trenchard's efforts to ensure the survival of an independent Royal Air Force; the RAF role in Imperial Policing in the Middle East and North West Frontier; and the period which Churchill described as 'The Locust Years'.

In these chapters Cumming engages in lengthy discourse on such matters as gunnery, anti-submarine warfare, and defence against mines from a naval perspective on the one hand, and then, on the other hand, equally long diversions to discuss the failure of the Air Ministry to establish a proper fighter/bomber ratio, or a capable bomber which would enable RAF operational capability to match the rhetoric of the Air Ministry. However, major points of disagreement between the Royal Air Force and Royal Navy, such as over the control of the Fleet Air Arm, are almost completely overlooked in Cumming's review.

Having failed to provide any analysis of the rivalry between the two protagonists, which is supposedly the subject of the book, Cumming then proceeds to provide an equally one-sided view of the events of the summer of 1940 painting the role of the Royal Air Force in the Battle of Britain in the worst possible light. In the opening paragraph of this chapter Cumming cites three leading academics in a quote intended to provide evidence that the air campaign in the Battle of Britain was by no means decisive, and that the Royal Navy remained the real guarantor of defence against invasion. The quotation was incomplete and led to the academics concerned writing lengthy rebuttals in the RUSI Journal following publication of the original article which Cumming had referenced.

What Cumming has failed to do is to seek the holistic view which the authors [Goulter, Gordon and Sheffield] had considered essential. An opportunity to present a reasoned debate is lost. In fact there is general acceptance amongst historians that both services contributed to Hitler's decision to cancel Operation Sealion, an established view which did not come about as a consequence of Cumming's provocative text.

Having failed to address the inter-war rivalry Cumming balances two chapters covering the air war in 1940 with the naval situation and therein he discusses two elements which could reasonably have been subject to the type of critical analysis which the title of the book suggests; albeit at the very end of the period supposedly under examination in the book title. The topics discussed were the action at Mers-el-Kebir and the Battle of the Atlantic.

The decision to deny German and Italian forces the opportunity of capturing the French fleet was a difficult one, and in the aftermath of Mers-el-Kebir it would have been extremely problematic to portray it as a victory to a British public in need of some evidence of turning the tide on German advances. In comparison the public perception of a significant victory against the Luftwaffe was much easier to promote. Furthermore there was an imperative to present a defiant message to Roosevelt in order to demonstrate British resolve, and the destruction of the ships of a former ally would hardly have portrayed the desired message. Although Cumming does devote a passage to these considerations, the interested reader would be better served in examining the '*The Good Fight: Battle of Britain Propaganda and The Few*' by Dr. Garry Campion, (Basingstoke, Palgrave Macmillan, 2010).

Similarly, a much more balanced analysis of the competing views with regard to the use of air power with respect to the Battle of the Atlantic can be gained by reading the work by John Buckley, '*RAF and Trade Defence 1919-1945: Constant Endeavour.*' (Keele University Press, 1995).
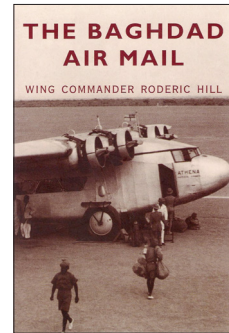
The penultimate chapter of the book deals with the war in the Mediterranean and as with the preceding chapters one is left to wonder what the relevance is to the book's title. Instead another review of events is given, with no engagement with the central question of inter-service rivalry. From cover to cover Cumming fails to describe or explain the political conflicts which existed between the Royal Air Force and the Royal Navy.

In his conclusion Cumming asks whether it is ever possible for the service chiefs to place the wider national interest above loyalty to their own service. It is a question which might well have been asked at the outset as a means for examining the rivalries which were prevalent between Admiralty and Air Ministry throughout the period covered in this book.

Polemic can be a productive device to raise new and controversial questions in the hope of improving understanding. Unfortunately Cumming's book does not invite considered appraisal of the subject matter raised, but rather has the potential to polarise opinion, based upon a very biased presentation of the topic. For the serious academic reader this volume has little to offer.

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Book Reviews

The Baghdad Air Mail

By Wing Commander Roderic Hill
Publisher: Nonsuch Publishing (Reprint, 2005) (**ISBN:** 978-1845880095) 256 pages

Reviewed by Flight Lieutenant Chloe Bridge

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Biography: Flight Lieutenant Chloe Bridge is an officer in the Personnel Branch serving at the Headquarters of No. 1 Group at RAF High Wycombe. She recently commenced a Dowding Fellowship with King's College London.

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Introduction

Who knew that a personal account about transporting mail in the 1920s could be so intriguing, captivating and relevant to a 21st Century audience? Wing Commander Roderic Hill's *'The Baghdad Air Mail'* offers readers a fascinating insight into the development of the RAF's desert air mail service between Cairo and Baghdad. First published in 1929, the book provides a detailed historical account of one man's perspective of operating and living in the Middle East. With similar environmental challenges that are still experienced today this account will appeal to those that have or are currently serving overseas and also aviation enthusiasts.

Wing Commander Hill was Officer Commanding 45 Squadron which operated the Vickers Vernon aircraft around the Middle East in the 1920s. Hill later became Commander-in-Chief of Fighter Command during the Second World War and after retiring from the RAF became Vice-Chancellor of the University of London in 1953.

Hill's *'The Baghdad Air Mail'* delivers a unique snapshot of history which conveys what life was like for an RAF Pilot on the mail route. Hill's own aim was to present personal narratives

so that readers could visualise and understand the conditions in the Middle East in the 1920s. He achieves this by utilising a number of British comparisons to describe the route. In one example Hill handily superimposes the entire mail route over an imaginary route in the UK from Penzance to the Shetland Islands giving readers scale and perspective.

The book is 238 pages long and well organised. It is essentially split into two distinct parts. The first part, roughly a third of the book, focuses on the development of the air route from its early conception in 1921. Here the history and operation of the route is also described.

The first part also has Hill meticulously describing a number of Middle Eastern cities which can be confusing to understand due to the sheer volume that are cited. However, with the inclusion of sketch maps, readers can become acquainted with locations quickly. The cities will be familiar to modern readers, examples being Fallujah, Mosul and Ramadi. Key descriptions of these places can be valuable to historians given that the locations and the surrounding areas have witnessed multiple wars and conflicts since the 1920s.

Hill changes focus for the second part of the book, describing in detail his personal flying experiences of six mail trips and rescue flights. Some accounts highlight how dangerous early flight was and the risks involved. These stories are easy for the reader to follow as Hill has already framed the context of the air mail route from the first part of his book, thus keeping the reader actively engaged. These personal experiences are so graphically described that readers can visualise themselves with Hill on his journeys. A whole chapter is dedicated to Hill's visit to a local Sheikh which provides a good depiction of British interactions with the local indigenous population.
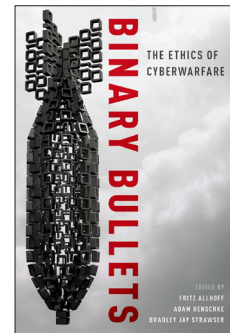
Throughout the account Hill intertwines his narrative with small vignettes that give a unique perspective of life in the Middle East. He goes into detail about food, dodging dangerous desert creatures and listening to the 'rugger' scores over the wireless radio, especially when the RAF beat the Navy. He also describes eager crowds waiting at aerodromes for their valuable personal mail to be delivered. With the introduction of the air route, mail would only take a few days from London to Baghdad when previously it would take nearly a month. Although modern day technology such as the Internet allows instant communication, the delivery of mail, especially during Christmas time, still produces an excitement and anticipation with those serving overseas. Some modern day readers would certainly be able to relate to these vignettes.

After reading the account one cannot help but reflect on Hill's narrative. He was writing at a time when the RAF was early in concept and operating in a new and hospitable environment, but where innovation was crucial and at the forefront. The balance between risk and achievement is clear, not only for the newly created independent RAF but also for personnel serving in the Middle East. A balance that still faces individuals and commanders today.

The style and scale of this account makes 'The Baghdad Air Mail' a good read not only for those that have or are currently serving overseas but also aviation enthusiasts. It is historically interesting, gripping and provides a unique snapshot of RAF life during the 1920s. Modern day readers will be able to follow and enjoy this account. It is clear that Hill has a passion for aviation and storytelling which makes this book intriguing, captivating and relevant to a 21st Century audience.

Book Reviews

Binary Bullets: The Ethics of Cyberwarfare

By Fritz Allhoff, Adam Hensschke and Bradley Jay Stawser
Publisher: Oxford University Press, 2016 (**ISBN:** 978-0190221089) 320 pages

Reviewed by Squadron Leader Eoin Sands

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Biography: Squadron Leader Eoin Sands is a C-130 pilot serving with No. 30 Squadron, RAF Brize Norton. He studied with King's College London under a Dowding Fellowship in 2012 graduating with a Distinction.

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Introduction

Binary Bullets is one of the first works to attempt to tackle the thorny problem of applying ethical theories from the just war tradition to the nascent and rapidly developing area of cyberwarfare. Comprising of twelve essays covering topics ranging from emerging international legal norms for cyberconflict to a suggested "Code of Honour" for cyberwarriors, the book is a brave and valuable attempt to stimulate academic discussion on what will be an increasingly important area for military ethics in the future.

The contributors come almost exclusively from the world of academia, with the majority being current or former professors of ethics, law or philosophy. While this means that each essay has been written by an expert in the field, it does reinforce the fact that this book is intended to provoke scholarly debate rather than to appeal to the casual reader. Most chapters assume at least a glancing familiarity with just war theory and international law, although it should be pointed out that an extensive background in the field of cyberwarfare itself is not a prerequisite. This is very much a book for military ethicists with an interest in cyber rather than the reciprocal.

That said, some chapters are more accessible than others, perhaps due to the presence of a former USAF officer on the editorial staff.

The book is split into four parts. The first explores the moral and legal normative framework that has already begun to emerge around the realm of cyberwarfare. The second investigates how easily cyberwarfare fits into the existing just war tradition, fundamentally asking whether there can be such a thing as a cyberwar (a question answered in the negative by Thomas Rid some years earlier in his seminal work '*Cyber War Will Not Take Place*'). The third section of the book considers the human element of cyberwarfare, both in terms of those who prosecute it and those who are affected by it. Perhaps the most accessible part of the book, it includes a fascinating chapter that examines through practical experimentation the psychological effects that cyberattacks can have on the individual. The book concludes by looking at "Cyberwarfare, Deception and Privacy" and includes an essay examining what is perhaps the salient question for the average citizen in the post-Snowden/Assange era: how ethical are national security surveillance programs.

Four practical examples of cyberattack dominate the book and they will be familiar to any student of cyberwarfare: the Stuxnet attack on the Iranian nuclear program; the Distributed Denial of Service (DDoS) attack on Estonia following the move of a Russian war memorial; Operation Orchard, the (alleged) Israeli Air Force raid on a Syrian weapons facility enabled by a prior cyberattack on the Syrian air defence system; and the alleged cyberespionage carried out by the Chinese military into a range of organisations and governments as detailed in the Mandiant Report. These examples highlight a fact that proves the importance of works such as *Binary Bullets*: cyberattacks to date have not involved death and large-scale physical destruction and therefore have fallen between the gaps of much of existing just war theory in a similar fashion to economic sanctions, diplomatic embargoes and other forces-short-of-war. Combined with the anonymity of cyberattacks (the so-called 'attribution problem'), this makes cyberwarfare an ethical minefield and one that demands attention.

Two works sit on the periphery of many of the essays and any prospective reader of *Binary Bullets* would benefit from also adding them to their collection. The first is the aforementioned '*Cyber War Will Not Take Place*' by Rid, which is in equal parts venerated and denounced in a number of the essays in this book (perhaps not surprising for what was an intentionally though-provoking and controversial piece). The second is *The Tallinn Manual*, perhaps the best attempt to date to codify rules for regulating the prosecution of cyberwar. Again, depending on the essayist, this work is either held up as a "very serious and expert document (p. 125)" or "a spectacular failure (p. 17)."

The presence of such contradictory opinions within the same book is indicative not only of *Binary Bullets*' ambition to spur academic debate but also of the absence of any existing agreed ethical frameworks for cyberwarfare. To further illustrate this point, in Chapter 5, Ryan Jenkins contends that cyberwarfare is a morally ideal form of war and as such the deployment of

cyberweapons should be morally favourable to a relevantly similar act of conventional war. Later on in Chapter 10, Heather Roff argues that any cyberattack (or at least any which results in death, injury or capture of adversaries) constitutes perfidy and is not only morally and legally prohibited but will also deleteriously affect the likelihood of *jus post bellum*. There can be few areas in military academia so undeveloped as to allow such opposing views equal credibility. This perhaps highlights the real appeal of *Binary Bullets*; it truly feels as if it is stepping into untrodden ground. It is not a book for everyone and casual readers will struggle with the occasionally impenetrable language used throughout. However, for those with a background or even merely an interest in ethics, it is essential reading.

Book Reviews

Red Team: How to Succeed by Thinking like the Enemy

By Micah Zenko
Publisher: The Perseus Book Group, 2015 (**ISBN:** 978-0465048946) 366 pages

Reviewed by Wing Commander Mal Craghill

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Biography: Wing Commander Mal Craghill completed a Master's degree in Applied Security Strategy at the University of Exeter in 2014 as the RAF's first Henderson Fellow. He is a fast-jet navigator serving in the UK's Ministry of Defence.

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Introduction

In highly competitive commercial environments poorly conceived strategies, weak security measures or inadequately resourced campaigns can result in financial and reputational damage. In a national security context the results could – and have been – disastrous in terms of lives lost, unforeseen consequences and shattered reputations. Yet in most cases, according to Micah Zenko, the chances of achieving more favourable outcomes could be improved through the use of 3 core practices: simulations, vulnerability probes and alternative analyses. Those aware of the dangers inherent in marking one's own homework can draft in a 'red team' of skilled facilitators who use these practices to encourage critical thinking, group think mitigation, cultural empathy and self-awareness to improve understanding of the motivations, intentions and capabilities of an organisation or actor.

To illustrate his theory, Zenko immersed himself in the world of red teaming, attending military courses at the US Army's University of Foreign Military and Cultural Studies (UFMCS, known as 'Red Team University') and commercial courses at the Fuld Gilad Herring Academy of Competitive Intelligence in Boston, USA. He also draws heavily on hundreds of interviews and case studies to bring his work to life, as well as relevant books, journals and military

doctrine. Zenko is currently a senior fellow at the Council on Foreign Relations in America, having previously held positions at Harvard University's Kennedy School of Government, the Brookings Institution, Congressional Research Service and the US State Department. He is widely published in the fields of national and international security and conflict prevention.

Late in the book Zenko states that "An adept red team will inform decision-makers by challenging conventional wisdom, identifying blind spots, revealing vulnerabilities, presenting alternative futures, and considering worst-case scenarios" (p.226). Many military readers will self-identify with that statement, pointing to numerous training courses and exercises (academic and practical) and their operational experience to show how they fit the mould of the critical thinker. The success of Zenko's book is in convincing the reader that is not the case, and that without significant investment – particularly in 'thinking about thinking', or learning how to think – most people in hierarchical organisations will be shaped more by their institution than vice versa.

The book is logically structured, beginning with the origins of red teaming in the Vatican's 'devils advocacy' approach to testing applications for sainthood, then working through best practices, red teaming in modern military, intelligence community and homeland security contexts, and private sector red teaming before summarising and suggesting the role that artificial intelligence might play in the discipline in future. Zenko uses contemporary examples throughout to show the benefits of red teaming as well as where its absence, or wilful ignorance of its results, has led to disastrous consequences. One theme is obvious throughout the book, directly related to the number one best practice: the boss must buy in. Where this is not the case, it tends to be due to cognitive biases (such as mirror imaging and confirmation bias) or organisational biases (of which institutional capture and adoption of hierarchical preferences are key to the military); without that high-level support, the red team's work is likely to be nugatory.

Several of Zenko's case studies are worth highlighting, for differing reasons. In one he explains how a lack of independent review and critical thought in the Israeli intelligence community ahead of the 1973 Yom Kippur War left Israel dangerously exposed. Learning from this experience, the Israeli Defence Force subsequently established a dedicated red team – the Mahleket Bakara – to prevent similar failures. The intelligence profession is highlighted as a narrow, deep specialisation where biases such as the 'tyranny of expertise' and 'coordination problems' (the 'blanding' effect of consensus) are particularly common. This point seems to have been recognised by the Obama administration in its use of three separate red teams to verify Osama bin Laden's likely presence in a compound in Pakistan ahead of the mission to capture him which resulted in his death. This example also shows how the use of simulations or table top exercises were useful in identifying, and planning responses to, 'what if?' situations such as the loss of a helicopter, which actually occurred.

Perhaps the most invidious example Zenko cites is the use of penetration testing and vulnerability probes by the US Federal Aviation Administration (FAA) during the 1990s to test airport and airline security. Despite repeatedly exposing the sort of shortcomings which
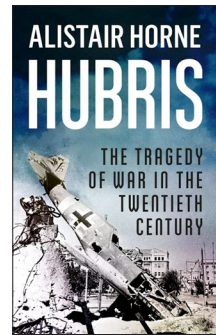
would lead to the catastrophe of 9/11, the FAA red team's findings were consistently ignored by the airlines and FAA leadership; failings which remain evident around the world today, as evidenced by the recent Brussels airport bombing. Zenko's exploration of red teaming in the private sector is no less revealing, highlighting how cost-benefit analysis and commercial secrecy combine to leave a feeling that the customer's best interests are frequently not a central consideration for big business.

Red Team is aimed at a wide audience, and some readers might feel that the 'how to' of military red teaming is somewhat overlooked. Zenko covers for this by liberally signposting other resources to which the reader can turn, including the Red Team University's Applied Critical Thinking Handbook and the UK Development, Concepts and Doctrine Centre's own Red Teaming Guide (Second Edition). For those seeking detail on some of the other concepts explored by Zenko (such as biases, thinking about thinking and unconventional approaches), the works of Daniel Kahneman, Malcolm Gladwell, Matthew Syed and Nassim Nicholas Taleb should provide excellent further reading.

Micah Zenko proves the wide applicability of his fascinating and convincing work time and again throughout Red Team. Seasoned practitioners will find it a valuable source of material, particularly on avoiding the identified pitfalls, and budding red teamers will find a wealth of resources to get them started. But the key target audience will be those in a position of high leadership and responsibility who can influence how (or even if) red team concepts are employed in their areas of responsibility. The real challenge – especially in a military environment where ego can often block alternative perspectives – will be overcoming those senior leaders' biases and opening their eyes to the possibilities of red teaming.

Book Reviews

Hubris: The Tragedy of War in the Twentieth Century

By Alistair Horne
Publisher: Orion Publishing Co, 2016 (**ISBN:** 978-1780222219) 352 pages

Reviewed by Dr Frank Ledwidge

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Biography: Dr Frank Ledwidge is a Senior Fellow at Portsmouth Business School (RAF College Cranwell). He is an Army Reserve officer, qualified barrister and received his doctorate in war studies from King's College London in 2015.

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Introduction

We are running out of first class historians – as opposed to journalists – with meaningful experience of combat or indeed any form of conflict. Arguably only two remain, Michael Howard and of course Alistair Horne. Horne's works have inspired and advised since the early 1960s. His seminal account of Verdun '*The Price of Glory*' (1962) remains the leading work on the greatest battle in Western European history. '*To Lose a Battle*' (1969) is said to have been closely studied by Israeli generals – specifically Ariel Sharon – and to have influenced their tactics in the Yom Kippur War of 1973. Perhaps his best known work, and that is saying something, is '*A Savage War of Peace*' (1973), once again still the go-to work on the Franco-Algerian War. In the dark days of 2006, Sir Alistair was invited by President George W Bush, who had read the books on Henry Kissinger's recommendation to discuss Iraq and how to deal with Arab insurgents.

With a background like that when you open a book by Horne, you can assume that you are in for an authoritative and interesting read. With his latest, '*Hubris*', you can be assured that as well as having those qualities it is also very enjoyable. Focussing on the early 20th Century '*Hubris*' looks at five campaigns, or more accurately, five series of battles where Hubris played a

role. Horne is too subtle a writer to overstress the 'Nemesis' that inevitably follows. This formula of studying failure is nothing new. After all, every battle won is also a battle lost by one's opponents. There is no shortage of studies outlining the reasons for the disasters (also Soviet victories) of Stalingrad and Kursk. One could name many, many other examples of events – some rather recent – which loom large in the 'military failure' literature.

'Hubris' is unusual for at least three reasons. First, for its selection of campaigns. Yes, there is Moscow 1941 – very well-covered quite recently by, amongst several others, Rod Braithwaite. However, aside from naval enthusiasts few might have come across a study of the battle of Tsushima where Japan's pre-Dreadnought battleships smashed Russia's fleet in 1905. Even those naval historians would have much to learn about the rest of the major battles in the Russo-Japanese War – particularly in Korea. All of them were new to this reader. These are very well-covered; indeed they prove to have provided important lessons for the commanders in the Korean War of 1950-1953. Horne looks again at that later campaign. Indeed his summary of the course of that war is excellent, the best available.

Similarly, experts on armoured warfare, or the life of Marshall Zhukov will have heard of the Battle of Nomonhan in 1939 where, this time on land, Soviet Russia decisively defeated Japan. This battle intimately influenced that Battle before Moscow in ensuring that the Japanese Army understood that there was little mileage in an invasion of the USSR. Indeed it may be argued that Nomonhan fought in 1939 played a part in the endgame of the Second World War in that it placed Japan on the defensive with respect to Russia; some argue that what the Japanese government really feared in 1945 was a *Russian*-dominated Japan.
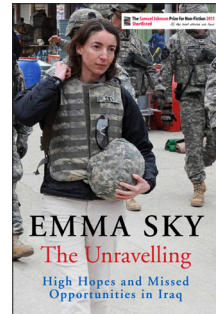
This raises the second almost unique quality of '*Hubris*'. Each of the five campaigns studies are well done. One would expect no less. However, each is linked both explicitly and implicitly to the next and the subsequent war. These links are not forced, but neither are they obvious. The close connection between Nomonhan and Moscow has already been mentioned. Less obvious are the links between Tsushima (1905) and Midway (1942). These skeins of connections pervade Hubris and render it almost a work of art as well as a fine work of history. In other words, there is a great deal more to the book than an apparently random or 'capricious' – Horne's word – collection of campaign summaries.

Finally, there is the personal element. Alistair Horne's life has spanned all the major conflicts of the late 20th Century. It has also encompassed sometimes close friendships with some of its key players. Once again, this personal element is not overplayed. It is however perhaps unconsciously present, as when the author mentions the throwaway comment of a friend of his who was in the German Army of 1941 before Moscow, or the relative comforts of an M4 Sherman and a T34 both of which as a young officer in the 1940s he had experienced. History, as the author says in his prologue, requires historians to 'scan backwards and forwards, as well as sideways'; in other words no battle exists in isolation. '*Hubris*' is a supreme example

of this approach, with all the conflicts chosen having links with each other. Each of the campaign studies in this book is a masterpiece in miniature. Taken together, they represent an excellent and fascinating book that will illuminate and entertain anyone with an interest in military history.

Book Reviews

The Unravelling: High Hopes and Missed Opportunities in Iraq

By Emma Sky
Publisher: Atlantic Books, 2015 (**ISBN:** 978-1-78239-257-6) 382 pages

Reviewed by Squadron Leader Matthew Smith

Biography: Squadron Leader Matthew Smith is an RAF engineering officer, currently serving with XV(R) Squadron (Tornado GR4) at RAF Lossiemouth. He studied at King's College London under a Dowding Fellowship graduating in 2016.

Introduction

The Unravelling is a unique, honest and detailed memoir of one woman's experience working side by side with the military and political elites charged with rebuilding Iraq following the 2003 invasion. The account aims to describe the challenges faced by the Coalition in conducting post-conflict nation building and how the overthrow of an authoritarian regime can lead to state collapse and conflict. In addition, The Unravelling seeks to demonstrate the limitations of external influence on foreign affairs, but also where such actors may be able to exert positive influence.

Emma Sky, a British national and currently a senior fellow at Yale University's Jackson Institute, has huge experience in working in the Middle East having worked for the British Council in Israel, Gaza and the West Bank as well as with Palestinian NGOs. Initially opposed to the war, she was presented with an opportunity to deploy to Iraq as an administrator following the dismantlement of Saddam Hussein's Baathist regime. Envisaged only as a short term appointment, Sky saw this as her chance to 'apologize to Iraqis for the war, and to help them rebuild their country'. Sky tells her story in four parts, initially charting her time with the Coalition Provisional Authority in Kirkuk in 2003 before serving twice as Political Advisor to

General Ray Odierno, first during the United States' troop surge in 2007 and then during the drawdown of Coalition forces between 2008 and 2010. Sky concludes with a chapter on her visits back to Iraq after the withdrawal and the subsequent rise of Da'ash.

Sky offers a singular insight into the complex circumstances faced by the Coalition and its struggle to come to terms with alien cultures and ideologies. Sky writes in an easy and informal style although the intricacies of Iraqi society and the pace at which the narrative darts between locales and actors can make the objectives and affiliations of the multitude of protagonists difficult to follow, the glossary of political parties and militias is a welcome aid. The human perspective that Sky provides is particularly engaging. Establishing herself as an essential intermediary between the politico-military elites of the Coalition and Iraq, Sky talks of the friendships she formed and intertwines the narrative with vignettes that demonstrate the impact of the war on everyday Iraqis from all backgrounds. In addition, her place at the heart of the Coalition during the surge period offers a different angle on this often controversial strategy.

Sky's account of her time as Kirkuk's Governorate Coordinator describes a region in chaos, with minimal governance and security provision entirely entrusted to the US Army. Sky is critical of the Coalition's decision to dismantle Saddam's Baathist party, claiming it left a yawning hole in the ability of the Provisional Authority to govern the nation. With no means of improving the situation at her direct disposal Sky integrates herself into the only body of power in the province, the 173rd Airborne Brigade under the command of Colonel William Mayville. She describes them as idealists committed to a cause that they have utmost faith in; however, she also sees an organisation that is constrained in its thinking, compartmentalising Iraqi citizens into rigid groups and lacking the nuance of mind to fully appreciate the sectarian dynamics fracturing Iraqi society. With Sky's expertise and Mayville's flexibility and resources they are able to make considerable improvements to the lives of Kirkuk's citizens. It is this respectful but authoritative approach that Sky asserts can allow foreign actors to win the trust of local populations and thus forms the bedrock of the nation building process.

The success of her partnership with Mayville leads to her being personally selected by General Odierno to be his Political Advisor during his time overseeing the implementation of the Surge. She describes how she guided the hand of Odierno, and that although they became extremely close she found occasion to strongly oppose policies she perceived to be detrimental to the reconciliation process. Sky contends that the surge period, allied with a change towards more reconciliation focused and population centric tactics, changed the strategic calculus of the various warring factions and thus created a stable security environment for the political process to move forward. She describes herself as leaving Iraq after the surge in a state of euphoria, optimistic that despite the disastrous internal conflict, created and enflamed by Coalition miscalculation, there existed hope that Iraq may rise as a secular democratic state.

The third period in the book recounts Sky's time as personal advisor to Odierno during the Coalition withdrawal and describes the transformation of her post-Surge euphoria into

sadness, anger and fear. Sky argues that for reasons of political expedience, the new Obama regime was prepared to accept the political status quo by backing the incumbent president, Shia strongman al-Maliki, rather than uphold the results of the 2010 election which had favoured the outwardly secular but predominantly Sunni Iraqiya party. It was this betrayal of democratic principles by American political elites that Sky claims lead to the failure of the reconciliation process in Iraq, allowing al-Maliki to consolidate his grip on power and crush Sunni hopes for an inclusive government. Her compelling argument is substantiated by the testimonies of the senior Sunni, Shia and Kurdish representatives that have come to view her as a friend. The disenfranchisement of the Sunni population, Sky argues, left the door open to the radical Da'ash group to establish itself as the defender of Sunnis across the region.

Sky's passion for the people of Iraq and her commitment to influencing the Coalition's approach to the conduct of nation building, counter-insurgency operations and reconciliation is conveyed strongly throughout her narrative. It is an account that will appeal to academics wishing to gain the perspective of an authoritative interlocutor, beholden neither to the military or political apparatus. But, it is also a story that is accessible to a wider audience seeking to understand the roots of the current schisms in Iraqi society. Whilst some of her views may be contested by some, her final conclusion that the West was left with nothing to show for all the blood and treasure invested and that it is likely no one will be held accountable will find few dissenters. The Unravelling is a sobering read, but it is infused with optimism for what might yet be accomplished if a common ground between faiths can be established and if the tainted political system can be reformed.

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